Competent Authority Report
Public version

SULFURYL FLUORIDE/VIKANE (PT8)

DOCUMENT III-B5

Intended Uses and Efficacy

Rapporteur Member State: Sweden

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KEMI
KEMIKALIEINSPEKTIONEN
SWEDISH CHEMICALS INSPECTORATE

Table of Contents; DOC III-B5

Section B5 Intended uses and efficacy

Annex Point IIB, V.

Subsection (Annex Point)			Official use only
		Introduction To obtain efficacy data on wood destroying pests is problematic. There are few specialized research organizations and few pest cultures maintained. Obtaining natural sources for testing may also prove difficult. Some species and life stages are especially challenging to raise in sufficient quantities for effectiveness studies. Despite these challenges much laboratory and field data has been collated to demonstrate the efficacy of sulfuryl fluoride in controlling important wood destroying pests. The active substance sulfuryl fluoride was originally developed by The Dow Chemical Company in the late 1950s as the product Vikane* gas fumigant to control wood destroying insects in structures. The product is currently registered for use in the USA, Caribbean Islands, Japan, Norway, Finland and Sweden, and is authorised for use in Germany. Since its introduction in 1961 Vikane has been used to fumigate more than one million buildings including residential homes, churches, museums, historical landmarks, rare book collections, scientific and medical research laboratories. The product is also used to fumigate shipping containers and also vehicles except aircraft and subsurface water vessels. *Trademark of Dow AgroSciences	
5.1	**Product type(s) and field(s) of use envisaged (IIB5.1)**	Fumigant for the control of wood destroying pests in wooden structures/rooms (e.g. churches, houses) and of wooden objects/timber in fumigation chambers, shipment containers and in stacks under tarpaulins (e.g. plastic sheets).	
5.1.1	**Product type(s)**		
	MG02: Preservatives	Product type PT 8.02	
	Further specification	Other wood preservatives (with curative action)	
5.1.2	**Overall use pattern**	Curative treatment by fumigation conducted only by professional licensed and trained fumigators. Use pattern is as described in the OECD – PT8 - Environmental Scenario Document (ESD) part 4, Appendix 7: "The wood treated with gases in contained rooms: fumigation chambers, shipment containers, plastic sheaths, sealed rooms" Fumigation of wooden structures/rooms (e.g. churches, houses) and of wooden objects/timber in fumigation chambers, shipment containers and in stacks under tarpaulins.	

Section B5 Intended uses and efficacy

Annex Point IIB, V.

5.2 Method of application including description of system used (IIB5.2)

Wood preservation covers a range of scenarios which include structural fumigation (e.g. churches, houses), chamber fumigation of wooden objects (e.g. wood artefacts, furniture), shipment containers and stacks under tarpaulin (e.g. wood packaging material, timber).

Similar work place activities occur with each scenario. In the case of structural fumigation, the structure has to be made as gas tight as possible by sealing all openings (e.g. windows, doors). The fumigant is then introduced and following the required exposure period the structure, chamber container and fumigated material is then aerated. Re-entry into the area where the fumigation occurred occurs following clearance of the fumigant.

Sulfuryl fluoride is transported in a cylinder as pressurised liquid. It is introduced in the structure, chamber, container or stack under its own pressure via suitable tubing e.g. polyethylene or nylon, connected to the cylinder which leads to the point of volatilisation, where the sulfuryl fluoride is dispersed.

5.3 Application rate and if appropriate, the final concentration of the biocidal product and active substance in the system in which the preparation is to be used, e.g. cooling water, surface water, water used for heating purposes (IIB5.3)

Maximum concentration

The dosage is the product (P) of concentration (C) x exposure time (T) product abbreviated as CTP. The maximum concentration is 128 g/m^3 with no restriction for exposure time.

The 128 g/m^3 was proposed by Dow AgroSciences to establish a limit that would provide the required flexibility for fumigators for practical fumigations. The required exposure period for fumigations vary, for some there may be a significant time constraint and a short exposure time is needed and therefore a higher concentration to achieve the target dosage. For others, where there is no time constraint a longer exposure time can be used with a corresponding reduction in the required concentration. It was considered necessary to have a concentration limit to avoid excessively high concentrations being used. The 128 g/m^3 proposed for the biocidial use of sulfuryl fluoride is in accord with that proposed for its non-biocidial use.

Dosage description

Vikane is the active ingredient (99.8 % of sulfuryl fluoride), there is no formulated product.

The dosage i.e. the CTP (concentration x time product) measured in g h $/m^3$ is dependent on the pest species, the life stage and the temperature. The toxicity of sulfuryl fluoride is highly influenced by temperature. Increasing the temperature reduces the dosage required for all pest life stages. For post-embryonic life stages this is due to the increased rate of respiration with temperature rise. With the higher rates of respiration a higher amount of sulfuryl fluoride enters the insect pest via the spiricales and is metabolised at a faster rate. For eggs sulfuryl fluoride enters via diffusion. Studies reported in the dossier have shown that the insect pest egg susceptibility to sulfuryl fluoride may vary according to egg age. By increasing the temperature the development time for eggs shortens and more susceptible egg ages are reached in a faster time reducing the dosage required. Fumigant dosages are properly calculated as the product of fumigant concentration (c) x exposure time (t) = CTP given in g h $/m^3$.

However, in pest control practice, fumigators generally have simplified target dosages to a rate in g /m^3 for methyl bromide and for phosphine. This approach has the significant flaw of not accounting for variable gas loss rates. The result is overdosing (gas loss rate slower than planned) or underdosing (gas loss rate was faster than planned) in many situations.

The proposed Vikane label does not provide target dosages because the Vikane Fumiguide calculator(s) are required to determine the target dosage. The dosage will be specific to each fumigation incorporating the biological factors to determine dosage, and the gas retention rate to determine the initial target concentration. The structure volume is then factored in to determine the amount (weight) of fumigant required for this specific target species, site, exposure period and environmental conditions.

Dosage requirement
For fumigation to control wood destroying pests, the Vikane Fumiguide calculator(s) are to be used for the coordination of fumigant rates with the parameters of temperature at the site of the pest, exposure period, and fumigant loss rate measured as half-loss-time (HLT). The HLT is a measure of gas confinement as is defined as the time in hours taken for the concentration of sulfuryl fluoride to reduce by 50%.

To simplify the use of the Vikane Fumiguide calculators, following the input of the parameters, the dosage is provided for a single pest - drywood termites. Dosages for other pests are then calculated as a multiple of this value. These multiplication factors are given in the table below:

Pest	Dosage Factor (as a multiple of drywood termite dosage)
Formosan termites (*Coptotermes formosanus*)	X4
Powder post beetle (*Lyctus brunneus*) –Non egg stages	X4
Egg stage	X15
Common furniture beetle, house borer, wood worm (*Anobium punctatum*) – Non egg stages	X4
Egg stage	X20
House longhorn beetle, European house borer, old house borer (*Hylotrupes bajulus*) - Non egg stages	X4
Egg stage	X20
Pine wood nematode (*Bursaphelenchus xylophilus*) – All stages	X20

The Fumiguide B Calculator was used for unmonitored fumigations to coordinate fumigant rates with temperatures, a 20 to 24 hour exposure period, and an estimated half loss time. All fumigations with sulfuryl fluoride in the EU will have to be monitored, as it is written in the ProFume/Vikane Gas Fumigant European Stewardship Policy for Fumigators and Distributors (enclosed in "Other Documentation (additional documents)".

The Fumiguide Y Calculator is used in conjunction with Fumiguide B when fumigant concentrations are monitored and/or the exposure period is not 20-24 hours.

The electronic Fumiguide Calculator is a hand held microprocessor which performs the functions of both the Fumiguide B and Y calculators.

A worked example to establish the correct dosage and the amount of Vikane needed using the Fumiguide Y is given as follows:

Parameters: Half loss time = 12 hours, exposure time = 48 hours, temperature = 25°C, structure volume 20,000 m^3.

Pest	Dosage g-h/m^3	KG Vikane
Drywood termites	78 (X)	94.10
Formosan termites (*Coptotermes formosanus*)	312 (4X)	376.44
Powder post beetle (*Lyctus brunneus*) – Non egg stages	312 (4X)	376.44
Egg stage	1170 (15X)	1411.50
Common furniture beetle, house borer, wood worm (*Anobium punctatum*) – Non egg stages	312 (4X)	376.44
Egg stage	1560 (20X)	1882.00
House longhorn beetle, European house borer, old house borer (*Hylotrupes bajulus*) – Non egg stages	312 (4X)	376.44
Egg stage	1560 (20X)	1882.00
Pine wood nematode (*Bursaphelenchus xylophilus*) - All stages	1560 (20X)	1882.00

Section B5 Intended uses and efficacy

Annex Point IIB, V.

5.4 Number and timing of applications, and where relevant, any particular information relating to geographical variations, climatic variations, or necessary waiting periods to protect man and animals (IIB5.4)

Application number and fumigation timing

For duration of the application i.e. the time that sulfuryl fluoride remains effective after fumigation, the following comments are made. Following a successful fumigation the infestation of the destroying insect pest would be eradicated. For some uses e.g. fumigation of imported wood packaging material to control quarantine pests one fumigation is required. Since sulfuryl fluoride has no residual activity re-infestation of wood destroying insects e.g. wood artefacts or wood within buildings could occur and further fumigations may be needed. In practice because of the long life cycle of many of the pests and the slow build up of an infestation years may elapse between treatments even when re-infestation occurs. This is certainly the situation with the current use of sulfuryl fluoride in Germany for the disinfestations of wood destroying insects from churches.

Regarding duration of the application i.e. the exposure period, although there is no upper limit in practice fumigation the majority of exposure periods would be within a 72 hour period.

A single fumigation may achieve complete disinfestations of wood providing conditions are suitable. Higher temperatures improve the effectiveness of sulfuryl fluoride**.** The reason why temperature has such a significant effect on fumigant effectiveness can be explained mostly by its effect on the rate of respiration of the pest. As temperature decreases, the respiration rate decreases, reducing fumigant uptake. Therefore fumigant dosage must be increased as temperature at the site of the target pest decreases. In addition to respiration temperature also affects the rate at which an insect develops. This is important in relation to insect life stages that may be less susceptible to the fumigant than others. Insect eggs are the most tolerant stage to sulfuryl fluoride. The level of tolerance can also depend on the egg age. At higher temperatures the egg stage is completed faster compared to lower temperatures and therefore it may become more susceptible to the fumigant.

Where the egg and post embryonic life stages of the pest are present and it is essential all pests are controlled it is advisable consider undertaking the fumigations in the warmer months or if necessary to introduce heat using appropriate heating systems. In addition longer exposure times would allow the more tolerant eggs to develop through to the more susceptible egg ages, possibly even into the very susceptible larval stage reducing the lethal dosage. If conditions are not suitable more than one fumigation may be needed to control the infestation after egg hatch.

Some pest species e.g. *Anobium punctatum*, produce only one generation per year and therefore presents an alternative strategy to avoid using the high rates necessary to achieve complete kill of the more tolerant eggs. These eggs may only represent a small percentage of the population. Fumigations could be done before or after the period when adult beetles are likely to be emerging and

laying eggs normally early spring and late summer. This would mean lower dosages could be used as the most tolerant egg stage would be absent. If using the lower post embryonic dosage it is advisable to confirm the egg laying period for the pest which requires eradication from the wood so the correct fumigation timing is selected.

Waiting period to protect man and animals

No one should be in the treated area if the concentration of sulfuryl of sulfuryl fluoride is above 3 ppm.

5.5 Function (IIB5.5)

Fumigant to destroy wood destroying insects and nematodes

5.6 Pest organism(s) to be controlled and products, organisms or objects to be protected (IIB5.6)

5.6.1 Pest organism(s) to be controlled

With the exception of termites all life stages of listed pests are controlled. Since termites are social insects only the non-egg stages need to be killed to eliminate the colony from wood.

Common Name(s)	Scientific Name
Drywood termites	*Cryptotermes cavifrons, Incisitermes minor, Incisitermes snyderi, Neotermes jouteli, Kalotermes approximates*
Formosan termites	*Coptotermes formosanus*
Common furniture beetle, house borer, wood worm	*Anobium punctatum*
Powder post beetle	*Lyctus brunneus*
House longhorn beetle, European house borer, old house borer	*Hylotrupes bajulus*
Pine wood nematode	*Bursaphelenchus xylophilus*

5.6.2 Products, organisms or objects to be protected

Disinfestation of wood from wood destroying pests. Uses include wooden structures/rooms (e.g. churches, houses), wooden objects and timber in fumigation chambers, shipment containers and in stacks under tarpaulins.

Section B5 Intended uses and efficacy

Annex Point IIB, V.

5.7 Effects on target organisms (IIB5.7)

Symptomology

Symptoms in exposed insects are lethargy in termites, whereas cockroaches become highly agitated and pest beetle larvae and adults emerge from hiding areas before death. Expulsion of body fluids may also occur. Mortality is generally rapid, occurring in minutes to hours at dosages significantly exceeding the lethal threshold, but may be delayed for several days, at marginally effective dosages (Osbrink, *et al*[1] 1988). Long-term effects, such as reduction in fecundity, have not been reported for insects surviving to adult stage, but this possible effect has not been carefully examined.

[1]Osbrink, W.L.A., Scheffrahn, R.H., Hsu, R.C. and Su, N-Y. (1988). Sulfuryl fluoride residues of fumigated foods protected in polythene bags. Journal of Agriculture and Food Chemistry, 36 (4), 853 – 855.

5.8 Mode of action (including time delay) in so far as not covered by section A5.4 (IIB5.8)

Mode of entry into pest

Sulfuryl fluoride occupies the air spaces within the fumigated site. These air spaces may be visible e.g. cracks and crevices within structures or unseen e.g. air spaces within wood. Sulfuryl fluoride enters the post embryonic life stages of insects via their spiracles; entry into the egg stages is achieved via diffusion.

Mode of action

Sulfuryl fluoride is a fumigant, which penetrates the pest's body through inhalation in actively respiring life stages (larvae, pupae and adults) or diffusion into the egg. Sulfuryl fluoride is considered a non-specific target poison acting by disrupting the glycolysis and citric acid cycles, thereby depriving the insect of the necessary energy for survival (Meikle *et al*[2] 1963). Upon sulfuryl fluoride entering a target organism it is broken down to the insecticidally active fluoride anion which disrupts the glycolysis and fatty acid cycles, depriving the pest of the necessary cellular energy. Outram [3](1967) suggests inhibition of magnesium enzyme systems is the inhibitory action within the glycolysis cycle. When the glycolysis and fatty acid cycles are inhibited, insects attempt to utilise protein and amino acids to maintain a viable energy level, but these alternative energy producing processes are insufficient to maintain a sufficient metabolic rate for survival. An increase in oxygen uptake in fumigated pest *vs* unfumigated pests occurs.

Speed of action

The effectiveness of sulfuryl fluoride is dependent on the concentration at the site of the pest, the exposure time (concentration x time product) and the physiological response of the pest species and life stage. Temperature at the site of the pest also affects its metabolic activity and the speed of action of sulfuryl fluoride. The post embryonic life stages (larvae, pupae and adults) have faster metabolic processes compared to eggs (Kenaga[4], 1957) which therefore require either a longer exposure or greater concentration. In a study on termite eggs Outram (1967) found that it took at least 24 hours for sulfuryl fluoride to penetrate the shell. He suggested that

this might be due to the impermeability of the egg shell, with sulfuryl fluoride being bound to its outer protein layer and the embryonic membranes.

Due to mode of action of the fumigant mortality may be delayed for several days. Osbrink *et al*[5] (1987) reported a range of mean delayed mortality times post-fumigation for ten termite species of 1.58 days for *Incisitermes snyderi* to 3.11 days for *Reticulitermes tibialis*.

[2]Meikle, R.W., Stewart, D., Globus, O.A. (1963). Drywood termite metabolism of Vikane fumigant as shown by labeled pool technique. Journal of Agriculture and Food Chemistry 11, 226 – 230.

[3]Outram, I. (1967). Factors affecting the resistance of insect eggs to sulphuryl fluoride-11. The distribution of sulphuryl ^{35}S fluoride in insect eggs after fumigation. Journal of Stored Product Research, 33, 353 – 358.

[4]Kenaga, E.E. (1957). Some biological, chemical and physical properties of sulfuryl fluoride as an insecticidal fumigant. Journal of Economic Entomology, 50, 1 – 6.

[5]Osbrink, W.L.A., Scheffrahn, R.H., Su, N-Y., and Rust, M.K. (1987). Laboratory comparisons of sulfuryl fluoride toxicity and mean time mortality among ten termite species (Isoptera: Hodotermitidae, Kalotermitidae, Rhinotermitidae). Journal ofr Economic Entomology, 80, 1044 – 1047.

5.9 User: industrial, professional, general public (non-professional) (IIB5.9)

1. Industrial No industrial use

2. Professional Sulfuryl fluoride is used by the professional user only (licensed / approved fumigator).

3. General public Sulfuryl fluoride is not used by the general public.

Section B5 Intended uses and efficacy

Annex Point IIB, V.

5.10 Efficacy data: The proposed label claims for the product and efficacy data to support these claims, including any available standard protocols used, laboratory tests, or field trials, where appropriate (IIB5.10)

The current Swedish label is attached below as an insert and as Appendix to this file.

9-009129-bk.pdf (101 KB) 9-007773.pdf (43 KB)

An OES (5 ppm) for sulfuryl fluoride had been established by numerous countries, including the UK, Sweden, Germany, the Netherlands and the US, and in all cases it is 5 ppm. For these reasons, Dow AgroSciences felt it was not appropriate to propose an AOEL, and were not at liberty to alter the established OES. During the data development for the 91/414/EEC data package numerous operator/bystander exposure studies were undertaken. Based on these studies and the fact that sulfuryl fluoride is now regulated under both Directives 91/414/EEC and 98/8/EC Dow AgroSciences felt it appropriate now to propose and AOEL which was set at 3 ppm. Therefore to ensure consistency Dow AgroSciences proposes to change current labels under 98/8/EC from the OES of 5 ppm to the AOEL of 3 ppm. X

In the current labels in Swedish, Norwegian and Finnish the maximum concentration of 128 g/m^3 is not given. At 5^{o}C the required concentration may exceed this level as the effectiveness of sulfuryl fluoride is reduced. For some insects at this temperature laboratory studies have shown mortality of target pest insects may not be achieved. By increasing the minimum temperature to 10^{o}C will improve the effectiveness of sulfuryl fluoride and control can be achieved within the 128 g/m^3 maximum concentration level. It is proposed that for all sulfuryl fluoride labels the maximum concentration level is included. X

The same pests may be widespread within the EU and in other countries or they may not be present but represent a potential threat and control measures need to be undertaken to prevent their introduction. Some are of such significance that international quarantine treatment standards for their control have been or are being adopted by countries around the world. The types of habitat where these pests occur, their food source and the environmental conditions i.e. temperature and relative humidity, which enable them to thrive are similar in the different countries. Therefore the data from field studies reported in the dossier from Europe and the USA are all considered as being relevant to support the application for EU authorisation of sulfuryl fluoride.

5.10.1 Proposed label claims for the product

Control of existing infestation in wood of the following pests:

Common Name(s)	Scientific Name
Drywood termites	*Cryptotermes cavifrons, Incisitermes minor, Incisitermes snyderi, Neotermes jouteli, Kalotermes approximates*

Section B5 Intended uses and efficacy

Annex Point IIB, V.

	Formosan termites	*Coptotermes formosanus*	
	Common furniture beetle, house borer, wood worm	*Anobium punctatum*	
	Powder post beetle	*Lyctus brunneus*	
	House longhorn beetle, European house borer, old house borer	*Hylotrupes bajulus*	
	Pine wood nematode	*Bursaphelenchus xylophilus*	
	Areas of use include: Fumigation of wooden structures/rooms (e.g. churches, houses) and of wooden objects/timber in fumigation chambers, containers, and stacks under tarpaulins.		
5.10.2 Efficacy data	See separate documents B5.10.2. The different terms: 'fumigation lasted for', 'exposure time', 'exposure' all have the same meaning. This being the time for which the target insect species is exposed to sulfuryl fluoride. The exposure concentration may be constant throughout the exposure time or it may reduce over time. For the concentration to remain constant over time the fumigated area would need to be completely gas tight e.g. as would be expected in a laboratory fumigation chamber. Reduction in concentration over time would be expected in a non-gas tight area e.g. as would be expected in a building. Efforts should be made to minimise the loss of concentration where gas loss is expected using appropriate permanent or temporary sealing techniques.		
5.11 Any other known limitations on efficacy including resistance (IIB5.11)	In over 40 years of use, during which sulfuryl fluoride has been used for the control of termites and wood boring beetles, these insects have not developed any known resistance to the fumigant. There is also no known evidence to cross-resistance to sulfuryl fluoride in phosphine resistant insects. Modeling has also shown for stored product insects, given the frequency of use and the life cycles of these pests that the resistance risk is low. These findings can be extrapolated to wood destroying pests. Taking these factors into consideration, no specific resistance management strategies are planned. However, fumigation should be considered as part of an integrated approach to pest management.		X
5.11.1 Use-related restrictions	If fumigating for insect pests do not apply when temperatures at the site of pest activity is below 10^{o}C. This temperature may be measured at the slab foundation, sub-floor or wherever the coolest part of the structure may be. For pinewood nematode do not apply at temperatures below 20^{o}C.		
5.11.2 Prevention of the development of resistance	To avoid the development of resistance sulfuryl fluoride as the product Vikane should be applied according at the dosage determined by the Fumiguide calculators. The use of the fumigant should be considered as part of an overall insect pest management plan and		

	other methods of pest control such as effective cleaning and avoidance of re-infestation should be practised. Where possible insect trapping and site specific monitoring on a routine basis to ensure effective timing and targeting of the fumigation. Reports of lack of performance will be fully investigated to determine the cause. If the cause cannot be readily established insects will be collected and tested for their sensitivity to sulfuryl fluoride.	
5.11.3 Concomitant use with other (biocidal) products	Sulfuryl fluoride is not mixed in cylinder with any other substance.	

Evaluation by Competent Authorities	
	EVALUATION BY RAPPORTEUR MEMBER STATE
Date	October 2004.
Comments on applicant's data	Field 5.10: The content of the product labels will be assessed at Member State level in connection to product authorisation. Field 5.11: A Sequential Quantitative Insecticide Resistance Model (SQUIRM) was used to evaluate the potential for sulfuryl fluoride resistance to develop in insect pests in stored products. The model was designed based on population dynamics by tracking the size and genetic mix of an insect population of many generations. The inputs include biological, genetic and operational factors. The modelling was conducted for two major stored product insect pests namely *T.castaneum* and *P.interpunctella.* The results showed that the probability of resistance development to sulfuryl fluoride is very low because of its unique mode of action, lack of cross-resistance and residual activity (Prabhakaran, S. K. and Ray, S. (2002). ProFume resistance risk analysis (Sequential Quantitative Resistance Model). Dow AgroSciences LLC, Zionsville Road, Indianapolis, Indiana, USA. Ref no. Z42).
Conclusion	Applicant's conclusions are adopted.
Acceptability	The information is considered acceptable.
Remarks	No remarks.

Table B5-1: Summary table of data on the method of application including description of system used

Serial number	Product type	Substance(s) used for dilution	Concentration of dilutant(s)	Other substance(s) added	Application technique	Remarks
(1)	PT08.02	Sulfuryl fluoride CAS: 2699-79-8	≥ 998 g/kg	Vikane, the product, is the technical material 99.8 %w/w. There are no other formulants or constituents of formulants in the 'product' Vikane.	Fumigation	
(2)	PT18.01	Sulfuryl fluoride CAS: 2699-79-8	≥ 998 g/kg	Vikane, the product, is the technical material 99.8 %w/w. There are no other formulants or constituents of formulants in the 'product' Vikane.	Fumigation	To be notified in the 2nd list

Table B5-2: Summary table of data on the number and timing of applications, and where relevant, any particular information relating to geographical variations, climatic variations, or necessary waiting periods to protect man and animals

Serial number	Product type	Application type	Number and timing of application	Waiting periods	Information on recommended variations of the application rate in different locations	Remarks
(1)	PT08.02	Fumigation of structures, chambers, containers and stacks under tarpaulin.	A single fumigation may achieve eradication of pest. A further application may be needed if conditions are not optimimal. No restriction on exposure time is required.	Concentration of sulfuryl fluoride should be ≤ 3 ppm before re-entry into a treated structure.	If fumigating for insect pests, do not apply when temperatures at the site of pest activity is below 10°C. This temperature may be measured at the slab foundation, sub-floor or wherever the coolest part of the structure may be. For pinewood nematode do not apply at temperatures below 20°C.	
(2)	PT18.01	Fumigation	To be notified in the 2nd list	To be notified in the 2nd list	To be notified in the 2nd list	To be notified in the 2nd list

Section B5.10.2 Efficacy Data

Annex Point IIB5.10
TNsG: Pt. I-B5.10, Pt. III-Ch. 6

B5.10.2/01 Termites
Laboratory study (Ref. Z1)

			Official use only
		1 REFERENCE: Z1, B5.10.2/01	
1.1	**Reference**	Osbrink, W.L.A., Scheffrahn, R.H., Su, N-Y., and Rust, M. K. (1987). Fort Lauderdale Research and Education Centre, University of Florida, Institute of Food and Agricultural Sciences, Fort Lauderdale, Florida 33314, USA. Laboratory comparisons of sulfuryl fluoride toxicity and mean time of mortality among ten termite species (Isoptera: Hodotermitidae, Kalotermitidae, Rhinotermitidae). Journal of Economic Entomology Volume 80, pages 1044-1047.	
1.2	**Data protection**	Not protected.	
1.2.1	Data owner	Data in the public domain in published paper.	
1.2.2	Companies with letter of Access	Not relevant.	
1.2.3	Criteria for data protection	No data protection claimed.	
1.3	**Guideline study**	The study was undertaken on the basis of sound principles of fumigation practice. The experimental design enabled robust statistical analysis to be undertaken to ensure high confidence in the data generated.	
1.4	**Deviations**	Not applicable as the study was not conducted to an international standard method.	
		2 METHOD	
2.1	**Test Substance (Biocidal Product)**	Sulfuryl fluoride	
2.1.1	Trade name/ proposed trade name	Vikane	
2.1.2	Composition of Product tested	> 99% Sulfuryl fluoride.	
2.1.3	Physical state and nature	Fumigant.	
2.1.4	Monitoring of active substance concentration	Monitoring was undertaken using a gas chromatograph.	
2.1.5	Method of analysis	Not applicable.	
2.2	**Reference substance**	No reference substance was included in the study.	
2.2.1	Method of analysis for reference substance	Not applicable.	
2.3	**Testing procedure**		

Section B5.10.2 **Efficacy Data**

Annex Point IIB5.10
TNsG: Pt. I-B5.10, Pt. III-Ch. 6

B5.10.2/01 Termites
Laboratory study (Ref. Z1)

2.3.1	Test population / inoculum / test organism	See Table 1.1.	X
2.3.2	Test system	See Table 1.2.	
2.3.3	Application of test substance	See Table 1.3.	
2.3.4	Test conditions	See Table 1.4.	
2.3.5	Exposure time	22 hours.	
2.3.6	Number of replicates performed	Each dosage was replicated three times except in tests with *K. approximatus*, which were replicated twice, and the soldier and alate castes, which were not replicated because of their limited availability.	
2.3.7	Controls	Controls were included; these were tested concurrently in a Pyrex desiccator (fumitorium).	
2.4	**Examination**		
2.4.1	Effect investigated	Lethal accumulated dosage (LAD) expressed as g-h/m^3. Two effects were determined - LAD_{50} i.e., lethal accumulated dosage to achieve 50% mortality and LAD_{99} lethal accumulated dosage to achieve 99% mortality.	
2.4.2	Method for recording	Termite mortality.	
2.4.3	Intervals of examination	Mortality was tallied upon termination of the fumigation and every 24 hours for five days.	
2.4.4	Statistics	Data obtained from the studies on termite larvae were analysed by probit procedure (Reference: SAS Institute 1985. SAS user's guide to statistics, version 5, SAS Institute, Cary, N.C.) Control mortality did not exceed 5% and was ignored (Reference: Finney, D. J. 1971. Probit analysis, Cambridge University, London). Post fumigation mean total mortality was calculated by dividing the number of dead termites of a particular species occurring on a given day by the total mortality 5 days post fumigation, multiplying this value by the respective day and summing days 0-5 to produce a weighted average mortality (Reference; Moar, W. J. and Trumble, J. T.1987 Toxicity, joint action and mean time of mortality of Dipel 2X, average mectin B_1 neem and thuringiensis against beet army worm (Lepidoptera: Noctuidae). Journal of Economic Entomology 80, 588-592). Mean time mortality (MTM) was calculated for all gas concentrations for each species. Analysis of variance (ANOVA) was used to test for differences of MTM between gas concentrations within species (P = 0.05). When a significant difference of MTM between gas concentration was found within a given species, the relationship between MTM and gas concentration was analysed by linear regression of MTM, the dependent variable, on gas concentration, the independent variable. The grand MTM was obtained by each species by averaging the MTM's for all gas concentrations. ANOVA was followed by mean separation using Student-Newman-Keuls test (P = 0.05) values between species.	X

Section B5.10.2 Efficacy Data

Annex Point IIB5.10
TNsG: Pt. I-B5.10, Pt. III-Ch. 6

B5.10.2/01 Termites
Laboratory study (Ref. Z1)

2.4.5 Post fumigation monitoring of termites

The total mortality effect of sulfuryl fluoride on termites was determined five days after fumigation.

3 RESULTS

3.1 Efficacy

The lethal accumulated dosages (LAD g-h/m^3) of sulfuryl fluoride against larvae of 10 termite species for 22 hour exposure is tabulated below. *Reticulitermes* spp. were the most sensitive and *I. Minor* the least sensitive to sulfuryl fluoride. Alates of *K. approximatus* displayed 80 and 100% mortality at 22.0 and 24.2 g-h/m^3 respectively. Alates of *N. jouteli* and *Z. angusticollis* all died at 26.4 g-h/m^3. Soldiers of *N. jouteli* and *P. simplex* demonstrated 40 and 100% mortality at 22 g-h/m^3 respectively.

X

Termite life stage: Larvae

X

Species	LAD_{50}	LAD_{99}	95% FL
R. flavipes	13.42a	-	13.20-13.86
	-	20.02a	19.14-21.34
R. tibialis	14.52	-	14.08-15.18
	-	30.36b	27.28-35.20
N. jouteli	20.02	-	17.82-21.34
	-	36.08bcd	32.78-42.90
K. approximatus	22.89	-	20.59-24.19
	-	44.29cde	37.63-65.10
C. cavifrons	23.76d	-	22.88-24.42
	-	36.96bc	34.76-40.26
P. simplex	24.42d	-	23.32-25.08
	-	41.60cde	30.06-48.62
C. formosanus	26.40e	-	25.96-27.06
	-	39.16cd	37.18-42.46
I. snyderi	27.28e	-	26.62-28.16
	-	46.42de	41.58-55.22
Z. angusticolis	28.38e	-	28.16-28.82
	-	34.98b	33.88-36.30
I. minor	30.36f	-	29.48-31.68
	-	51.04e	44.66-66.22

Means within a column followed by the same letter indicate overlap of

		95% fiducial limits Greatest and least post fumigation grand mean time of mortality (± SEM) was 3.11 ± 0.04 and 1.58 ± 0.05 days for *R. tibialis* and *I snyderi*, respectively. Regressions of probit-mortality (g-h/m^3) on log-dosage of termite species indicate differences in probit regression slopes between species, with *Z. angusticollis* possessing a uniquely steep slope.
3.1.1	Dose/Efficacy curve	Not available from report.
3.1.2	Begin and duration of effects	Five days were required after fumigation to obtain the total mortality effect of sulfuryl fluoride on termites.
3.1.3	Observed effects in the post monitoring phase	No unusual effect observed.
3.2	**Effects against organisms or objects to be protected**	None reported.
3.3	**Other effects**	None reported.
3.4	**Efficacy of the reference substance**	No reference substance was used.
3.5	**Tabular and/or graphical presentation of the summarised results**	See 3.1.
3.6	**Efficacy limiting factors**	
3.6.1	Occurrences of resistances	None reported.
3.6.2	Other limiting factors	None reported.
		4 RELEVANCE OF THE RESULTS COMPARED TO FIELD CONDITIONS
4.1	**Reasons for laboratory testing**	1. Range of termites could be tested. 2. Different dosages could be tested. 3. Practical, accurate procedure. Data generated is considered relevant for field of use. Test insects obtained from the field.
4.2	**Intended actual scale of biocide**	Not applicable.

	application	
4.3	**Relevance compared to field conditions**	
4.3.1	Application method	The principle of fumigation is to confine a sufficient concentration for a sufficient period of time to enable a toxic dose to be received by the target pest. There are a number of ways in laboratory and field studies to achieve this although the principle is the same.
4.3.2	Test organism	There are many different pest species of termites, the species tested are proven pests where control would be required to avoid wood being destroyed .
4.3.3	Observed effect	The high mortality effects, LAD_{99} recorded in the laboratory test is considered as the desired field response for the eradication of termites.
4.4	**Relevance for read-across**	The results on the ten termite species representing three families are considered relevant to other species ground and subterranean termites.

5 APPLICANT'S SUMMARY AND CONCLUSION

5.1	**Materials and methods**	Ten termite species, *Zootermopsis angusticollis*, *Cryptotermes cavifrons*, *Incistermes minor*, *Incisitermes snyderi*, *Neotermes jouteli*, *Kalotermes approximatus*, *Coptotermes formosanus*, *Reticulitermes tibialis*, *Reticulitermes flavipes*, *Prorhinotermes simplex*,were fumigated with sulfuryl fluoride for 22 h at 27°C in laboratory fumitoria. The test insects were collected from naturally infested wood. The termites were exposed to sulfuryl fluoride to establish the LAD_{50} and LAD_{99} values. Untreated termites were included in the test. Fumigant concentration was measured using a gas chromatograph. Mortality was assessed and tallied every 24 hours for five days.
5.2	**Reliability**	Reliability indicator 2: Study conducted in accordance with generally accepted scientific principles, possibly with incomplete reporting or methodological deficiencies, which do not affect the quality of relevant results.
5.3	**Assessment of efficacy, data analysis and interpretation**	Five days were required after fumigation to obtain the total mortality effect of sulfuryl fluoride on termites. Based on LAD_{50} and LAD_{99} (LAD – lethal accumulated dosage) *Reticulitermes* spp. were the most sensitive species and *I. Minor* the least sensitive to the fumigant. Alates of *K. approximatus* displayed 80 and 100% mortality at 22.0 and 24.2 g-h/m^3 respectively as compared with 99% mortality of pseudergates at 44.29 g-h/m^3. Alates of *N. jouteli* and *Z. angusticollis* all died at 26.4 g-h/m^3 whereas 99% mortality of pseudergates occurred at 36.08 and 34.98 g-h/m^3 respectively. Alates seem, in these instances to be more sensitive to sulfuryl fluoride than pseudergates. Thus swarming after a fumigation at dosages that successfully control pseudergates is unlikely. Soldiers of *N. jouteli* and *P. simplex* demonstrated 40 and 100% mortality at 22 g-h/m^3 respectively. Therefore, sensitivity of *N. jouteli* pseudergates to sulfuryl fluoride (LAD_{50} = 20.02 g-h/m^3) corresponded well with their soldiers, but *P. simplex* pseudergates were much less

		sensitive (LAD_{50} = 41.80 g-h/m^3) than their soldiers. Implications of differential sensitivity of soldiers relative to pueudergates are not as important as the with the alate caste because the former cannot survive without pseudergates. Grand mean time mortality's were significantly different between species (F = 38.86; df = 9,145; P = 0.0001). ***R. trbialis*** and *C. formosanus* remained alive for an average of > five days, whereas ***I. snyderi***, the quickest to succumb, remained alive an average of > 1.5 days. As sulfuryl fluoride is metabolised, fluoride anions are produced that inhibit the activity of enzymes containing a magnesium co-factor resulting in cessation of lipid catabolism and glycolysis. Energy to maintain life processes must be alternately derived from amino acid and protein catabolism. Energy flow becomes negative, resulting in the observed delayed mortality.
5.4	**Conclusion**	Worldwide there are approximately 1,800 species of termites divided into six families. The termite species included in the tests were selected on the basis of their economic importance. The laboratory fumigation tests undertaken were considered to be a valid and effective procedure for evaluating the efficacy of sulfuryl fluoride on termites. The efficacy results showed that sulfuryl fluoride was highly effective on all species of termites. Being social insects only the non egg life stages must be killed. Since the insect egg stage is known to be less susceptible comparatively lower dosages can be used for the more susceptible post embryonic life stages.
5.5	**Proposed efficacy specification**	Termites Total control – eradication from wood material

Evaluation by Competent Authorities	
	EVALUATION BY RAPPORTEUR MEMBER STATE
Date	October 2004.
Comments	Field 2.3.1: In Table 1.1 Test organisms, the following corrections are suggested: Life stage (Hodotermitidae): Larvae/pseudergates and alates. Life stage (Kalotermitidae): Larvae/pseudergates of all species, soldier termites of ***N. jouteli*** and alates of ***K. approximates*** and ***N. jouteli.*** Life stage (Rhinotermitidae): Larvae/pseudergates of all species and soldier termites of ***P. simplex*** Field 2.4.4 first line/Field 3.1 second line and table heading: In reference study the termite larvae are denoted pseudergates. Pseudergates carry out the function exercised by workers in the higher termites (IMMS' General Textbook of Entomology. 10th edition, Vol. 2. Richards, O. W. and Davies, R. G. Chapman and Hall, London).
Summary and conclusion	Applicant's summary and conclusion is adopted.

1.1 Test organisms - Termites

Criteria	Details
Family	Hodotermitidae.
Species	*Zootermopsis angusticollis.*
Source	Collected from naturally infested wood, stored in containers < 2 weeks before testing.
Life stage	Larvae, alates.
Mixed age population	Undifferentiated larvae of at least third or first-molt nymphs.
Number of termites in test	Thirty per treatment.

Criteria	Details
Family	Kalotermitidae (drywood termites).
Species	*Cryptotermes cavifrons, Incisitermes minor, Incisitermes snyderi, Neotermes jouteli, Kalotermes approximatus.*
Source	Collected from naturally infested wood, stored in containers < 2 weeks before testing.
Life stage	Larvae of all species, soldier termites of *N. jouteli, P. simplex* and alates of *N. jouteli*.
Mixed age population	Undifferentiated larvae of at least third or first-molt nymphs.
Number of termites in test	Thirty per treatment.

Criteria	Details
Family	Rhinotermitidae.
Species	*Coptotermes formosanus, Reticulitermes tibialis, Reticulitermes flavipes, Prorhinotermes simplex.*
Source	Collected from naturally infested wood, stored in containers < 2 weeks before testing.
Life stage	Larvae.
Mixed age population	Undifferentiated larvae of at least third or first-molt nymphs.
Number of termites in test	Thirty per treatment.

1.2 Test system

Criteria	Details
Test chamber	Fumitoria (fumigation chambers) consisted of Pyrex desiccators, 250 mm internal diameter of ca. 9 litres in volume. The lid opening of each desiccator was plugged with a one-hole neoprene stopper. The male end of a tube adapter of 6 mm external diameter was inserted through the stopper's hole. A nut

	compressed a neoprene septum against the fitting end of the tube adapter, allowing gas introduction or removal while maintaining a closed lid. Lids were sealed to desiccator bodies with silicone vacuum grease.
Number of chambers	For termite larvae six fumatoria were used for all termite species except for *I. Minor, N. jouteli, Z. angusticollis* and *K. approximatus* which were placed in five fumatoria. For other termite life stages a single fumitorium was used.
Test insects introduction into chamber	Thirty termites of each species were into each fumitorium as two subsamples of 15 termites and held in vented glass Petri dishes of 500 mm internal diameter.
Measuring equipment	Gas concentrations were verified upon initiation and termination each test by injecting a gas sample of fumitorium atmosphere into a gas chromatograph equipped with a glass column measuring 2.44 m by 2 mm internal diameter packed with Chromosorb 101.

1.3 Application of test substance

Criteria	**Details**
Application procedure	Sulfuryl fluoride was supplied in commercial steel cylinders as liquid under pressure. It was introduced into the fumitoria in its gaseous form.
Delivery method	Sulfuryl fluoride was made available for introduction into the fumitorium by a transfer of gas from a commercial dip tube cylinder to a stainless steel tubeless cylinder of 500 ml capacity. Gas delivery pressure from the tubeless cylinder was reduced from ca. 18 kg/cm^2 to ca. 2.8 kg/cm^2 with a regulator. The regulated gas was passed through a polyethylene gas sample tube of 270 ml modified with a rubber septum. Exact amounts of neat sulfuryl fluoride were transferred from the gas sample tube to the fumatorium with a gas syringe. Gas was mixed as it was injected into the fumatorium and afterwards for 5 min using a propeller attached to a magnetic stir disk driven by a stir plate.
Dosage rate	<u>Larvae</u> All species were fumigated at 0.1 g/m^3 increments at concentrations ranging from 1.0 to 1.5 g/m^3 except for *R. flavipes* and *R. tibialis* which received dosages ranging from 0.4 to 0.9 g/m^3. All fumigations lasted for 22 hours. <u>Soldier termites</u> *N. jouteli and P. simplex* Termites exposed to accumulated dosage of 22 g-h/m^3. <u>Alates</u> *K. approximatus*

	Termites exposed to accumulated dosage of 22 and 24 g-h/m^3. *N. jouteli* Termites exposed to an accumulated dosage of 26.4 g-h/m^3. *Z. angusticollis* Termites exposed to an accumulated dosage of 30.8 g-h/m^3.

1.4 Test conditions

Criteria	Details
Substrate	The Petri dishes which contained termites for introducing into the fumitoria were supplied. with filter paper for mechanical support. Filter paper was moistened for *R. flavipes*, *R. tibialis*, *C. formosanus*, *P. simplex* and *N. jouteli* to prevent desiccation.
Incubation temperature	All fumigations were conducted at 27°C.
Moisture	Initial atmosphere within the fumitoria was at ca. 80% relative humidity.

Section B5.10.2 Efficacy Data

Annex Point IIB5.10
TNsG: Pt. I-B5.10, Pt. III-Ch. 6

B5.10.2/02 Termites Laboratory study (Ref. Z2)

			Official use only
		1 REFERENCE: Z2, B5.10.2/02	
1.1	**Reference**	Su, N-Y., Osbrink, W.L.A., and Scheffrahn, R. H. (1989). Fort Lauderdale Research and Education Centre, University of Florida, Institute of Food and Agricultural Sciences, Fort Lauderdale, Florida 33314, USA. Concentration-time relationship for fumigant efficacy of sulfuryl fluoride against the Formosan subterranean termite (Isoptera: Rhinotermitidae) Journal of Economic Entomology Volume 82, pages 156-158.	
1.2	**Data protection**	Not protected.	
1.2.1	Data owner	Data in the public domain in published paper.	
1.2.2	Companies with letter of Access	Not relevant.	
1.2.3	Criteria for data protection	No data protection claimed.	
1.3	**Guideline study**	The study was undertaken on the basis of sound principles of fumigation practice. The experimental design enabled robust statistical analysis to be undertaken to ensure high confidence in the data generated.	
1.4	**Deviations**	Not applicable as the study was not conducted to an international standard method.	
		2 METHOD	
2.1	**Test Substance (Biocidal Product)**	Sulfuryl fluoride.	
2.1.1	Trade name/ proposed trade name	Vikane.	
2.1.2	Composition of Product tested	>99% Sulfuryl fluoride.	
2.1.3	Physical state and nature	Fumigant.	
2.1.4	Monitoring of active substance concentration	Monitoring was undertaken using a gas chromatograph.	
2.1.5	Method of analysis	Not applicable.	
2.2	**Reference substance**	No reference substance was included in the study.	
2.2.1	Method of analysis for reference substance	Not applicable.	

Section B5.10.2 **Efficacy Data**

Annex Point IIB5.10
TNsG: Pt. I-B5.10,
Pt. III-Ch. 6

B5.10.2/02 Termites
Laboratory study (Ref. Z2)

2.3	**Testing procedure**		
2.3.1	Test population / inoculum / test organism	See Table 1.1.	
2.3.2	Test system	See Table 1.2.	
2.3.3	Application of test substance	See Table 1.3.	
2.3.4	Test conditions	See Table 1.4.	
2.3.5	Exposure time	22 hours.	X
2.3.6	Number of replicates performed	Each treatment was replicated three times.	
2.3.7	Controls	Controls were included, these were tested concurrently in a Pyrex desiccator (fumitorium).	
2.4	**Examination**		
2.4.1	Effect investigated	The study was undertaken to primarily undertaken to establish if the product of the two parameters, time and concentration have an equal weighting in accumulation of dosage for the test termite species. $C^n \times t = k$ Where C = concentration, t = time, n = toxicity index and k = dosage for a specific mortality level. If concentration and time have the same weighing then n will be equal to 1. The study also enabled a dose response to be established.	
2.4.2	Method for recording	Termite mortality.	
2.4.3	Intervals of examination	Termite survival counts after exposure to sulfuryl fluoride were made daily up to daily up to seven days. Dead or moribund termites were removed from the units in the fumitoria.	
2.4.4	Statistics	Worker mortality was corrected by a control mortality formula (Reference: Abbott, W.S. (1925). A method for computing the effectiveness of an insecticide. Journal of Economic Entomology, 18, 265-267) and square root transformed before analysis. For each accumulated dosage, mortalities corresponding to the exposure times were subjected to analysis of variance for the completely randomised block design (Reference: SAS Institute 1985. SAS user's guide to statistics, version 5, SAS Institute, Cary, N.C.). Colony origin was used as the block factor. Significant differences among exposure times were separated using the Student-Newman-Keuls test (P = 0.05). Lethal dosages for mortality levels of 50, 90 and 99% were estimated for each of the 12 exposure times using probit analysis. The LD_{50}, LD_{90} or LD_{99} values were then independently regressed against the exposure time on a logarithmic scale to estimate the toxicity index (n) as described by Winks (Reference: Winks, R.G. (1984). The toxicity of phosphine to	

adults of *Tribolium castaneum*: time as a dosage factor.

2.4.5 Post fumigation monitoring of termites

Termite survival counts after exposure to sulfuryl fluoride were made daily up to daily up to seven days.

3 RESULTS

3.1 Efficacy

No differences in mortality of *C. formosanus* workers were found among the 12 exposure times when accumulated dosage was ≤ 20 g-h/m^3 (data tabulated below). At an accumulated dosage of 30 g-h/m^3, significantly fewer termites died when exposure time was < 3 hours. Effects of exposure time became insignificant when accumulated dosage and corresponding mortality increase above before-mentioned levels. Time threshold (significant difference in concentration x time mortality) was 2 hours when accumulated dosage was 40 g-h/m^3, while at accumulated dosages > 50 g-h/m^3 only those termites confined to sulfuryl fluoride for 1 hour responded with significantly lower mortality.

Linear regression lines of concentration (g/m^3) against exposure time for three mortality levels, 50, 90, 99%, were: LD_{50}: log C = -1.0706 log t + 1.6026 (R^2 = 0.9927; P = < 0.0001); LD_{90}: log C = - 1.0727 log t + 1.7280 (R^2 = 0.9943; P< 0.0001); LD_{99}; lod C = - 1.0724 log t + 1.8066 (R^2 = 0.9949; p < 0.0001). The toxicity index was approximately 0.93.

Mortality (% ± SE) of *C. formosanus* exposed to sulfuryl fluoride

Exposure (h)	Accumulated dosage (g-h/m^3)		
	10	20	30
1	1.1 ± 0.8a	0.7 ± 0.5a	1.5 ± 0.8a
2	5.5 ± 2.1a	3.3 ± 1.4a	2.4 ± 1.7a
3	2.8 ± 1.5a	4.4 ± 2.9a	19.6 ± 4.3b
4	1.5 ± 0.7a	1.8 ± 0.8a	58.8 ± 5.7c
6	2.7 ± 0.9a	6.8 ± 5.8a	31.6 ± 9.8bc
8	2.2 ± 0.8a	4.6 ± 1.4a	41.3 ± 9.4bc
10	1.1 ± 0.6a	6.3 ± 2.7a	57.6 ± 4.6c
12	2.2 ± 1.0a	6.7 ± 3.9a	55.4 ± 12.4c
24	2.9 ± 1.2a	1.9 ± 1.0a	35.2 ± 4.2bc
48	0.8 ± 0.5a	5.1 ± 3.3a	34.9 ± 4.4bc
72	1.9 ± 0.8a	3.7 ± 1.4a	33.4 ± 8.3bc
96	1.9 ± 0.9	0.4 ± 0.4a	34.3 ± 6.9bc

Section B5.10.2 **Efficacy Data**

Annex Point IIB5.10
TNsG: Pt. I-B5.10,
Pt. III-Ch. 6

B5.10.2/02 Termites
Laboratory study (Ref. Z2)

Exposure (h)	Accumulated dosage (g-h/m^3)		
	40	50	60
1	3.0 ± 2.6a	46.9 ± 8.4a	80.8 ± 7.2a
2	5.3 ± 0.7b	96.5 ± 1.5b	100b
3	78.3 ± 3.3c	92.3 ± 2.5b	95.9 ± 1.9b
4	92.0 ± 2.9c	99.2 ± 0.5b	99.6 ± 0.4b
6	91.0 ± 2.3c	98.9 ± 0.8b	100b
8	89.3 ± 3.3a	100b	100b
10	87.2 ± 2.8a	97.4 ± 1.1b	99.6 ± 0.4b
12	81.1 ± 5.5c	97.0 ± 1.2b	98.1 ± 0.8b
24	90.7 ± 2.6c	97.4 ± 0.9b	99.6 ± 0.4b
48	77.7 ± 6.1c	99.6 ± 0.4b	100b
72	88.3 ± 3.4c	98.9 ± 0.6b	98.3 ± 0.9b
96	95.3 ± 1.8c	100b	100b

Data are means of nine replicates. Within a column, means followed by the same letter are not significantly different (P = 0.05; Student-Newman-Keuls test).

3.1.1	Dose/Efficacy curve	See 3.1.
3.1.2	Begin and duration of effects	Up to seven days were given after fumigation to obtain the total mortality effect of sulfuryl fluoride on termites.
3.1.3	Observed effects in the post monitoring phase	No unusual effect observed.
3.2	**Effects against organisms or objects to be protected**	None reported.
3.3	**Other effects**	None reported.
3.4	**Efficacy of the reference substance**	No reference substance was used.
3.5	**Tabular and/or graphical presentation of the summarised**	See 3.1.

	results	
3.6	**Efficacy limiting factors**	Exposure time threshold for sulfuryl fluoride is < 1 hour.
3.6.1	Occurrences of resistances	None reported.
3.6.2	Other limiting factors	None reported.
		4 RELEVANCE OF THE RESULTS COMPARED TO FIELD CONDITIONS
4.1	**Reasons for laboratory testing**	1. Termites from three different naturally occurring colonies could be tested. 2. A wide range dosages could be tested to determine the concentration-time relationship of sulfuryl fluoride on termite mortality. 3. Dosage response could be established. 4. Practical, accurate procedure Data generated is considered relevant for field of use. Test insects obtained from the field.
4.2	**Intended actual scale of biocide application**	Not applicable.
4.3	**Relevance compared to field conditions**	
4.3.1	Application method	The principle of fumigation is to confine a sufficient concentration for a sufficient period of time to enable a toxic dose to be received by the target pest. There are a number of ways in laboratory and field studies to achieve this although the principle is the same.
4.3.2	Test organism	The test insect, *C. formosanus*, is considered a test of economic importance and therefore a desirable species for the laboratory test.
4.3.3	Observed effect	The desired result through fumigation of termites with sulfuryl fluoride is to achieve 100% control, i.e. eradication. Some of the dosages tested in the study achieved this result. These results were under laboratory conditions and other factors occurring in the field need to be taken into account when establishing the correct dosage. These include, as well as the insect species, the gas tightness of the fumigated zone and the temperature at the site of the pest.
4.4	**Relevance for read-across**	The results *C. formaoanus* is considered relevant to other species of subterranean termites.
		5 APPLICANT'S SUMMARY AND CONCLUSION
5.1	**Materials and methods**	The subterranean termite species, *Coptotermes formosanus*, was exposed to sulfuryl fluoride over a range of six accumulated dosages (10 – 60 g-h/m^3) which included 12 exposure times (1-96 hours) to

Section B5.10.2 **Efficacy Data**

Annex Point IIB5.10
TNsG: Pt. I-B5.10,
Pt. III-Ch. 6

B5.10.2/02 Termites
Laboratory study (Ref. Z2)

		determine the concentration-time relationship on termite mortality. In addition dose responses were established. The test was conducted at 27°C. in laboratory fumitoria. The test insects were collected from naturally infested wood from three different colonies. Untreated termites were included in the test. Fumigant concentration was measured using a gas chromatograph. Mortality was assessed after seven days.
5.2	**Reliability**	Reliability indicator 2: Study conducted in accordance with generally accepted scientific principles, possibly with incomplete reporting or methodological deficiencies, which do not affect the quality of relevant results.
5.3	**Assessment of efficacy, data analysis and interpretation**	Mortality assessment was established seven days after fumigation. The slopes of these regressions demonstrated parallelism. Despite the inclusion of data from the 1 hour exposure that showed significantly lower mortality, no systematic deviation from the general model $C^n t = k$ was found in the regressions. From the regression analysis the toxicity index n was determined as 0.93 regardless of mortality levels. The results demonstrated that $C^{0.93} t = k$ is a satisfactory model to describe the response relationship for sulfuryl fluoride against *C. formosanus* workers.
5.4	**Conclusion**	In commercial applications of sulfuryl fluoride it is considered that exposure time is equally important to concentration or the toxicity index n = 1. The study showed that to achieve a level of control of *C. formosanus* workers of >95% a dosage, i.e., Ct (concentration x time) of 60 g-h/m^3 is required.
5.5	**Proposed efficacy specification**	Termites Total control – eradication from wood material.

Evaluation by Competent Authorities	
	EVALUATION BY RAPPORTEUR MEMBER STATE
Date	October 2004.
Comments	Field 2.3.5 Exposure: The termites were exposed to sulfuryl fluoride for 1, 2, 3, 4, 6, 8, 10, 12, 24, 48, 72 and 96 hours (not only for 22 h).
Summary and conclusion	Applicant's summary and conclusion is adopted.

1.1 Test organisms - Termites

Criteria	Details
Family	Rhinotermitidae.
Species	*Coptotermes formosanus* (Common name: Formosan Subterranean Termite).
Source	Three field colonies were collected from naturally infested wood, stored in containers < 2 weeks before testing.
Life stage	Workers and soldiers.
Mixed age population	Age not differentiated.
Number of termites in test	Workers: thirty per treatment. Soldiers: three per treatment.

1.2 Test system

Criteria	Details
Test chamber	Fumitoria (fumigation chambers) consisted of Pyrex desiccators, 250 mm internal diameter of ca. 9 litres in volume. The lid opening of each desiccator was plugged with a one-hole neoprene stopper. The male end of a tube adapter of 6 mm external diameter was inserted through the stopper's hole. A nut compressed a neoprene septum against the fitting end of the tube adapter, allowing gas introduction or removal while maintaining a closed lid. Lids were sealed to desiccator bodies with silicone vacuum grease.
Number of chambers	Seven fumitoria, six receiving a prescribed dosage and one control, were used.
Test insects introduction into chamber	Thirty workers and three soldiers were placed into glass Petri dishes of 500 mm internal diameter provisioned with a moistened filter paper. Three units were prepared for each of the three colonies and placed in a fumitorium.
Measuring equipment	Gas concentrations were verified upon initiation and termination each test by injecting a gas sample of fumitorium atmosphere into a gas chromatograph equipped with a glass column measuring 2.44 m by 2 mm internal diameter packed with Chromosorb 101.

1.3 Application of test substance

Criteria	Details
Application procedure	Sulfuryl fluoride was supplied in commercial steel cylinders as liquid under pressure. It was introduced into the fumitoria in its gaseous form.
Delivery method	Sulfuryl fluoride was made available for introduction into the fumitorium by a transfer of gas from a commercial dip tube cylinder to a stainless steel tubeless cylinder of 500 ml capacity. Gas delivery pressure from the tubeless cylinder was reduced from ca. 18 kg/cm^2 to ca. 2.8 kg/cm^2 with a regulator. The regulated gas was passed through a polyethylene gas sample tube of 270 ml modified with a rubber septum. Exact amounts of neat sulfuryl fluoride were transferred from the gas sample tube to the fumatorium with a gas syringe. Gas was mixed as it was injected into the fumatorium and afterwards for 5 min using a propeller attached to a magnetic stir disk driven by a stir plate.
Dosage rate	The termites were exposed to sulfuryl fluoride for 1, 2, 3, 4, 6, 8, 10, 12, 24, 48, 72 and 96 hours. Different quantities of sulfuryl fluoride were introduced for each exposure time to yield accumulated dosages of 10, 20, 30, 40, 50 and 60 $g\text{-}h/m^3$.

1.4 Test conditions

Criteria	Details
Substrate	The Petri dishes which contained termites for introducing into the fumitoria were supplied. with filter paper for mechanical support and to prevent desiccation.
Incubation temperature	All fumigations were conducted at 27^{o}C.
Moisture	Initial atmosphere within the fumitoria was at ca. 80% relative humidity.

Section B5.10.2 Efficacy Data

Annex Point IIB5.10
TNsG: Pt. I-B5.10, Pt. III-Ch. 6

B5.10.2/03 Termites
Simulated field study (Ref. Z3)

			Official use only
		1 REFERENCE: Z3, B5.10.2/03	
1.1	**Reference**	Su, N-Y., and Scheffrahn, R. H. (1986). Fort Lauderdale Research and Education Centre, University of Florida, Institute of Food and Agricultural Sciences, Fort Lauderdale, Florida 33314, USA. Field comparison of sulfuryl fluoride susceptibility among three termite species (Isoptera: Kalotermitidae, Rhinotermitidae) during structural fumigation. Journal of Economic Entomology Volume 79, pages 903-908.	
1.2	**Data protection**	Not protected.	
1.2.1	Data owner	Data in the public domain in published paper.	
1.2.2	Companies with letter of access	Not relevant.	
1.2.3	Criteria for data protection	No data protection claimed.	
1.3	**Guideline study**	The study was undertaken on the basis of sound principles of fumigation practice. The experimental design enabled robust statistical analysis to be undertaken to ensure high confidence in the in the data generated.	
1.4	**Deviations**	Not applicable as the study was not conducted to an international standard method.	
		2 METHOD	
2.1	**Test Substance (Biocidal Product)**	Sulfuryl fluoride.	
2.1.1	Trade name/ proposed trade name	Vikane.	
2.1.2	Composition of Product tested	99% Sulfuryl fluoride.	
2.1.3	Physical state and nature	Fumigant.	
2.1.4	Monitoring of active substance concentration	Monitoring was undertaken using a Fumiscope (thermal conductivity meter).	
2.1.5	Method of analysis	Not applicable.	
2.2	**Reference substance**	No reference substance was included in the study.	
2.2.1	Method of analysis for reference substance	Not applicable.	
2.3	**Testing procedure**		

2.3.1	Test population / inoculum / test organism	See Table 1.1.
2.3.2	Test system	See Table 1.2.
2.3.3	Application of test substance	See Table 1.3.
2.3.4	Test conditions	See Table 1.4.
2.3.5	Exposure time	2 – 20 hours.
2.3.6	Number of replicates performed	Each treatment was replicated three times.
2.3.7	Controls	Controls were included; these were placed in an untreated building nearby to the fumigation chambers.
2.4	**Examination**	
2.4.1	Effect investigated	The study was undertaken to determine the effectiveness of sulfuryl fluoride on termites under field conditions.
2.4.2	Method for recording	Termite mortality.
2.4.3	Intervals of examination	After each designated exposure period initial termite mortality was recorded immediately. Dead and moribund individuals were counted and removed from each container and survivors were transferred to freshly provisioned Petri dishes. Mortality in the control group was tallied after the 20 hour count. All surviving termites were stored in a 30^{o}C incubation chamber for succeeding 24 hours post treatment counts which were stopped after no additional mortality was observed.
2.4.4	Statistics	Since the control units were only examined at 20 hours a linear control mortality was extrapolated for each of the 2 hour counts. Abbots formula (Reference: Abbott, W.S. (1925). A method for computing the effectiveness of an insecticide. Journal of Economic Entomology, 18, 265-267) was used to correct control mortality. The statistical design used for each 2 hour series was a 3 x 2 factorial, with species and container type as the main effect and termite mortality as the response variable. Mortality percentages were transformed to the arcsine of their square root values and were subjected to analysis of variance. Significant differences were detected by Student-Newman-Kuels test (P = 0.05).
2.4.5	Post fumigation monitoring of termites	See 2.4.3.
		3 RESULTS
3.1	**Efficacy**	Seventy-two hours was required after the exposure to sulfuryl fluoride to fully express its lethal effect on the termites. Initial mortalities of *C. formosanus* in Petri dishes were significantly lower than the other species when elapsed exposure time was 10 – 12 hours at 3 g/m^3 and 8

hours at 6 g/m^3. However, the 72 hour mortality showed no significant differences among species in the Petri dishes. In the wooden enclosures, initial mortalities for *C. formosanus* were also significantly lower than the drywood termites for 10 – 20 hours at 3 g/m^3, 8 - 18 hours at 6 g/m^3 and 4 – 12 hours at 12 g/m^3. In contrast to the results in the Petri dishes mortality in the wood enclosures was also significantly lower for *C. formosanus* after 8 – 10 and 14 – 20 hours exposure at 3 g/m^3, 4 – 10 hours at 6 g/m^3 and 4 – 6 hours at 12 g/m^3. The only other significant mortality difference between container types was increased survivorship in wooden containers for *C. cavifrons* after 6 hours at 3 g/m^3 and 4 hours at 6 g/m^3.

Termite mortality (mean ± SE) observed 72 hours after exposure to sulfuryl fluoride at three concentrations

		Concentration 3 g/m^3		
ET[1]	C[2]	*C. formosanus*	*C. cavifrons*	*I. schwarzi*
2	W	0.0 ± 0.0aA	0.0 ± 0.0aA	5.0 ± 2.9aA
2	P	0.2 ± 0.2aA	1.1 ± 0.8aA	6.7 ± 6.7aA
4	W	0.0 ± 0.0aA	1.8 ± 1.8aA	10.0 ± 10.0aA
4	P	11.3 ± 9.8aA	1.6 ± 0.9aA	1.7 ± 1.7aA
6	W	0.0 ± 0.0aA	1.2 ± 1.2aA	10.0 ± 5.0aA
6	P	11.5 ± 6.0aA	8.7 ± 2.0aB	43.3 ± 17.6aA
8	W	0.0 ± 0.0aA	91.0 ± 1.8bA	88.3 ± 9.3bA
8	P	99.0 ± 0.8aB	98.0 ± 2.0aA	98.3 ± 1.7aA
10	W	36.9 ± 2.1aA	100.0 ± 0.0bA	100.0 ± 0.0bA
10	P	97.7 ± 2.3aB	100.0 ± 0.0aA	100.0 ± 0.0bA
12	W	70.5 ± 12.8aA	100.0 ± 0.0aA	100.0 ± 0.0bA
12	P	100.0 ± 0.0aA	100.0 ± 0.0aA	100.0 ± 0.0bA
14	W	72.0 ± 5.3aA	100.0 ± 0.0aA	100.0 ± 0.0bA
14	P	98.5 ± 2.1aA	100.0 ± 0.0aA	100.0 ± 0.0bA
16	W	77.0 ± 6.2aA	100.0 ± 0.0bA	100.0 ± 0.0bA
16	P	100.0 ± 0.0aB	100.0 ± 0.0aA	100.0 ± 0.0bA
18	W	75.3 ± 3.9aA	100.0 ± 0.0aA	100.0 ± 0.0bA
18	P	100.0 ± 0.0aB	100.0 ± 0.0aA	100.0 ± 0.0bA
20	W	74.3 ± 4.1aA	100.0 ± 0.0aA	100.0 ± 0.0bA
20	P	100.0 ± 0.0aB	100.0 ± 0.0aA	100.0 ± 0.0bA

Concentration 6 g/m^3

ET[1]	C[2]	*C. formosanus*	*C. cavifrons*	*I. schwarzi*
2	W	0.0 ± 0.0aA	4.6 ± 4.6aA	11.7 ± 11.7aA
2	P	16.6 ± 14.1aA	4.0 ± 0.7aA	23.3 ± 4.4aA
4	W	0.0 ± 0.0aA	21.3 ± 6.7bA	83.3 ± 7.3cA
4	P	86.1 ± 6.7aB	66.2 ± 11.aB	93.3 ± 3.3aA
6	W	0.0 ± 0.0aA	99.3 ± 0.7bA	100.0 ± 0.0bA
6	P	94.6 ± 2.8aB	99.3 ± 0.7aA	100.0 ± 0.0aA
8	W	45.6 ± 7.8aA	100.0 ± 0.0bA	100.0 ± 0.0bA
8	P	99.2 ± 0.8aB	100.0 ± 0.0aA	100.0 ± 0.0aA
10	W	47.9 ± 10.9aA	100.0 ± 0.0bA	100.0 ± 0.0bA
10	P	100.0 ± 0.0aB	100.0 ± 0.0aA	100.0 ± 0.0aA
12	W	96.5 ± 2.2aA	100.0 ± 0.0aA	100.0 ± 0.0aA
12	P	100.0 ± 0.0aA	100.0 ± 0.0aA	100.0 ± 0.0aA
14	W	93.6 ± 0.0aA	100.0 ± 0.0aA	100.0 ± 0.0aA
14	P	100.0 ± 0.0aA	100.0 ± 0.0aA	100.0 ± 0.0aA
16	W	98.7 ± 1.3aA	100.0 ± 0.0bA	100.0 ± 0.0aA
16	P	100.0 ± 0.0aA	100.0 ± 0.0aA	100.0 ± 0.0aA
18	W	100.0 ± 0.0aA	100.0 ± 0.0aA	100.0 ± 0.0aA
18	P	100.0 ± 0.0aA	100.0 ± 0.0aA	100.0 ± 0.0aA
20	W	97.9 ± 1.1aA	100.0 ± 0.0aA	100.0 ± 0.0aA
20	P	100.0 ± 0.0aA	100.0 ± 0.0aA	100.0 ± 0.0aA

Concentration 12 g/m^3

ET[1]	C[2]	*C. formosanus*	*C. cavifrons*	*I. schwarzi*
2	W	0.0 ± 0.0aA	6.2 ± 1.4aA	58.3 ± 29.2aA
2	P	19.2 ± 18.5aA	2.6 ± 18.5aA	26.7 ± 15.9aA
4	W	0.0 ± 0.0aA	76.7 ± 23.3aA	100.0 ± 0.0bA
4	P	100.0 ± 0.0aB	100.0 ± 0.0aA	100.0 ± 0.0aA
6	W	24.1 ± 11.3aA	100.0 ± 0.0bA	100.0 ± 0.0bA
6	P	100.0 ± 0.0aB	100.0 ± 0.0aA	100.0 ± 0.0aA
8	W	98.0 ± 2.0aA	100.0 ± 0.0aA	100.0 ± 0.0bA
8	P	100.0 ± 0.0aA	100.0 ± 0.0aA	100.0 ± 0.0aA
10	W	100.0 ± 0.0aA	100.0 ± 0.0aA	100.0 ± 0.0bA
10	P	100.0 ± 0.0aA	100.0 ± 0.0aA	100.0 ± 0.0aA

12	W	100.0 ± 0.0aA	100.0 ± 0.0aA	100.0 ± 0.0aA
12	P	100.0 ± 0.0aA	100.0 ± 0.0aA	100.0 ± 0.0aA
14	W	100.0 ± 0.0aA	100.0 ± 0.0aA	100.0 ± 0.0aA
14	P	100.0 ± 0.0aA	100.0 ± 0.0aA	100.0 ± 0.0aA
16	W	100.0 ± 0.0aA	100.0 ± 0.0bA	100.0 ± 0.0aA
16	P	100.0 ± 0.0aA	100.0 ± 0.0aA	100.0 ± 0.0aA
18	W	100.0 ± 0.0aA	100.0 ± 0.0aA	100.0 ± 0.0aA
18	P	100.0 ± 0.0aA	100.0 ± 0.0aA	100.0 ± 0.0aA
20	W	100. ± 0.0aA	100.0 ± 0.0aA	100.0 ± 0.0aA
20	P	100.0 ± 0.0aA	100.0 ± 0.0aA	100.0 ± 0.0aA

Data are means of three replicates. For each exposure time at each concentration, means followed by the same lowercase letter within a row, or means followed by the same uppercase letter within a column are not significantly different at P = 0.05 (Student-Newman-Keuls test).

[1]ET = exposure time; [2]C = container type, W = wooden enclosure, sealed, P = Petri dish, vented.

3.1.1	Dose/Efficacy curve	Not available from report.
3.1.2	Begin and duration of effects	Initial mortality was recorded immediately for each of the given time periods of exposure to sulfuryl fluoride. Assessments of mortality were completed 72 hours after each of the exposure periods.
3.1.3	Observed effects in the post monitoring phase	No unusual effect observed.
3.2	**Effects against organisms or objects to be protected**	None reported.
3.3	**Other effects**	None reported.
3.4	**Efficacy of the reference substance**	Not applicable.
3.5	**Tabular and/or graphical presentation of the summarised results**	See 3.1.
3.6	**Efficacy limiting factors**	A delayed action of sulfuryl fluoride was recorded for *C. formosanus* compared with the other two species. A higher level of survival was also recorded in wooden containers of this species. The water solubility of sulfuryl fluoride is low (750 ppm at 25°C). It is considered that the addition of water to the *C. formosanus* wood enclosures, intended to

		prevent termite desiccation, also impeded gas penetration. Higher wood moisture content in the *C. formosanus* containers, in conjunction with a possible differential physiological response to sulfuryl fluoride, may have contributed to the increased survivalship of this subterranean termite species.
3.6.1	Occurrences of resistances	None reported.
3.6.2	Other limiting factors	None reported.
	4 RELEVANCE OF THE RESULTS COMPARED TO FIELD CONDITIONS	
4.1	**Reasons for laboratory testing**	Not applicable, study was a simulated field test.
4.2	**Intended actual scale of biocide application**	Not applicable.
4.3	**Relevance compared to field conditions**	
4.3.1	Application method	The procedure adopted represented commercial practice.
4.3.2	Test organism	The test insects, *C. formosanus*, *C. cavifrons and I. schwarzr*, are considered as economic important pests and therefore desirable species for inclusion in the simulated field study.
4.3.3	Observed effect	The desired result through fumigation of termites with sulfuryl fluoride is to achieve 100% control, i.e. eradication. Some of the dosages tested in the study achieved this result. These results were under field conditions.
4.4	**Relevance for read-across**	The results achieved these drywood and subterranean species are considered relevant to other termite species which occupy similar habitats.
	5 APPLICANT'S SUMMARY AND CONCLUSION	
5.1	**Materials and methods**	Two drywood (*Incisitermes minor*, *Cryptotermes cavifrons*) and one subterranean (*Coptotermes formosanus*) termite species were used in the study which was designed to represent field conditions. The drywood termites were obtained from naturally infested logs and the subterranean species from wooden traps. The termites were exposed in separate structures to sulfuryl fluoride at concentrations of 3, 6 and 12 g/m^3. Termites were confined to vented Petri dishes and sealed wooden enclosures which were removed from each structure at 2 hour intervals for 20 hours for mortality assessments. These assessments were undertaken immediately on removal and up to 72 hours following their removal.
5.2	**Reliability**	Reliability indicator 2: Study conducted in accordance with generally accepted scientific principles, possibly with incomplete reporting or methodological deficiencies, which do not affect the quality of relevant

		results.	
5.3	**Assessment of efficacy, data analysis and interpretation**	The initial mortality assessment of *C. formosanus* in Petri dishes was significantly lower than *I. schwarzi* and *C. cavifrons*. However by 72 hours after exposure mortality had stabilised and was the same for all three species. In wood enclosures mortality at 72 hours did remain lower for *C. formosanus*. This effect was attributed to experimentally elevated wood moisture content in the *C. formosanus* enclosures acting as a gas barrier and possible physiological differences between this termite and the other two species. In all combinations except for *C. formosanus* in wood enclosures, 72 hour mortality followed a simple hyperbolic concentration versus time function and reached 100% mortality from accumulated dosages of 28 – 49 g-h/m^3. *C. formosanus* in wood enclosures required dosages of > 95 g-h/m^3 for 100% mortality.	
5.4	**Conclusion**	Complete control of the drywood termites *I. minor* and *C. cavifrons* and the subterranean species *C. formosanus* can be achieved with sulfuryl fluoride. To achieve 100% mortality for *C. formosanus* requires a higher minimum fumigant concentration and time threshold compared with the other two species. This is because of the potential partial moisture gas barrier which may be present in his species natural habitat.	X
5.5	**Proposed efficacy specification**	Termites Total control – eradication from wood material.	

Evaluation by Competent Authorities	
	EVALUATION BY RAPPORTEUR MEMBER STATE
Date	October 2004.
Comments	Field 5.4: The first sentence should read: Complete control of the drywood termites *I. schwarzi* and *C. cavifrons* and the subterranean species *C. formosanus* can be achieved with sulfuryl fluoride.
Summary and conclusion	Applicant's summary and conclusion is adopted.

1.1 Test organisms - Termites

Criteria	Details
Family	Rhinotermitidae.
Species	*Coptotermes formosanus* (Common name: Formosan Subterranean Termite).
Source	Foraging groups from three colonies were taken from buried wooden traps located in Hallandale, Florida, USA. Termites were excised from the wood, separated from the debris, and stored in containers < 2 weeks before testing.
Life stage	Undifferentiated larvae of at least third instar and soldiers.
Mixed age population	Age not differentiated.
Number of termites in test	Larvae: 44 per treatment. Soldiers: three per treatment.

Criteria	Details
Family	Kalotermitidae.
Species	*Crytotermes cavifrons*, *Incisitermes schwarzi.*
Source	Whole colonies collected in dead wood logs located in Lauderdale, Florida, USA. Termites were excised from the wood, separated from the debris, and stored in containers for < 2 weeks before testing.
Life stage	*Crytotermes cavifrons* – pseudergates, first molt nymphs. *Incisitermes schwarzi* – pseudergates, soldiers.
Mixed age population	Age not differentiated.
Number of termites in test	*Crytotermes cavifrons* – 50 pseudergates or first molt nymphs per treatment *Incisitermes schwarzi – 19* pseudergates and 1 soldiers or 20 pseudergates

1.2 Test system

Criteria	Details
Test chamber	Mobile homes mounted on a tarmac surface served as the experimental fumigation chamber. These were covered with tarpaulins secured with clamps and sealed along the ground with sand. A resealable seam was positioned at the bottom of each ramp through which test insects could be removed.
Number of chambers	Three mobiles homes received were used. The homes encompassed volumes of 368, 204 and 368 m^3.

Test insects introduction into chamber	Termites were confined to either vented Petri dishes or wooden enclosures. Plastic Petri dishes of 350 mm diameter fitted with single filter paper discs moistened with deionised water for *C. formosanus* and a small wood chip. The wooden enclosures were cut (11.4 x 11.4 cm) from heartwood timbers of *Pinus elliottii*. These cubes were drilled-chiselled along the grain from one side to form rectangular hollows (3.8 x 3.8 x 7.6 cm) surrounded on all sides by 3.8 cm thick walls. The 3.8 cm thick lids were attached by dual rear hinges and a front snap latch to firmly compress a lid mounted gasket when closed. Gaskets were cut from sheets of Nalgene closed cell resilient polyethylene foam which provided a water tight seal. External cracks on some of the wood surfaces were filled with silicon glue.
Measuring equipment	Sulfuryl fluoride concentration was measured by using a Fumiscope (thermal conductivity meter). Gas samples were drawn by a pump and measured successively from sampling hoses in entrance hallways before and after each cardboard box was removed.

1.3 Application of test substance

Criteria	Details
Application procedure	Sulfuryl fluoride was introduced weight for desired dosage through a hose which opened into a side room of each chamber.
Delivery method	Not given in report.
Dosage rate	The termites were exposed to three sulfuryl fluoride concentrations of 3, 6 and 12 g/m^3 for 2 – 20 hours.

1.4 Test conditions

Criteria	Details
Substrate	Plastic Petri dishes of 350 mm diameter fitted with single filter paper discs moistened with deionised water for *C. formosanus* and a small wood chip. Wood containers used for *C. formosanus* were provisioned with 5 ml sand and 3 ml water before adding the termites.
Incubation temperature	Temperature within the fumigation chambers during the test period was 27.2 ± 0.9^{o}C with ca. 90% relative humidity. The control group of insects was placed in a nearby building maintained at 30^{o}C.
Moisture	Relative humidity within the fumigation chambers during the test period was ca. 90%. The control group of insects was placed in a nearby building maintained at 80% relative humidity.

Section B5.10.2 Efficacy Data

Annex Point IIB5.10
TNsG: Pt. I-B5.10, Pt. III-Ch. 6

B5.10.2/04 Termites Laboratory study (Ref. Z4)

			Official use only
		1 REFERENCE: Z4, B5.10.2/04	
1.1	**Reference**	La Fage, J.P., Jones, M., and Lawrence, T. (1982). Department of Entomology, Louisiana Agricultural Experiment Station and Louisiana State University, Baton Rouge, Louisiana, 70803, USA. A laboratory evaluation of the fumigant, sulfuryl fluoride (Vikane), against the Formosan termite *Coptotermes formosanus* Shiraki. The International Research Group on Wood Preservation, Thirteenth Annual Meeting, May 1982. IRG Secretariat Drottning Kristinas väg 47C, S – 114 28 Stockholm Sweden.	
1.2	**Data protection**	Not protected.	
1.2.1	Data owner	Data in the public domain in published paper.	
1.2.2	Companies with letter of Access	Not relevant.	
1.2.3	Criteria for data protection	No data protection claimed.	
1.3	**Guideline study**	The studies were undertaken on the basis of sound principles of fumigation practice. The treatments were replicated to enable confidence in the results to be achieved. The studies had two objectives: 1. To determine the effect of temperature on the efficacy of sulfuryl fluoride on termite control. 2 To determine whether sulfuryl fluoride can achieve penetration of termite nests so eradication can be achieved.	
1.4	**Deviations**	Not applicable as the study was not conducted to an international standard method.	
		2 METHOD	
2.1	**Test Substance (Biocidal Product)**	Sulfuryl fluoride	
2.1.1	Trade name/ proposed trade name	Vikane	
2.1.2	Composition of Product tested	Not available from report.	
2.1.3	Physical state and nature	Fumigant.	
2.1.4	Monitoring of active substance concentration	Not undertaken.	
2.1.5	Method of analysis	Not applicable.	

Section B5.10.2 **Efficacy Data**

Annex Point IIB5.10
TNsG: Pt. I-B5.10, Pt. III-Ch. 6

B5.10.2/04 Termites
Laboratory study (Ref. Z4)

2.2	**Reference substance**	No reference substance was included in the study.	
2.2.1	Method of analysis for reference substance	Not applicable.	
2.3	**Testing procedure**		
2.3.1	Test population / inoculum / test organism	See Table 1.1.	
2.3.2	Test system	See Table 1.2.	
2.3.3	Application of test substance	See Table 1.3.	X
2.3.4	Test conditions	See Table 1.4.	
2.3.5	Exposure time	24 hours.	
2.3.6	Number of replicates performed	Study 1 – Effect of temperature on efficacy of sulfuryl fluoride. Each temperature-concentration treatment combinations were each replicated three times. Study 2 – Penetration of sulfuryl fluoride into termite nest. Six replicates per treatment.	
2.3.7	Controls	Controls included.	
2.4	**Examination**		
2.4.1	Effect investigated	Study 1 – Effect of temperature on efficacy of sulfuryl fluoride.	
2.4.2	Method for recording	Termite mortality.	
2.4.3	Intervals of examination	Mortality was determined after 24 hours exposure to sulfuryl fluoride.	
2.4.4	Statistics	Study 1 – Effect of temperature on efficacy of sulfuryl fluoride. Twenty temperature-dosage treatment combinations were each replicated three times using colony source as a blocking factor in the experimental design. Study 2 – Penetration of sulfuryl fluoride into termite nest. Each treatment was replicated six times.	
2.4.5	Post fumigation monitoring of termites	The total mortality effect of sulfuryl fluoride on termites was determined immediately after fumigation.	
		3 RESULTS	
3.1	**Efficacy**	Study 1 – Effect of temperature on efficacy of sulfuryl fluoride. Following exposure of sulfuryl fluoride for 24 hours both temperature and initial concentration had profound effects on efficacy. At 10^{o}C no	

significant mortality was observed even at the highest gas concentration tested. At 20°C there was a dramatic increase in mortality at concentrations of 1.32 g/m^3 (dosage, concentration x time Ct = 32 g-h/m^3).

Percentage mortality of *C. formosanus* exposed to sulfuryl fluoride for 24 hours

Colony	Conc g/m^3	Temperature °C			
		10	20	30	40
A	Control	0	0	0	0
B	Control	0	0	0	0
C	Control	0	-[2]	0	-[2]
A	0.26	14	0	0	4
B	0.26	0	8	6	4
C	0.26	4	4	0	16
A	0.79	2	0	90	98
B	0.79	0	0	100	100
C	0.79	0	6	100	100
A	1.32	0	100	100	100
B	1.32	2	60	100	100
C	1.32	8	64	100	100
A	1.84	0	72	100	100
B	1.84	0	94	100	100
C	1.84	0	92	100	100
A	2.37	0	98	100	100
B	2.37	10	100	100	100
C	2.37	26	100	100	100

-[2] Controls lost due to accidental handling.

Study 2 – Penetration of sulfuryl fluoride into termite nest.

The study showed that sulfuryl fluoride could effectively diffuse through termite carton nest matrix to achieve control.

Effect of sulfuryl fluoride on groups of *C. formosanus* exposed to sulfuryl fluoride after diffusion through a disc of carton nest maxtrix. Exposure was 24 hours at 30°C.

Replicate	Conc g/m^3	Condition of termites after 24 hours (%)		
		Alive	Ataxic	D + M[1]
1	Control	96	0	4
2	Control	96	0	4

		3	Control	96	0	4
		4	Control	100	0	0
		5	Control	88	6	6
		6	Control	96	2	2
		1	0.79	8	90	2
		2	0.79	0	0	100
		3	0.79	2	38	60
		4	0.79	6	50	44
		5	0.79	0	0	100
		6	0.79	3	27	70
		1	1.06	0	0	100
		2	1.06	0	0	100
		3	1.06	0	0	100
		4	1.06	0	28	72
		5	1.06	0	0	100
		6	1.06	0	0	100
		1	1.32	0	0	100
		2	1.32	0	0	100
		3	1.32	0	0	100
		4	1.32	0	0	100
		5	1.32	0	0	100
		6	1.32	0	0	100

[1]D+M = Dead + moribund.

3.1.1	Dose/Efficacy curve	Study 1 – Effect of temperature on efficacy of sulfuryl fluoride. The data suggests that the LD_{50} at 20°C was between 0.79 and 1.84 g/m^3 for exposure of 24 hours i.e., concentration x time (dosage) 19 – 44 g-h/m^3. The data results in a steep slope of the dosage responses curve and the inherent difficulties of drawing small gas samples were such that acceptable LD_{50} values could not be obtained.
3.1.2	Begin and duration of effects	Assessed immediately after 24 hours exposure to sulfuryl fluoride.
3.1.3	Observed effects in the post monitoring phase	No unusual effect observed.
3.2	**Effects against**	None reported.

	organisms or objects to be protected	
3.3	**Other effects**	None reported.
3.4	**Efficacy of the reference substance**	No reference substance was used.
3.5	**Tabular and/or graphical presentation of the summarised results**	See 3.1.
3.6	**Efficacy limiting factors**	
3.6.1	Occurrences of resistances	None reported.
3.6.2	Other limiting factors	None reported.
		4 RELEVANCE OF THE RESULTS COMPARED TO FIELD CONDITIONS
4.1	**Reasons for laboratory testing**	4. Termites from different colonies could be tested. 5. Different dosages could be tested. 6. Practical, accurate procedure. Data generated is considered relevant for field of use. Test insects obtained from the field.
4.2	**Intended actual scale of biocide application**	Not applicable.
4.3	**Relevance compared to field conditions**	
4.3.1	Application method	The principle of fumigation is to confine a sufficient concentration for a sufficient period of time to enable a toxic dose to be received by the target pest. There are a number of ways in laboratory and field studies to achieve this although the principle is the same.
4.3.2	Test organism	There are many different pest species of termites; the species tested, *C. formosanus*, is considered as being of economic importance.
4.3.3	Observed effect	The desired result through fumigation of termites with sulfuryl fluoride is to achieve 100% control, i.e., eradication. Some dosages tested in the two studies achieved this result.
4.4	**Relevance for read-across**	The result achieved for *C. formosanus* is considered relevant to other subterranean termite species.

Section B5.10.2 **Efficacy Data**

Annex Point IIB5.10
TNsG: Pt. I-B5.10, Pt. III-Ch. 6

B5.10.2/04 Termites
Laboratory study (Ref. Z4)

5 APPLICANT'S SUMMARY AND CONCLUSION

5.1 Materials and methods

The first study was undertaken to determine the effect of temperature on the efficacy of sulfuryl fluoride on the control the subterranean termite species of *Coptotermes formosanus*. Termites colonies were collected from naturally occurring infestations and used as stock cultures. Termites were exposed to sulfuryl fluoride in laboratory fumigation chambers for 24 hours at four temperatures, 10. 20, 30 and 40^{o}C. Mortality assessments were made immediately after the exposure period.

The second study was undertaken to determine if sulfuryl fluoride could diffuse through carton nests build by *C. formosanus* to achieve effective control. Carton nest matrix was available from infestations removed from roof voids. Matrix discs from the nest material were used as barriers to prevent the ingress of sulfuryl fluoride to the termite bioassay (termite source as for the first study). Exposure time was 24 hours at 30^{o}C and three concentrations were tested 0.79, 1.06 and 1.32 g/m^{3}. Mortality assessments were made immediately after the exposure period.

5.2 Reliability

Reliability indicator 2: Studies conducted in accordance with generally accepted scientific principles, possibly with incomplete reporting or methodological deficiencies, which do not affect the quality of relevant results.

5.3 Assessment of efficacy, data analysis and interpretation

The first study showed that the fumgiant sulfuryl fluoride was effective against the subterranean termite species *Coptotermes formosanus* when exposed at temperatures from 20 – 40^{o}C for 24 hours..At 10^{o}C the fumigation failed to achieve effective control regardless of initial gas concentration. Very high or total mortality was observed at concentrations of 0.79 g/m^{3} or higher.

The second study showed that at 30^{o}C for 24 hours penetration of sulfuryl fluoride thorough the carton nest matrix constructed by *C. formosanus* was sufficient to achieve high mortality with gas concentrations > 1.06 g/m^{3}.

5.4 Conclusion

Sulfuryl fluoride is highly effective at controlling the termite species *C. formosanus* at temperatures above 20^{o}C. The fumigant can effectively penetrate into the nest of this species.

5.5 Proposed efficacy specification

Termites

Total control – eradication from wood material

Evaluation by Competent Authorities

EVALUATION BY RAPPORTEUR MEMBER STATE

Date	October 2004.
Comments	Field 2.3.3: There are some misprints and missing information in Table 1.3 Application of test substance: Dosage rate (Study 1): The concentration of sulfuryl fluoride were …..… and 2.37 g/m^3. Dosage rate (Study 2): The concentration of sulfuryl fluoride were …..… and 1.32 g/m^3. The termites were exposed for 24 hours.
Summary and conclusion	Applicant's summary and conclusion is acceptable.

1.1 Test organisms - Termites

Criteria	Details
Family	Rhinotermitidae.
Species	*Coptotermes formosanus.*
Source	Colonies collected from naturally infested cypress wood located in a swamp in Louisiana, USA.. These were made after several days of near to below freezing temperatures when termites were inactive and concentrated close to or totally within carton nests. Under these conditions a one or two metre snag of wood was removed from just above the water line which provided large numbers of termites in a small quantity of wood. The complete stock colonies were maintained in the laboratory in metal containers. The colonies were provisioned with supplementary food (southern yellow pine boards) and moisture as necessary.
Life stage	Various.
Mixed age population	Colonies contained mixed age population.
Number of termites in test	Study 1 – Effect of temperature on efficacy of sulfuryl fluoride Fifty forager termites per treatment Study 2 – Penetration of sulfuryl fluoride into termite nest Fifty forager termites per treatment

1.2 Test system

Criteria	Details
Test chamber	The fumigation vessel consisted of ca. 3.8 litre wide-mouth glass jar fitted with a metal screw cap through which sulfuryl fluoride was injected. Plastic tape was used to seal the lid and gas entry port. Gas circulation

	was achieved in the chamber with a small metal fan blade placed in the bottom of the chamber and made to turn with a magnetic stirrer placed under the chamber.
Number of chambers	Not given in report.
Test insects introduction into chamber	<u>Study 1 – Effect of temperature on efficacy of sulfuryl fluoride</u> Termites were transferred from the stock colonies to 30 ml plastic cups containing ca. 12 ml of agar which provided an attractive substrate for gallery building and also provided the required moisture. Groups of 50 foragers held in the cups without supplemental food survived at least 30 days with negligible mortality. Termites were conditioned at test temperatures for 12 – 24 hours in the agar cups prior to beginning the sulfuryl fluoride exposure tests. <u>Study 2 – Penetration of sulfuryl fluoride into termite nest</u> Carton termite matrix was available from infestations removed from wall voids. Carton matrix discs 10 cm in diameter and 8.9 cm thick were cut from larger pieces using a band saw and glued into the ends of 30 cm long, 10 cm diameter Schedule 40 polyvinyl chloride sewer pipes. A second piece of pipe was added to extend the overall length to 44.5 cm. The volume of the apparatus with end covers in place was ca. 3.8 litres. The entire apparatus was submerged in water for 24 hours to saturate the carton material. Fifty *C. formosanus* foragers taken from stock laboratory colonies were conditioned in agar cups and placed in the short end of the test apparatus. Sulfuryl fluoride samples were infected through the hole in the cover of the long chamber and the unit transferred to a bioclimatic chamber. Placement was horizontal to allow the gas to flow toward the carton discs.
Measuring equipment	Gas samples were drawn with a gas syringe to inject the require amount – See 1.3 below.

1.3 Application of test substance

Criteria	Details
Application procedure	Sulfuryl fluoride was supplied in demonstration bottle without a dip tube.
Delivery method	Study 1 – Effect of temperature on efficacy of sulfuryl fluoride The sulfuryl fluoride bottle was connected directly to a brass needle valve fitting which allowed slight adjustment in the gas flow rate. The delivery tube was circulated through a heated water bath to provide gas at a temperature of 20°C. Gas samples were drawn with a gas syringe and injected into the fumigation chamber. Study 2 – Penetration of sulfuryl fluoride into termite nest See Table 2.1.
Dosage rate	Study 1 – Effect of temperature on efficacy of sulfuryl fluoride The concentrations of sulfuryl fluoride were 0.26, 0.79, 1.32, 1.84 and 2.37/m^3. The termites were exposed for 24 hours. Study 2 – Penetration of sulfuryl fluoride into termite nest The concentrations of sulfuryl fluoride were 0.79, 1.06 and 1.32 g/m^3.

1.4 Test conditions

Criteria	Details
Substrate	Study 1 – Effect of temperature on efficacy of sulfuryl fluoride Agar contained in plastic cups. Study 2 – Penetration of sulfuryl fluoride into termite nest See Table 2.1.
Incubation temperature	Study 1 – Effect of temperature on efficacy of sulfuryl fluoride Termites were exposed to sulfuryl fluoride at four temperatures; 10, 20, 30 and 40°C. Study 2 – Penetration of sulfuryl fluoride into termite nest Termites were exposed to sulfuryl fluoride at 30°C.
Moisture	Not given in report.

Section B5.10.2 Efficacy Data

Annex Point IIB5.10
TNsG: Pt. I-B5.10, Pt. III-Ch. 6

B5.10.2/05 Pine wood nematode Simulated field study (Ref. Z5)

			Official use only
		1 REFERENCE: Z5, B5.10.2/05	
1.1	**Reference**	[1]Soma, Y., [1]Naito, H., [1]Misumi, T., [1]Mizobuchi, M., [1]Tsuchiya, Y., [1]Matsuoka, I., [1]Kawakami, F., [2]Hirata, K., and [3]Komatsu, H. (2001). [1]Chemical and Physical Control Laboratory, Research Division, Yokohama Plant Protection Station, MAFF, Japan. [2]Research Division, Yokohama Plant Protection Station, MAFF, Japan. [3]Research Laboratory, Japan Fumigation Technology Association, Tokyo, Japan. Effects of some fumigants on pine wood nematode, *Buraphelenchus xylophilus*, infecting wooden packages. 1. Susceptibility of pine wood nematode to methyl bromide, sulfuryl fluoride and methyl isothiocyanate. Research Bulletin Plant Protection, Japan, 2001, Number 37, pages 19 – 26.	
1.2	**Data protection**	Not protected.	
1.2.1	Data owner	Data in the public domain in published paper.	
1.2.2	Companies with letter of Access	Not relevant.	
1.2.3	Criteria for data protection	No data protection claimed.	
1.3	**Guideline study**	The studies were undertaken on the basis of sound principles of fumigation practice.	
1.4	**Deviations**	Not applicable as the study was not conducted to an international standard method.	
		2 METHOD	
2.1	**Test Substance (Biocidal Product)**	Sulfuryl fluoride.	
2.1.1	Trade name/ proposed trade name	Vikane.	
2.1.2	Composition of Product tested	≥ 99% Sulfuryl fluoride.	
2.1.3	Physical state and nature	Fumigant.	
2.1.4	Monitoring of active substance concentration	Monitoring was undertaken using a gas chromatograph.	
2.1.5	Method of analysis	Not applicable.	
2.2	**Reference**	Two references were included in the study, methyl bromide (purity of ≥	

	substance	99%) and methyl isothiocyanate (30% in CO_2).	
2.2.1	Method of analysis for reference substance	Not applicable.	
2.3	**Testing procedure**		
2.3.1	Test population / inoculum / test organism	See Table 1.1.	
2.3.2	Test system	See Table 1.2.	
2.3.3	Application of test substance	See Table 1.3.	
2.3.4	Test conditions	See Table 1.4.	
2.3.5	Exposure time	24 hours.	X
2.3.6	Number of replicates performed	Five pieces of board and three pieces of lumber per treatment.	
2.3.7	Controls	Non-fumigated wooden samples were included as the controls.	
2.4	**Examination**		
2.4.1	Effect investigated	Nematode mortality.	
2.4.2	Method for recording	Fumigated and control wooden material were placed in netted bags and stored at ambient temperature until detection of the nematode by Bermann funnel method. Wooden pieces were taken from a few places in the fumigated and untreated control samples by saw separately and then by cutting them into the smaller pieces of 3mm x 3mm x 5mm with scissors. The samples of 10 – 20g were placed in a Bermann funnel for 24 hours at room temperature. Surviving nematodes were counted using microscopes.	
2.4.3	Intervals of examination	Mortality was determined 6 – 7 and 20 – 21 days after fumigation.	
2.4.4	Statistics	Not available from report.	
2.4.5	Post fumigation monitoring of nematodes	See 2.4.3.	
		3 RESULTS	
3.1	**Efficacy**	Gas concentration and dosages (CT products - concentration x time) The ratios of residual gas concentration at the end of fumigation for 24 and 48 hours for sulfuryl fluoride were more than 95% while average ratios for 24 and 48 hours were 3.3% and 2.7% for methyl isothiocyanate and 58.1% and 54.6% for methyl bromide respectively.	

These data indicate that both methyl iosothiocyanate and methyl bromide are absorbed onto wooden material.

Ratios of residual gas and Ct (concentration x time) products for the red pine infested with pine wood nematode fumigated with sulfuryl fluoride, methyl bromide and methyl isothiocyanate at 25% (v/v) load factor and 15°C for 24 and 48 hours.

Fumigant[1]	Conc^{n} g/m^3	Ratio of residual gas		Ct product g-h/m^3	
		24	48	24	48
SF	30	97.8	-	765	-
SF	60	98.5	95.0	1539	2932
MB	20	58.0	-	313	-
MB	40	59.3	53.8	631	1174
MB	60	57.3	54.3	900	1704
MB	80	57.7	55.8	1188	2277
MITC	20	3.5	3.0	32	47
MITC	40	3.0	2.3	53	78

[1]SF = sulfuryl fluoride, MB = methyl bromide, MITC = methyl isothiocyanate

Mortality of pine wood nematodes in boards

Nematode survival was recorded following fumigation of red pine boards with sulfuryl fluoride and for some of the methyl bromide treatments; no survival was recorded following the methyl isothiocyanate treatments.

Mortality of pine wood nematode infested red pine board 2 cm thick fumigated with sulfuryl fluoride, methyl bromide and methyl isothiocyanate at 25% (v/v) load factor and 15°C for 24 and 48 hours (mortality was assessed on samples 6 – 7 days after fumigation).

Fumigant[1]	Conc^{n} g/m^3	Ex. time hours	Moisture %		No. nematodes per 100g		Survivor %
			BF[2]	AF[3]	BF	AF	
SF	60	24	27.3	10.5	20400	2704	13.3
SF	60	48	27.3	12.7	20400	1227	6.0
MB	20	24	28.2	23.1	69900	1522	2.2
MB	40	24	25.1	22.4	36500	4.7	0.01
MB	40	48	31.5	22.9	57800	0	0.0
MB	60	24	30.6	22.7	53600	0	0.0
MB	60	48	27.8	21.3	62200	0	0.0

MB	80	24	29.4	24.8	41500	0	0.0
MB	80	48	33.2	39.6	33300	0	0.0
MITC	20	24	27.2	23.0	57200	0	0.0
MITC	20	48	26.1	22.9	68000	0	0.0
MITC	40	24	26.4	23.5	45200	0	0.0
MITC	40	48	27.2	22.3	45500	0	0.0
Control	0	48	25.8	22.3	39000	33300	85.4

[1]SF = sulfuryl fluoride, MB = methyl bromide, MITC = methyl isothiocyanate

[2]BF = Before fumigation

[3]AF = After fumigation

Mortality of pine wood nematodes in lumber

Nematode survival was recorded following fumigation of red pine boards with sulfuryl fluoride and for some of the methyl bromide treatments; no survival was recorded following the methyl isothiocyanate treatments. X

Mortality of pine wood nematode infested red pine lumber 15 cm^2 fumigated with sulfuryl fluoride, methyl bromide and methyl isothiocyanate at 25% (v/v) load factor and 15°C for 24 and 48 hours (mortality was assessed on samples 20 - 21 days after fumigation).

Fumigant[1]	Conc^n g/m^3	Ex. time hours	Moisture %		No. nematodes per 100g		Survivor %
			BF[2]	AF[3]	BF	AF	
SF	30	24	27.7	21.7	20500	3819.0	18.6
SF	60	24	20.1	11.7	22700	453.7	2.0
SF	60	48	20.1	11.7	22700	77.8	0.34
MB	20	24	57.2	27.4	18400	1584.0	8.6
MB	40	24	30.5	13.7	79400	42.4	0.18
MB	60	24	30.5	13.7	79400	0	0.0
MITC	20	24	33.2	14.2	42300	0	0.0
MITC	20	48	46.1	25.7	25900	0	0.0
Control	0	48	33.4	12.2	35500	53100	149.6

[1]SF = sulfuryl fluoride, MB = methyl bromide, MITC = methyl isothiocyanate

		[2]BF = Before fumigation [3]AF = After fumigation
3.1.1	Dose/Efficacy curve	Not available from report.
3.1.2	Begin and duration of effects	Assessments for mortality undertaken at 6 –7 and 20 – 21 days after 24 and 48 hours exposure to sulfuryl fluoride and the reference products methyl bromide and methyl isothiocyanate.
3.1.3	Observed effects in the post monitoring phase	No unusual effect observed.
3.2	**Effects against organisms or objects to be protected**	None reported.
3.3	**Other effects**	None reported.
3.4	**Efficacy of the reference substance**	See 3.1.
3.5	**Tabular and/or graphical presentation of the summarised results**	See 3.1.
3.6	**Efficacy limiting factors**	
3.6.1	Occurrences of resistances	None reported.
3.6.2	Other limiting factors	None reported.
		4 RELEVANCE OF THE RESULTS COMPARED TO FIELD CONDITIONS
4.1	**Reasons for laboratory testing**	Not applicable, study was a simulated field test.
4.2	**Intended actual scale of biocide application**	Not applicable.
4.3	**Relevance compared to field conditions**	
4.3.1	Application method	The procedure adopted represented commercial practice.
4.3.2	Test organism	Pine wood nematode, *Bursaphelenchus zylophilus*, is considered as being of economic importance to the forestry industry. Plant quarantine authorities in many countries require treatment of imported wooden materials such as pallets, crates and boxes for disinfestation of this pest

		to prevent its spread.	
4.3.3	Observed effect	The desired result through fumigation of pine wood nematodes with sulfuryl fluoride is to achieve 100% control, i.e., eradication. None of the dosages tested at 15°C achieved this result.	
4.4	**Relevance for read-across**	The data generated is relevant for pine wood nematode where ever this pest occurs.	
		5 APPLICANT'S SUMMARY AND CONCLUSION	
5.1	**Materials and methods**	The stimulated field study was undertaken to determine the efficacy of sulfuryl fluoride on the control the pine wood nematode, *Bursaphelenchus zylophilus*, infesting conifer wooden boards and lumber at 15°C. The concentrations of sulfuryl fluoride tested were 30 and 60 g/m^3 and the exposure times 24 and 48 hours. Methyl bromide and 30% methyl isothiocyanate in CO_2 were included as the reference fumigants at a range of concentrations and at 24 and 48 hours exposures. Naturally infested test wood materials including more than 10000 nematodes per 100g of the sample was used for the tests. Nematodes were detected using the Bermann funnel method. Mortality assessments were completed 6 – 7 and 20 – 21 days after fumigation.	
5.2	**Reliability**	Reliability indicator 2: Study conducted in accordance with generally accepted scientific principles, possibly with incomplete reporting or methodological deficiencies, which do not affect the quality of relevant results.	
5.3	**Assessment of efficacy, data analysis and interpretation**	Sulfuryl fluoride achieved a high level of mortality of pine wood nematodes at 15°C at some of the concentration tested. For quarantine purposes a treatment programme to achieve complete disinfestation would be required. It is possible than sulfuryl fluoride fumigation at higher temperatures would achieve this result.	
5.4	**Conclusion**	Sulfuryl fluoride has the potential of achieving a high level of control of pine wood nematode. Fumigation at temperatures higher than 15°C would improve the efficacy of the fumigant.	
5.5	**Proposed efficacy specification**	Total control – eradication from wood material	X

Evaluation by Competent Authorities	
	EVALUATION BY RAPPORTEUR MEMBER STATE
Date	October 2004.
Comments	Field 2.3.5 Exposure time: Should be 24 hours and 48 hours. Field 3.1: Nematode survival was recorded following fumigation of lumber with sulfuryl fluoride….. Field 5.5 Proposed efficacy specification: None of the dosages tested achieved 100% control, i.e. eradication. Therefore the proposed efficacy specification should read e.g. high mortality was achieved.
Summary and conclusion	Applicant's summary and conclusion is adopted with the proposed modification of the efficacy specification.

1.1 Test organism – Pine wood nematode

Criteria	Details
Species	*Bursaphelenchus xylophilus.*
Source	Red pine, *Pinus densiflora*, naturally infested with the pine wood nematode were collected and sawn into boards (2cm thick x 15cm wide x 30cm long) and lumber (15 cm thick x 15 cm wide x 30 cm long in size). Five pieces of board and three pieces of lumber were tied up into a bundle by plastic bands. Board and lumber of the same size as the test samples were also prepared as filler materials for achieving a certain fumigation loading. The filler was always placed outside the bundle.
Life stage	The stage of the nematode in a series of the test accounted for preceding the dispersal 3rd and 4th stage larvae to more than 90% of the nematode in each sample.
Mixed age population	Not available from report.
Number of nematodes in test	The number of pine wood nematodes in the test wooden material was always confirmed before fumigation. The wooden materials included more than 10,000 nematodes per 100 g of the sample were used for the tests.

1.2 Test system

Criteria	Details
Test chamber	The test chamber to simulate field fumigation conditions consisted of a 100 litre fibre-glass fumigation box measuring 50cm x 40cm x 50cm.
Number of chambers	Not available from report.
Test insects introduction into chamber	The bundle of test wooden material was placed in the fumigation chamber with 25% loading again to stimulate field fumigation conditions (which would normally take place in a warehouse) and stored overnight at 15°C.
Measuring equipment	Gas concentrations during fumigation were monitored periodically with gas chromatography. Temperature was also recorded with an automatic recorder (Hybrid recorder AH, Chino).

1.3 Application of test substance

Criteria	Details
Application procedure	Not available from report.
Delivery method	For sulfuryl fluoride and methyl bromide prescribed amounts were collected in a syringe and then introduced in the fumigation chamber. Methyl isothiocyanate was introduced directly from a cylinder by measuring a prescribed amount.
Dosage rate	Fumigation exposure periods were 24 and 48 hours. Concentrations Sulfuryl fluoride: 30, 60 g/m^3 Methyl bromide: 20, 40, 60, 80 g/m^3 Methyl isothiocyanate: 30% in CO_2

1.4 Test conditions

Criteria	Details
Substrate	Red pine, *Pinus densiflora.*
Incubation temperature	Pre-conditioning of test material and during fumigation completed at 15°C.
Moisture	Average moisture content in test wood lumber Before fumigation 20.1 – 57.2% After fumigation 11.7 – 27.4%

Section B5.10.2 Efficacy Data

Annex Point IIB5.10
TNsG: Pt. I-B5.10, Pt. III-Ch. 6

B5.10.2/06 Pine wood nematode Laboratory and field studies (Ref. Z6)

			Official use only
		1 REFERENCE: Z6, B5.10.2/06	
1.1	**Reference**	[1]Dwinell, L. D., [2]Thoms, E., and [3]Prabhakaran, S. (2003). [1]United States Department of Agriculture Forestry Service, Athens, Georgia, USA. [2]Dow AgroSciences LLC, Gainesville, Florida, USA. [3]Dow AgroSciences LLC, Indianapolis, Indiana, USA. Exploratory research on sulfuryl fluoride fumigation to eradicate the pine wood nematode in unseasoned pine lumber. Annual International Research Conference on Methyl Bromide Alternatives and Emission Reduction, 2003, San Diego, California, USA.	
1.2	**Data protection**	Not protected.	
1.2.1	Data owner	Data in the public domain in published paper.	
1.2.2	Companies with letter of Access	Not relevant.	
1.2.3	Criteria for data protection	No data protection claimed.	
1.3	**Guideline study**	The studies were undertaken on the basis of sound principles of fumigation practice.	
1.4	**Deviations**	Not applicable as the study was not conducted to an international standard method.	
		2 METHOD	
2.1	**Test Substance (Biocidal Product)**	Sulfuryl fluoride	
2.1.1	Trade name/ proposed trade name	Vikane.	
2.1.2	Composition of Product tested	≥ 99% Sulfuryl fluoride.	
2.1.3	Physical state and nature	Fumigant.	
2.1.4	Monitoring of active substance concentration	Monitoring was undertaken using a Fumiscope thermal conductivity meter.	
2.1.5	Method of analysis	Not applicable.	
2.2	**Reference substance**	No reference substance was included in the study.	
2.2.1	Method of analysis for reference	Not applicable.	

	substance	
2.3	**Testing procedure**	
2.3.1	Test population / inoculum / test organism	See Table 1.1.
2.3.2	Test system	See Table 1.2.
2.3.3	Application of test substance	See Table 1.3.
2.3.4	Test conditions	See Table 1.4.
2.3.5	Exposure time	Two laboratory studies 24 hours. Field fumigation 7.5 hours.
2.3.6	Number of replicates performed	In the first laboratory study each chamber treatment was replicated twice. The second laboratory study was not replicated. The field chamber fumigation treatment was replicated six times.
2.3.7	Controls	Single untreated controls were included both of the laboratory studies. Three untreated controls were included in the field fumigation study.
2.4	**Examination**	
2.4.1	Effect investigated	Occurrence of pine wood nematode.
2.4.2	Method for recording	Laboratory studies A thin section of wood was sawn from the centre of the pine sticks and nematodes extracted using the Baermann funnel procedure. The occurrence of the pine wood nematode in the sticks was recorded and expressed as percent of sticks positive for pine wood nematode. Field fumigation After fumigation the boards were sampled for the pine wood nematode by drilling two 2.5 cm holes with an auger bit and extracting the nematodes from the borings using the Baermann funnel procedure. The slabs were examined for pine sawyer exit holes in July. The wood moisture content, expressed on a dry weight basis, was determined by drying a second set of wood wafers at 105°C for 24 hours.
2.4.3	Intervals of examination	Post fumigation.
2.4.4	Statistics	Not available from report.
2.4.5	Post fumigation monitoring of nematodes	See 2.4.3.
		3 RESULTS
3.1	**Efficacy**	Laboratory studies In the first study conducted at 20°C, 70% of the shortleaf pine sticks were positive for pine wood nematode following exposure to a concentration of sulfuryl fluoride at 30 g/m^3 and an accumulated dosage (Ctp) of 694 g-h/m^3 and 10% were positive at 60 g/m^3 and an accumulated dosage of 1393 g-h/m^3. However when sulfuryl fluoride

was held at 60 g/m^3 for 24 hours and the temperature increased to 25 and 30^{o}C (accumulated dosage of 1420 and 1426 g-h/m^3 respectively) none of the pine sticks were positive for the nematode.

Percentage of shortleaf pine sticks with PWN (pine wood nematode) before and after fumigation with SF (sulfuryl fluoride) at 30 and 60 g/m^3 at 20^{o}C for 24 hours.

Treatment	Dosage	% of sticks positive for PWN	
SF g/m^3	g-h/m^3	Before Fum.	After Fum.
30	694	100	70
60	1393	100	10
Control	0	100	100

Percentage of shortleaf pine sticks with PWN (pine wood nematode) before and after fumigation with SF (sulfuryl fluoride) at 60 g/m^3 at 25^o and 30oC for 24 hours.

Treatment	Dosage	% of sticks positive for PWN	
Temp. ^{o}C	g-h/m^3	Before Fum.	After Fum.
25	1420	100	0
30	1426	100	0
Control	0	100	100

Field fumigation

In the field fumigation it was necessary to add sulfuryl fluoride after about 4.5 hours and the exposure was terminated after about 7.5 hours when the targeted dosages (Ctps) were obtained. The resulting accumulated dosages ranged from 997 – 1751 g-h/m^3 in the fumigation chambers. The mean and maximum temperatures for the chambers during fumigation averaged 35.3 and 40.9^{o}C respectively. No nematodes were extracted from the lumber in any of the fumigation treatments.

Accumulated dosages (Ctps) in field fumigation chambers to eradicate pine wood nematode from infested lumber

Chamber	Time 1[a]	Time 2[a]	Total SF g	Dosage g-h/m^{3b}
1	102	357	459	1751
2	102	533	635	1039
3	103	345	447	1538
4	244	78	322	1506
5	153	317	470	1192
6	153	357	510	997

[a]Time 1 = 0; Time 2 = 4.5 hours. Time 2 concentrations increased to

compensate for rapid gas loss from the chamber.

[b]Dosages corrected for atmospheric changes, e.g. relative humidity and CO_2 by monitoring non-fumigated controls.

Efficacy of sulfuryl fluoride in eradication of pine wood nematode from infested lumber of different sizes in field fumigation chambers

Lumber size cm[a]	% WMC[b]	% Lumber positive for PWN			
		Non-fumigated		Fumigated	
		Pre	Post	Pre	Post
2.5 x 15 x 96.5	34	90	89	90	0
5 x 12.7 x 96.5	37	93	83	93	0
12.7 x 12.7 x 96.5	32	84	74	84	0

[a]Each chamber load consisted of 13 pieces of each size. Data is the mean of six fumigation chambers and three non-fumigated control chambers.

[b]Mean wood moisture content, expressed on a dry weight basis.

3.1.1	Dose/Efficacy curve	Not available from report.
3.1.2	Begin and duration of effects	Before and after fumigation.
3.1.3	Observed effects in the post monitoring phase	No unusual effect observed.
3.2	**Effects against organisms or objects to be protected**	None reported.
3.3	**Other effects**	None reported.
3.4	**Efficacy of the reference substance**	No reference substance used.
3.5	**Tabular and/or graphical presentation of the summarised results**	See 3.1.
3.6	**Efficacy limiting factors**	
3.6.1	Occurrences of resistances	None reported.

3.6.2	Other limiting factors	None reported.	
		4 RELEVANCE OF THE RESULTS COMPARED TO FIELD CONDITIONS	
4.1	**Reasons for laboratory testing**	Laboratory studies were included to refine the dosage rates in preparation for the field fumigation.	
4.2	**Intended actual scale of biocide application**	The scale of the fumigation only limited to the size of the fumigated chamber.	
4.3	**Relevance compared to field conditions**	Field fumigation included.	
4.3.1	Application method	The procedure adopted represented commercial practice.	
4.3.2	Test organism	Pine wood nematode, *Bursaphelenchus zylophilus*, is considered as being of economic importance to the forestry industry. Plant quarantine authorities in many countries require treatment of imported wooden materials such as pallets, crates and boxes for disinfestation of this pest to prevent its spread.	
4.3.3	Observed effect	The desired result through fumigation of pine wood nematodes with sulfuryl fluoride is to achieve 100% control, i.e., eradication. In the laboratory studies this was achieved following fumigation at 25 and 30°C at a dosage of 1460 g-h/m^3. Complete control was also achieved in the field fumigation at an average temperature of 35.3 and 40.9°C at a dosage range from 997 – 1751 g-h/m^3.	X
4.4	**Relevance for read-across**	The data generated is relevant for pine wood nematode where ever this pest occurs.	
		5 APPLICANT'S SUMMARY AND CONCLUSION	
5.1	**Materials and methods**	Two laboratory chamber studies and one field fumigation were undertaken to determine the accumulated dosage (CT, concentration x time) of sulfuryl fluoride to eradicate naturally occurring pine wood nematode, *Burasphelenchus xylophilus*, from unseasoned shortleaf pine, *Pinus echinata*. The efficacy of sulfuryl fluoride was tested at different temperatures ranging from 20 – 30°C in the laboratory studies and 35.3 – 40.9°C in the field fumigation at a range of dosages. The test pine material was cut into sticks for the laboratory studies and three sizes of lumber for the field fumigation. Assessment of the presence of pine wood nematode before and after fumigation was undertaken using the Baermann procedure.	
5.2	**Reliability**	Reliability indicator 2: Study conducted in accordance with generally accepted scientific principles, possibly with incomplete reporting or methodological deficiencies, which do not affect the quality of relevant results.	X
5.3	**Assessment of efficacy, data analysis and**	Sulfuryl fluoride achieved complete eradication of pine wood nematodes in the laboratory chambers following fumigation at 25 and 30°C at a dosage of 1460 g-h/m^3. Complete control was also achieved	X

Section B5.10.2 **Efficacy Data**

Annex Point IIB5.10
TNsG: Pt. I-B5.10, Pt. III-Ch. 6

B5.10.2/06 Pine wood nematode Laboratory and field studies (Ref. Z6)

	interpretation	in the field fumigation at a average temperature of 35.3 and 40.9°C
5.4	**Conclusion**	Sulfuryl fluoride can achieve complete eradication of pine wood nematode from infested pine wood.
5.5	**Proposed efficacy specification**	Total control – eradication from wood material

Evaluation by Competent Authorities	
	EVALUATION BY RAPPORTEUR MEMBER STATE
Date	October 2004.
Comments	Field 4.3.3: In the laboratory studies this was achieved following fumigation at 25 and 30°C at dosages of 1420 g-h/m^3 and 1426 g-h/m^3, respectively. Field 5.2: A reliability indicator of 3 is suggested due to very brief reporting in study report, no statistical methods description, one study was not replicated, it was stated that further research was needed to verify the results. Field 5.3: Sulfuryl fluoride achieved complete eradication of pine wood nematodes in the laboratory chambers following fumigation at 25 and 30°C at dosages of 1420 g-h/m^3 and 1426 g-h/m^3, respectively.
Summary and conclusion	Applicant's summary and conclusion is adopted.

1.1 Test organism – Pine wood nematode

Criteria	Details
Species	*Bursaphelenchus xylophilus.*
Source	Two Laboratory studies Shortleaf pine, *Pinus echinata*, naturally infested with the pine wood nematode cut into sticks of 2.5 x 2.5 x 2.5 cm were used. Field fumigation Logs of salvaged shortleaf pines that has been killed by the southern pine beetle, *Dendroctonus frontalis,* in 2002 and subsequently colonised by pine sawyers and pine wood nematode. The slabs from the logs, which were sawn into 96.5 cm lengths, were recovered during the milling process. The boards were 2.5 x 15 x 96.5 cm and 5 x 12.7 x 96.5 cm. The cants were 12.7 x 12.7 x 96.5 cm.
Life stage	Not available from report.
Mixed age population	Not available from report.
Number of nematodes in test	Not available from report.

1.2 Test system

Criteria	Details
Test chamber	Two laboratory studies Laboratory fumigation chambers, 0.028 m^3 in volume. Field fumigation Temporary fumigation chambers of 5m^3 volume were constructed of lumber and covered with 6 mil polyethylene sheeting. The chambers were on a concrete pad and the edges sealed with wet sand prior to fumigation.
Number of chambers	Two laboratory studies First study: 4 Second study: 1 Field fumigation 9 chambers.
Test insects introduction into chamber	First laboratory study Each of four fumigation chambers was loaded with 20 of the naturally infested with pine wood nematode shortfleaf pine sticks. Second laboratory study The chamber was loaded with 25 shortleaf pine sticks naturally infested with pine wood nematode. Field fumigation Each chamber load consisted of 13 pieces of each of

	the three lumber sizes and 24 slabs of shortleaf pine naturally infested with pine wood nematode.
Measuring equipment	Gas concentrations during fumigation were monitored with a Fumiscope, thermal conductivity meter. In the field fumigation ambient air temperature was recorded using Hobo data loggers.

1.3 Application of test substance

Criteria	Details
Application procedure	Laboratory studies Not available from report. Field fumigation Not available from report.
Delivery method	Laboratory studies Not available from report. Field fumigation The introduction of sulfuryl fluoride into the chambers was controlled by a digital electronic scale.
Dosage rate	First laboratory study Fumigation exposure period was 24 hours. Concentrations were 30 and 60 g/m^3. Second laboratory study Fumigation exposure period was 24 hours. Concentration was 60 g/m^3. Field fumigation Fumigation exposure period 7.5 hours. Accumulated concentration x time (CT) range = 997 – 1751 g-h/m^3.

1.4 Test conditions

Criteria	Details
Substrate	Shortleaf pine *Pinus echinata.*
Incubation temperature	First laboratory study temperature was 20°C. Second laboratory study two temperatures were tested, 25 and 30°C. In the field fumigation the mean and maximum temperatures for the chambers during fumigation averaged 35.3 and 40.9°C respectively.
Moisture	Laboratory studies Not available from report. Field fumigation Mean wood moisture content expressed on a dry weight basis ranged from 32 – 37%.

Section B5.10.2 Efficacy Data

Annex Point IIB5.10
TNsG: Pt. I-B5.10, Pt. III-Ch. 6

B5.10.2/07 House longhorn beetle, European house borer, old house borer (H*ylotrupes bajulus*) Powder post beetle (*Lyctus brunneus*) Laboratory studies (Ref. Z7)

			Official use only
		1 REFERENCE: Z7, B5.10.2/07	
1.1	**Reference**	Verheyen, H. (2002) Fachhochschule, Eberswalde, Germany. Investigatory studies on the ovicidal effect of a fumigant on dry wood insect pests. Student Research Project.	
1.2	**Data protection**	Yes.	
1.2.1	Data owner	Dow AgroSciences LLC.	
1.2.2	Companies with letter of Access	Not relevant.	
1.2.3	Criteria for data protection	Data submitted to the MS after 13 May 2000 on existing b.p. for the purpose of its entry into Annex I.	
1.3	**Guideline study**	The studies were undertaken on the basis of sound principles of fumigation practice. The treatments were replicated to enable confidence in the results to be achieved.	
1.4	**Deviations**	Not applicable as the study was not conducted to an international standard method.	
		2 METHOD	
2.1	**Test Substance (Biocidal Product)**	Sulfuryl fluoride.	
2.1.1	Trade name/ proposed trade name	Vikane.	
2.1.2	Composition of Product tested	≥ 99.8% Sulfuryl fluoride.	
2.1.3	Physical state and nature	Fumigant.	
2.1.4	Monitoring of active substance concentration	Monitoring was undertaken using a Fumiscope gas analyser.	
2.1.5	Method of analysis	Not applicable.	
2.2	**Reference substance**	No reference substance was included in the study.	
2.2.1	Method of analysis for reference substance	Not applicable.	
2.3	**Testing procedure**		

Section B5.10.2 **Efficacy Data**

Annex Point IIB5.10
TNsG: Pt. I-B5.10,
Pt. III-Ch. 6

B5.10.2/07 House longhorn beetle, European house borer, old house borer (H*ylotrupes bajulus*) Powder post beetle (*Lyctus brunneus*) Laboratory studies (Ref. Z7)

2.3.1	Test population / inoculum / test organism	See Table 1.1.
2.3.2	Test system	See Table 1.2.
2.3.3	Application of test substance	See Table 1.3.
2.3.4	Test conditions	See Table 1.4.
2.3.5	Exposure time	*Hylotrupes bajulus* 22 hours and 29 minutes – 168 hours and 30 minutes. *Lyctus brunneus* 8 hours and 48 minutes – 26 hours and 30 minutes.
2.3.6	Number of replicates performed	For each test insect species a range of concentrations were tested with different exposure times. For *H. bajulus* the same concentration and time was replicated 1 – 4 times and for *L. brunneus* 1 – 8 times.
2.3.7	Controls	Three controls were included for *H. bajulus* and two for for *L. brunneus*. Larvae emerging from the controls were maintained for a period of 4 weeks on wood material to confirm their viability to produce a new generation of beetles.
2.4	**Examination**	
2.4.1	Effect investigated	Mortality of eggs of different ages of *H. bajulus* and *L. brunneus* following exposure to sulfuryl fluoride.
2.4.2	Method for recording	Examination for egg hatch after fumigation.
2.4.3	Intervals of examination	Mortality was determined 1 – 4 days after exposure to sulfuryl fluoride.
2.4.4	Statistics	Not available from report.
2.4.5	Post fumigation monitoring	The total mortality effect of sulfuryl fluoride on *H. bajulus* and *L. brunneus* was determined after fumigation.
		3 RESULTS
3.1	**Efficacy**	*Hylotrupes bajulus* The mortality results of *H. bajulus* following exposure to sulfuryl fluoride as shown below.

Percentage mortality of eggs of *Hylotrupes bajulus* following exposure to sulfuryl fluoride at 22°C

Egg Age Days	Egg No.	Con^n g/m^3	Ex. Time Hours:min	Dosage (CT) g-h/m^3	Mortality
1	30	33.1	26:29	875	13.5

1	15	66.3	26:25	1752	80.0
1	39	11.6	168:15	1954	53.2
1	8	13.6	169:22	2309	92.9
1	36	13.6	169:23	2309	98.5
1	19	132.8	18:12	2416	100.0
1	33	132.8	18:14	2416	66.7
1	24	16.5	168:30	2779	99.1
2	26	66.3	26:28	1752	100.0
2	4	97.9	26:18	2575	100.0
2	31	97.9	26:23	2575	100.0
3	11	33.1	26:28	875	1.3
3	23	66.3	26:27	1752	93.3
3	5	97.9	26:19	2575	40.0
3	18	97.9	26:21	2575	100.0
4	2	33.1	26:26	875	8.1
4	21	66.3	26:26	1752	1.2
4	20	132.8	18:13	2416	8.1
4	14	97.9	26:20	2575	39.7
4	6	174.5	18:07	3162	100.0
1				Untreated	3.1
1				Untreated	10.0
4				Untreated	18.8

Lyctus brunneus

The mortality results of *L. brunneus* following exposure to sulfuryl fluoride as shown below.

Percentage mortality of eggs of *Lyctus brunneus* following exposure to sulfuryl fluoride at 22°C

Egg Age Days	Egg No.	Con^n g/m^3	Ex. Time Hours:min	Dosage (CT) g-h/m^3	Mortality
1	19	11.5	44:39	512	100.0
1	39	11.5	44:39	512	100.0
1	11	28.9	19:40	568	100.0
1	38	28.9	19:40	568	100.0

Section B5.10.2 **Efficacy Data**

Annex Point IIB5.10
TNsG: Pt. I-B5.10, Pt. III-Ch. 6

B5.10.2/07 House longhorn beetle, European house borer, old house borer (H*ylotrupes bajulus*) Powder post beetle (*Lyctus brunneus*) Laboratory studies (Ref. Z7)

		1	21	24.5	26:30	650	100.0
		1	33	24.5	26:30	650	100.0
		1	43	24.5	26:30	650	100.0
		2	20	28.9	19:40	568	100.0
		2	27	24.5	26:30	650	100.0
		3	8	36.3	08:48	320	100.0
		3	22	28.9	19:40	568	100.0
		3	29	28.9	19:40	568	100.0
		3	1	24.5	26:30	650	100.0
		4	12	28.9	19:40	568	100.0
		4	13	28.9	19:40	568	100.0
		4	26	24.5	26:30	650	100.0
		5	2	32.6	11:50	385	100.0
		5	5	32.6	11:50	385	100.0
		5	3	24.4	19:22	472	100.0
		5	7	28.9	19:40	568	100.0
		5	10	24.5	26:30	650	100.0
		2				Untreated	100.0
		5				Untreated	100.0

3.1.1	Dose/Efficacy curve	The mortality results for *H. bajulus* eggs following exposure to sulfuryl fluoride at 22°C at different dosages were variable and it is was not possible for a dose response to be established. A high level of mortality of *L. brunneus* eggs in the untreated was recorded and again it was not possible for a dose response to be established.
3.1.2	Begin and duration of effects	Assessment was completed 1 – 4 days after exposure to sulfuryl fluoride.
3.1.3	Observed effects in the post monitoring phase	No unusual effect observed.
3.2	**Effects against organisms or objects to be protected**	None reported.
3.3	**Other effects**	None reported.
3.4	**Efficacy of the reference substance**	No reference substance was used.

Section B5.10.2 **Efficacy Data**

Annex Point IIB5.10
TNsG: Pt. I-B5.10,
Pt. III-Ch. 6

B5.10.2/07 House longhorn beetle, European house borer, old house borer (H*ylotrupes bajulus*)
Powder post beetle (*Lyctus brunneus*)
Laboratory studies (Ref. Z7)

3.5	**Tabular and/or graphical presentation of the summarised results**	See 3.1.
3.6	**Efficacy limiting factors**	
3.6.1	Occurrences of resistances	None reported.
3.6.2	Other limiting factors	None reported.
		4 RELEVANCE OF THE RESULTS COMPARED TO FIELD CONDITIONS
4.1	**Reasons for laboratory testing**	1. Practical, accurate procedure. 2. Different dosages could be tested.
4.2	**Intended actual scale of biocide application**	In structures and wooden material infested with the beetles.
4.3	**Relevance compared to field conditions**	
4.3.1	Application method	The principle of fumigation is to confine a sufficient concentration for a sufficient period of time to enable a toxic dose to be received by the target pest. There are a number of ways in laboratory and field studies to achieve this although the principle is the same.
4.3.2	Test organism	*Hylotrupes bajulus* and *Lyctus brunneus* eggs used in the study produced after understanding the natural behaviour of the insects.
4.3.3	Observed effect	The desired result through fumigation of *Hylotrupes bajulus* and *Lyctus brunneus* with sulfuryl fluoride is to achieve 100% control, i.e., eradication. Some dosages achieved this result.
4.4	**Relevance for read-across**	The results achieved were not considered to be relevant to read across to other insect species.
		5 APPLICANT'S SUMMARY AND CONCLUSION
5.1	**Materials and methods**	A series of laboratory chamber fumigations with sulfuryl fluoride at 22^{o}C were undertaken to determine the dosage required to kill eggs of different ages of *Hyloptrupes bajulus* and *Lyctus brunneus*. In these tests different concentrations and exposure times were used to establish the dosage (Ctp, concentration x time product) range. Mortality assessments were undertaken 4 days after fumigation.
5.2	**Reliability**	Reliability indicator 2: Study conducted in accordance with generally accepted scientific principles, possibly with incomplete reporting or methodological deficiencies, which do not affect the quality of relevant

Section B5.10.2 **Efficacy Data**

Annex Point IIB5.10
TNsG: Pt. I-B5.10, Pt. III-Ch. 6

B5.10.2/07 House longhorn beetle, European house borer, old house borer (H*ylotrupes bajulus*) Powder post beetle (*Lyctus brunneus*) Laboratory studies (Ref. Z7)

		results.
5.3	**Assessment of efficacy, data analysis and interpretation**	High or complete mortality was achieved for *Hylotrupes bajulus* at some of the dosages tested e.g. 1752, 2416, 2575 3162 g-h/m^3. However there was a lack of consistency in the results. The data indicated that eggs of 4 days old were less sensitive to sulfuryl fluoride compared with younger eggs. In view of the variability in the data set it is not possible to establish a dose response for this pest. High mortality of *Lyctus brunneus* was recorded in the untreated controls and it therefore it is not possible to make any meaningful interpretation of the data.
5.4	**Conclusion**	No dose response could be established for eggs of *Hylotrupes bajulus* following fumigation with sulfuryl fluoride at 22^{o}C. It is suggested that fumigation at higher temperatures would enable this to be achieved. Further work is needed on *Lyctus brunneus* to enable a more reliable method of producing eggs to enable those in the untreated controls to remain viable.
5.5	**Proposed efficacy specification**	Proposed efficacy specification not proposed from this study.

Evaluation by Competent Authorities	
	EVALUATION BY RAPPORTEUR MEMBER STATE
Date	October 2004.
Comments	No comments.
Summary and conclusion	Applicant's summary and conclusion is adopted.

1.1 Test organisms - House Longhorn beetle, powder post beetle

Criteria	Details
Family	House long horn beetle – Cerambycidae Powder post beetle – Lycidae
Species	House long horn beetle (also known as old house borer) – *Hylotrupes bajulus* Powder post beetle – *Lyctus brunneus*
Source	<u>*Hylotrupes bajulus* eggs</u> The male and female beetles were placed together into a Petri dish lined with filter paper, mating commenced immediately. Two to 3 hours later the male beetle was removed. Oviposition (egg laying) commenced within the next 24 – 48 hours. <u>*Lyctus brunneus* eggs</u> Two methods to produce eggs were evaluated. <u>Method 1</u> A successful oviposition was achieved on oak sapwood specimens, *Quercus petraea,* in dimensions of 15 mm x 50 mm x 25 mm. The cross-cut ends of the sapwood specimens were dipped in paraffin in order to seal the vessels, thereby forcing the beetles to deposit their eggs on the surface. The wood specimens were placed in a dish lined with filter paper, onto which approx. 30 male and female *Lyctus brunneus* beetles were dropped. The female *Lyctus* beetles used their ovipositor to lay their eggs in the gap between the wood specimen and the filter paper. The subsequent continuous inspection of the specimens had to be conducted with great care, as the necessity to check the eggs deposited underneath the specimens proved somewhat difficult. <u>Method 2</u> The wood specimen tested was English holly, *Ilex aquifolium* . This specimen had the same dimensions as the previous one. In this wood type, the vessels at the cross-cut ends, being extremely small, did not present a problem. The same number of beetles was deposited on the specimen. Here again, *Lyctus brunneus* laid its eggs in the gap between the wood specimen and the filter paper. <u>Comparison of the methods</u> The only difference was in the number of eggs deposited on the individual holly wood specimens. This is attributed to the wood itself, which had been stored in different conditions and thus featured surface discolorations, which were probably responsible for the differences in the egg-laying behavior of the beetles as they fed across the surface. The adult beetles laid fewer eggs on wood that had not been encased during storage, and was subsequently slightly darker in colour as a result of

	being exposed to daylight, than on wood that had been stored in a dark, air-conditioned location. On darker wood specimens, the egg batches comprised 10 to 15 eggs. On wood that had been stored in air-conditioned locations, the batches ranged from 20 to 30 eggs. On both specimens, the eggs were positioned close to the edge and did not extend very far into the crevice. This is explained by the short length of the ovipositor of the *Lyctus brunneus* female beetles. Consequently Method 2 was selected chosen, using holly wood specimens positioned on filter paper in Petri dishes and comprising 30 beetles per sample.
Life stage	Eggs.
Mixed age population	Eggs aged 1 – 5 days old.
Total number of eggs in test	*Hylotrupes bajulus* Eggs Age (days) Number 1 521 2 120 3 119 4 519 *Lyctus brunneus* Eggs Age (days) Number 1 139 2 48 3 75 4 43 5 215

1.2 Test system

Criteria	Details
Test chamber	Fumigation boxes consisting of small plastic containers. Each box was fitted with two plastic tubes in the lid designed to provide a connection to the ambient air or other media.
Number of chambers	Thirteen.
Test insects introduction into chamber	Eggs were introduced into the chambers on Petri dishes lined with filter paper.
Measuring equipment	Concentration of sulfuryl fluoride was measured with a Fumiscope thermal conductivity detector.

1.3 Application of test substance

Criteria	Details
Application procedure	Not available from report.
Delivery method	Sulfuryl fluoride was injected into each box via one of the tubes fitted to the lid.
Dosage rate	*Hylotrupes bajulus* 875 – 3162 CT (concentration x time) g-h/m^3 *Lyctus brunneus* 512 – 650 Ctp (concentration x time product) g-h/m^3

1.4 Test conditions

Criteria	Details
Substrate	Filter paper.
Incubation temperature	22^{o}C.
Moisture	44% relative humidity.

Section B5.10.2 Efficacy Data

Annex Point IIB5.10
TNsG: Pt. I-B5.10, Pt. III-Ch. 6

B5.10.2/08 House longhorn beetle, European house borer, old house borer (H*ylotrupes bajulus*) Laboratory studies (Ref. Z8)

			Official use only
		1 REFERENCE: Z8, B5.10.2/08	
1.1	**Reference**	Ducom, P., Roussel, C., and Stefanini, V. (2003). 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. Efficacy of sulfuryl fluoride on European house borer eggs, *Hylotrupes bajulus* (L.) (Coleoptera: Cerambycida). Contract research project.	
1.2	**Data protection**	Yes.	
1.2.1	Data owner	Dow AgroSciences LLC.	
1.2.2	Companies with letter of Access	Not relevant.	
1.2.3	Criteria for data protection	Data submitted to the MS after 13 May 2000 on existing b.p. for the purpose of its entry into Annex I	
1.3	**Guideline study**	The studies were undertaken on the basis of sound principles of fumigation practice.	
1.4	**Deviations**	Not applicable as the study was not conducted to an international standard method.	
		2 METHOD	
2.1	**Test Substance (Biocidal Product)**	Sulfuryl fluoride	
2.1.1	Trade name/ proposed trade name	Vikane.	
2.1.2	Composition of Product tested	≥ 99.8% Sulfuryl fluoride.	
2.1.3	Physical state and nature	Fumigant.	
2.1.4	Monitoring of active substance concentration	Monitoring was undertaken using a gas chromatograph.	
2.1.5	Method of analysis	Not applicable.	
2.2	**Reference substance**	No reference substance was included in the study.	
2.2.1	Method of analysis for reference substance	Not applicable.	
2.3	**Testing procedure**		

Section B5.10.2 **Efficacy Data**

Annex Point IIB5.10
TNsG: Pt. I-B5.10,
Pt. III-Ch. 6

B5.10.2/08 House longhorn beetle, European house borer, old house borer (H*ylotrupes bajulus*) Laboratory studies (Ref. Z8)

2.3.1	Test population / inoculum / test organism	See Table 1.1.	
2.3.2	Test system	See Table 1.2.	
2.3.3	Application of test substance	See Table 1.3.	
2.3.4	Test conditions	See Table 1.4.	
2.3.5	Exposure time	24 and 48 hours.	
2.3.6	Number of replicates performed	Dose range developed for 24 and 48 hour exposure to sulfuryl fluoride at 20 and 25°C.	X
2.3.7	Controls	One or two controls were included for each dose response determined for each egg age.	
2.4	**Examination**		
2.4.1	Effect investigated	Mortality of eggs of different ages *Hylotrupes bajulus* following exposure to sulfuryl fluoride.	
2.4.2	Method for recording	Examination for egg mortality after fumigation.	
2.4.3	Intervals of examination	Not available from report.	
2.4.4	Statistics	Data was analysed using probit analysis.	
2.4.5	Post fumigation monitoring	The total mortality effect of sulfuryl fluoride on *Hylotrupes. bajulus* eggs was determined after fumigation.	

3 RESULTS

3.1 Efficacy

Temperature 20°C, one day old eggs

With a dosage (Ctp concentration x time product) of 800 g-h/m^3 the mortality of *Hylotrupes bajulus* eggs was higher for an exposure time of 48 hours compared with 24 hours. However, 100% mortality is achieved with each exposure time for one day old eggs at a dosage of 1200 g-h/m^3.

Percentage mortality of one day old eggs of *Hylotrupes bajulus* following exposure to sulfuryl fluoride for 24 and 48 hours at 20°C

24 Hour Exposure			48 Hour Exposure		
Dosage CT g-h/m^3	Egg No.	% Kill	Dosage CT g-h/m^3	Egg No,	% Kill
Untreated	56	7.14	Untreated	57	10.53
Untreated	59	11.86	Untreated	59	3.39
379	51	19.61	419	57	10.53
781	59	27.12	766	58	79.31

793	54	35.19	788	59	91.38
1226	60	100	1242	59	100
1234	50	96	1247	60	100
1635	60	100	1600	59	100
1637	55	100	1621	59	100

Temperature 20°C, two day old eggs

The length of exposure time, 24 and 48 hours did not influence the efficacy of sulfuryl fluoride on two day old eggs. A dosage (CT) of 1200 g-h/m^3 provided complete mortality of two day old eggs for each exposure time.

Percentage mortality of two day old eggs of *Hylotrupes bajulus* following exposure to sulfuryl fluoride for 24 and 48 hours at 20°C

24 Hour Exposure			48 Hour Exposure		
Dosage CT g-h/m^3	Egg No.	% Kill	Dosage CT g-h/m^3	Egg No,	% Kill
Untreated	55	0	Untreated	59	8.5
387	53	18.9	421	60	21.7
449	53	41.5	448	59	16.9
790	51	76.5	812	61	70.5
1256	55	100	846	57	73.7
1658	54	100	1251	62	88.7
			1299	58	100
			1627	60	100

Temperature 20°C, three day old eggs

The length of exposure time, 24 and 48 hours did not influence the efficacy of sulfuryl fluoride on three day old eggs. A dosage (CT) of 1600 g-h/m^3 provided complete mortality of three day old eggs for each exposure time.

Percentage mortality of three day old eggs of *Hylotrupes bajulus* following exposure to sulfuryl fluoride for 24 and 48 hours at 20°C

24 Hour Exposure			48 Hour Exposure		
Dosage CT g-h/m^3	Egg No.	% Kill	Dosage CT g-h/m^3	Egg No,	% Kill
Untreated	53	11.3	Untreated	59	3.4

Untreated	54	5.6	Untreated	56	8.9
387	56	26.8	371	56	10.7
789	55	65.5	756	55	49.1
1220	55	87.3	844	57	52.6
1574	55	100	1155	57	68.4
1614	57	100	1190	54	72.2
			1551	55	100
			1581	57	100

Temperature 20°C, five day old eggs

The length of exposure time, 24 and 48 hours did not influence the efficacy of sulfuryl fluoride on five day old eggs. A dosage (CT) of 1600 g-h/m^3 provided complete mortality of five day old eggs for each exposure time.

Percentage mortality of five day old eggs of *Hylotrupes bajulus* following exposure to sulfuryl fluoride for 24 and 48 hours at 20°C

24 Hour Exposure			48 Hour Exposure		
Dosage CT g-h/m^3	Egg No.	% Kill	Dosage CT g-h/m^3	Egg No,	% Kill
Untreated	55	5.3	Untreated	54	3.7
394	59	11.9	Untreated	54	1.9
770	58	27.6	Untreated	59	3.4
836	54	31.5	407	61	31.3
1237	60	93.3	755	57	33.3
1243	56	98.2	1229	57	84.2
1662	56	100	1732	60	100

Temperature 25°C, two day old eggs

At 25°C the length of exposure time, 24 and 48 hours did not influence the efficacy of sulfuryl fluoride on two day old eggs. A dosage (CT) of 1200 g-h/m^3 provided complete mortality of two day old eggs for each exposure time.

Percentage mortality of two day old eggs of *Hylotrupes bajulus* following exposure to sulfuryl fluoride for 24 and 48 hours at 25°C

24 Hour Exposure			48 Hour Exposure		
Dosage CT g-h/m^3	Egg No.	% Kill	Dosage CT g-h/m^3	Egg No,	% Kill

Untreated	59	10.2	Untreated	57	3.5
198	52	3.9	Untreated	59	17.6
397	59	15.3	252	58	10.3
596	52	5.8	582	56	16.1
787	54	40.7	782	53	15.7
1222	60	100	1191	51	92.2
1612	61	100	1207	55	100
			1534	53	100

Temperature 25°C, five day old eggs

At 25°C the 24 hour exposure time seems to be less effective than the 48 hour exposure time since the dosage achieving complete mortality is 1200 g-h/m^3 and 750 g-h/m^3 respectively.

Percentage mortality of five day old eggs of *Hylotrupes bajulus* following exposure to sulfuryl fluoride for 24 and 48 hours at 25°C

24 Hour Exposure			48 Hour Exposure		
Dosage CT g-h/m^3	Egg No.	% Kill	Dosage CT g-h/m^3	Egg No,	% Kill
Untreated	56	3.6	Untreated	54	1.6
Untreated	56	10.7	Untreated	60	5.0
241	56	21.4	Untreated	55	7.3
459	55	29.1	134	56	16.1
740	60	26.7	309	55	9.1
991	54	27.8	440	56	16.1
1234	54	100	464	58	12.1
			592	57	43.9
			754	57	100

X

Statistical analysis

Comparison of calculated dosage giving 99% mortality (using probit analysis) with dosage observed giving 100% mortality

Treatment[1]	Dosage (CT) Calculated	Dosage (CT) Observed
20°C, d+1, 24h	1285	1200
20°C, d+2, 24h	1379	1200
20°C, d+3, 24h	1927	1600
20°C, d+5, 24h	1402	1600

Section B5.10.2 **Efficacy Data**

Annex Point IIB5.10
TNsG: Pt. I-B5.10, Pt. III-Ch. 6

B5.10.2/08 House longhorn beetle, European house borer, old house borer (H*ylotrupes bajulus*) Laboratory studies (Ref. Z8)

		20°C, d+1, 48h	1214	1200	
		20°C, d+2, 48h	1661	1200	
		20°C, d+3, 48h	2098	1600	
		20°C, d+5, 48h	2755	1600	
		25°C, d+2, 48h	886	1200	X
		25°C, d+2, 48h	1203	1200	
		25°C, d+5, 48h	5388	1600	
		25°C, d+5, 48h	678	1600	

3.1.1 Dose/Efficacy curve

Different levels of susceptibility to sulfuryl fluoride were apparent in *Hylotrupes bajulus* eggs. For examples at 20°C and 24 hours exposure the 3 day old eggs were the most tolerant. Using probit analysis it was calculated that 50% mortality of each egg age would be achieved at follows:

Temperature 20°C, 24 hours exposure

Egg Age (days)	Dosage Needed for 50% Mortality g-h/m^3
1	883
2	531
3	633
5	907

Temperature 20°C, 48 hours exposure

Egg Age (days)	Dosage Needed for 50% Mortality g-h/m^3
1	507
2	686
3	850
5	710

3.1.2 Begin and duration of effects — Not available from report.

3.1.3 Observed effects in the post monitoring phase — No unusual effect observed.

3.2 Effects against — None reported.

	organisms or objects to be protected		
3.3	**Other effects**	None reported.	
3.4	**Efficacy of the reference substance**	No reference substance was used.	
3.5	**Tabular and/or graphical presentation of the summarised results**	See 3.1.	
3.6	**Efficacy limiting factors**		
3.6.1	Occurrences of resistances	None reported.	
3.6.2	Other limiting factors	None reported.	
		4 RELEVANCE OF THE RESULTS COMPARED TO FIELD CONDITIONS	
4.1	**Reasons for laboratory testing**	1. Practical, accurate procedure. 2. Different dosages could be tested.	
4.2	**Intended actual scale of biocide application**	In structures and wooden material infested with the beetles.	
4.3	**Relevance compared to field conditions**		
4.3.1	Application method	The principle of fumigation is to confine a sufficient concentration for a sufficient period of time to enable a toxic dose to be received by the target pest. There are a number of ways in laboratory and field studies to achieve this although the principle is the same.	
4.3.2	Test organism	*Hylotrupes bajulus* eggs used in the study.	
4.3.3	Observed effect	The desired result through fumigation of *Hylotrupes bajulus* is to achieve 100% control, i.e., eradication. Using a range of dosages it was possible to establish dosages which achieved this result.	
4.4	**Relevance for read-across**	The results achieved were not considered to be relevant to read across to other insect species.	
		5 APPLICANT'S SUMMARY AND CONCLUSION	
5.1	**Materials and methods**	A series of laboratory chamber fumigations with sulfuryl fluoride at 2°C and 25°C were undertaken to determine the dosage required to kill eggs of different ages of *Hyloptrupes bajulus*. In these tests different concentrations and exposure times of 24 and 48 hours were used to	X

		establish the dosage (Ctp, concentration x time product) range.
5.2	**Reliability**	Reliability indicator 2: Study conducted in accordance with generally accepted scientific principles, possibly with incomplete reporting or methodological deficiencies, which do not affect the quality of relevant results.
5.3	**Assessment of efficacy, data analysis and interpretation**	High or complete mortality was achieved for *Hylotrupes bajulus* at some of the dosages tested The data indicated that the age of the eggs affected their level of susceptibility to sulfuryl fluoride. At 20^{o}C and 24 hours exposure three day old eggs appeared to be the least susceptible. At 20^{o}C a dosage of 2500 g-h/m^{3} would provide complete mortality for eggs of all ages. In view of the heterogeneous data it was not possible to obtain statistical significant results to define the relative importance of concentration and time in the dosage or the influence of increasing the temperature.
5.4	**Conclusion**	At 20^{o}C and 24 hours exposure sulfuryl fluroride a dosage (CT) of 2500 g-h/m^{3} will achieve complete mortality of *Hylotrupes bajulus* eggs of all ages.
5.5	**Proposed efficacy specification**	Complete mortality (eradication) of *Hylotrupes bajulus* eggs from wood infested material.

Evaluation by Competent Authorities

EVALUATION BY RAPPORTEUR MEMBER STATE

Date October 2004.

Comments The text in field 2.3.6 is wrong and should read: 50-61 eggs were included in each treatment.

Field 3.1: Table headed 'Percentage mortality of five day old eggs of *Hylotruptes bajulus* following exposure to sulfuryl fluoride for 24 and 48 hours at 25 °C' the two last lines (for 48h exposure) are missing, they should read:

Dosage CT	Egg No	% Kill
1164	57	100
1435	52	100

Table headed 'Comparison of calculated dosage giving 99% mortality (using probit analysis) with dosage observed giving 100% mortality' contains some misprints, the last section should read:

Treatment	Dosage (CT) Calculated	Dosage (CT) Observed
25 °C, d+2, 24h	886	1200
25 °C, d+2, 48h	1203	1200
25 °C, d+5, 24h	5388	1200
25 °C, d+5, 48h	678	750

Field 5.1 The temperature given in the first line should be 20 °C (not 2°C)

Summary and conclusion Applicant's version is adopted.

1.1 Test organisms - House Longhorn beetle

Criteria	Details
Family	Cerambycidae.
Species	House long horn beetle (also known as European house borer and old house borer) – *Hylotrupes bajulus*.
Source	Laboratory reared.
Life stage	Eggs.
Mixed age population	Eggs aged 1, 2, 3 and 5 days old.
Total number of eggs in test	Test temperature 20°C Eggs Age (days) / Exposure period (hours) 24 / 48 Egg number 1 / 504 / 527

	2	321	476
	3	385	506
	5	400	402
	Test temperature 25°C		
	Eggs Age (days)	Exposure period (hours)	
		24	48
		Egg number	
	2	397	442
	5	391	618

1.2 Test system

Criteria	Details
Test chamber	Glass jar, one litre in volume maintained in a climate control cabinet.
Number of chambers	Eleven.
Test insects introduction into chamber	Eggs were introduced into the chambers on filter paper.
Measuring equipment	Concentration of sulfuryl fluoride was measured with a gas chromatograph.

1.3 Application of test substance

Criteria	Details
Application procedure	Syringe.
Delivery method	Sulfuryl fluoride was injected into glass jar using a 60 or 140 ml syringe. It was then homogenized with a stirrer.
Dosage rate	Ctp (concentration x time product) range 0 – 1658 g-h/m^3.

1.4 Test conditions

Criteria	Details
Substrate	Filter paper.
Incubation temperature	20°C and 25°C.
Moisture	Not available from report.

Section B5.10.2 **Efficacy Data**

Annex Point IIB5.10
TNsG: Pt. I-B5.10,
Pt. III-Ch. 6

B5.10.2/09 Furniture carpet beetle (*Anthrenus flavipes*) Black carpet beetle (*Attagenus megatoma*) Cigarette beetle (*Lasioderma serricorne*) Hide beetle (*Dermestes maculatus*) Laboratory studies (Ref. Z9)

			Official use only
		1 REFERENCE: Z9, B5.10.2/09	
1.1	**Reference**	Su, N-Y., and Scheffrahn, R.H. (1990). Fort Lauderdale Research and Education Centre, University of Florida, Institute of Food and Agricultural Sciences, Fort Lauderdale, Florida 33314, USA. Efficacy of sulfuryl fluoride against four beetle pests of museums (Coleoptera: Dermestidae, Anobiidae). Journal of Economic Entomology Volume 83, pages 879 – 882.	
1.2	**Data protection**	Not protected.	
1.2.1	Data owner	Data in the public domain in published paper.	
1.2.2	Companies with letter of Access	Not relevant.	
1.2.3	Criteria for data protection	No data protection claimed.	
1.3	**Guideline study**	The studies were undertaken on the basis of sound principles of fumigation practice. The experimental design enabled a robust statistical analysis to be undertaken to ensure high confidence in the data generated.	
1.4	**Deviations**	Not applicable as the study was not conducted to an international standard method.	
		2 METHOD	
2.1	**Test Substance (Biocidal Product)**	Sulfuryl fluoride.	
2.1.1	Trade name/ proposed trade name	Vikane.	
2.1.2	Composition of Product tested	99% Sulfuryl fluoride.	
2.1.3	Physical state and nature	Fumigant.	
2.1.4	Monitoring of active substance concentration	Monitoring was undertaken using a gas chromatograph.	
2.1.5	Method of analysis	Not applicable.	
2.2	**Reference substance**	No reference substance was included in the study.	
2.2.1	Method of analysis for reference	Not applicable.	

	substance	
2.3	**Testing procedure**	
2.3.1	Test population / inoculum / test organism	See Table 1.1.
2.3.2	Test system	See Table 1.2.
2.3.3	Application of test substance	See Table 1.3.
2.3.4	Test conditions	See Table 1.4.
2.3.5	Exposure time	22 hours.
2.3.6	Number of replicates performed	Fifteen to 20 insects included for each treatment.
2.3.7	Controls	One control was included for life stage and species combination.
2.4	**Examination**	
2.4.1	Effect investigated	Mortality of eggs, larvae and adults of *A. flavipes, A. megatoma, L. serricorne,* and *D. maculatus.*
2.4.2	Method for recording	Mortality assessments after fumigation with sulfuryl fluoride.
2.4.3	Intervals of examination	3 – 18 days after fumigation.
2.4.4	Statistics	Data was analysed using probit analysis.
2.4.5	Post fumigation monitoring	The total mortality effect of sulfuryl fluoride on eggs, larvae and adults of *A. flavipes, A. megatoma, L. serricorne*, and *D. maculatus* was determined after fumigation.

3 RESULTS

3.1 Efficacy

Except for *D. maculatus* adults were generally twice as susceptible to sulfuryl as the larvae at LC_{50}. The egg stage is less susceptible to sulfuryl fluoride compared to the larval and adult stage. *A. flavipes* and *A. megatoma* were generally more difficult to kill with sulfuryl fluoride compared with *L. serricorne. D. maculatus* was the most susceptible species. *A. megatoma* eggs were approximately twice as tolerant to sulfuryl fluoride as the egg stage of *A. flavipes*. However, *A. megatoma* adults and larvae were almost two times more susceptible than those of *A. flavipes*.

Section B5.10.2

Annex Point IIB5.10
TNsG: Pt. I-B5.10, Pt. III-Ch. 6

Efficacy Data

B5.10.2/09 Furniture carpet beetle (*Anthrenus flavipes*) Black carpet beetle (*Attagenus megatoma*) Cigarette beetle (*Lasioderma serricorne*) Hide beetle (*Dermestes maculatus*) Laboratory studies (Ref. Z9)

X

Efficacy of sulfuryl fluoride for the control of three life stages of beetle pests

Species[1]	Stage[2]	No[3].	Slope	LC_{50} (95% CL[4])	LC_{99} (95% CL)	PFT[5]
A. fla.	E	228	0.01 ± 0.01	15.97 (13.15 – 18.44)	38.80 (33.79 – 47.25)	18
A. fla.	L	228	0.83 ± 0.13	4.30 (4.30 – 4.54)	7.11 (6.36 – 8.52)	8
A. fla.	A	229	1.86 ± 0.28	2.30 (2.12 – 2.43)	3.55 (3.30 – 4.01)	6
A. meg.	E	164	0.05 ± 0.007	29.93 (25.28 – 34.48)	77.00 (66.04 – 96.05)	18
A. meg.	L	240	2.58 ± 0.45	2.19 (2.03 – 2.30)	3.09 (2.89 – 3.49)	2
A. meg.	A	228	1.94 ± 0.24	0.79 (0.66 – 0.90)	1.98 (1.75 – 2.36)	4
L. ser.	E	231	0.15 ± 0.02	16.90 (15.11 – 18.50)	32.35 (29.20 – 37.37)	8-10
L. ser.	L	240	3.28 ± 0.50	1.83 (1.73 – 1.90)	2.54 (2.40 – 2.79)	3
L. ser.	A	240	3.27 ± 0.38	0.88 (0.81 – 0.94)	1.59 (1.46 – 1.79)	3
D. mac.	E	198	0.15 ± 0.02	19.12 (17.36 – 20.78)	34.93 (31.71 – 39.92)	5
D. mac.	L	240	3.86 ± 0.47	0.67 (0.60 – 0.74)	1.27 (1.14 – 1.47)	6
D. mac	A	228	3.76 ± 0.53	0.68 (0.59 – 0.77)	1.30 (1.14 – 1.60)	3

[1]A. fla. = *Anthrenus flavipes*, A. meg. = *Attagenus megatoma*, L. ser. = *Lasioderma serricorne*, D. mac. = *Dermestes maculatus*.

[2]E = Egg, L = Larva, A = Adult.

[3]No. = Number of insects excluding control.

[4]LD = Lethal concentration, CL = Confidence limits.

Section B5.10.2 **Efficacy Data**

Annex Point IIB5.10
TNsG: Pt. I-B5.10, Pt. III-Ch. 6

B5.10.2/09 Furniture carpet beetle (*Anthrenus flavipes*)
Black carpet beetle (*Attagenus megatoma*)
Cigarette beetle (*Lasioderma serricorne*)
Hide beetle (*Dermestes maculatus*)
Laboratory studies (Ref. Z9)

[5]PFT = Period after fumigation time in days when no further mortality for larvae and adults occurred or when no egg hatching was observed.

Dosage (CT, concentration x time) of sulfuryl fluoride required to achieve 50 and 99% control of three life stages of beetle pests at 26.5 ± 0.5°C.

Species	Stage	Dosage (CT) g-h/m^3	
		50%	99%
Anthrenus flavipes	Egg	351.3	853.6
	Larva	94.6	156.4
	Adult	50.6	78.1
Attagenus megatoma	Egg	658.5	1694.0
	Larva	48.2	68.0
	Adult	17.4	43.6
Lasioderma serricorne	Egg	371.8	711.7
	Larva	40.3	55.9
	Adult	19.4	35.0
Dermestes maculatus	Egg	420.6	768.5
	Larva	14.7	27.9
	Adult	15.0	28.6

3.1.1	Dose/Efficacy curve	See Efficacy Results above for 50% and 99% control.
3.1.2	Begin and duration of effects	Ranged from 3 – 18 days.
3.1.3	Observed effects in the post monitoring phase	No unusual effect observed.
3.2	**Effects against organisms or objects to be protected**	None reported.
3.3	**Other effects**	None reported.
3.4	**Efficacy of the reference substance**	No reference substance was used.
3.5	**Tabular and/or graphical presentation of the summarised**	See 3.1.

	results	
3.6	**Efficacy limiting factors**	
3.6.1	Occurrences of resistances	None reported.
3.6.2	Other limiting factors	None reported.
		4 RELEVANCE OF THE RESULTS COMPARED TO FIELD CONDITIONS
4.1	**Reasons for laboratory testing**	1. Practical, accurate procedure. 2. Different dosages could be tested.
4.2	**Intended actual scale of biocide application**	In structures and wooden material infested with the beetles. These beetle pests are of particular importance in museums.
4.3	**Relevance compared to field conditions**	
4.3.1	Application method	The principle of fumigation is to confine a sufficient concentration for a sufficient period of time to enable a toxic dose to be received by the target pest. There are a number of ways in laboratory and field studies to achieve this although the principle is the same.
4.3.2	Test organism	Furniture carpet beetle (*Anthrenus flavipes*) Black carpet beetle (*Attagenus megatoma*) Cigarette beetle (*Lasioderma serricorne*) Hide beetle (*Dermestes maculatus*)
4.3.3	Observed effect	**The desired result through fumigation *Anthrenus flavipes, Attagenus megatoma, Lasioderma serricorne* and *Dermestes maculatus* is to achieve 100% control, i.e., eradication. Using a range of dosages it was possible to establish dosages which achieved this result.**
4.4	**Relevance for read-across**	The results achieved were considered to be relevant to other beetle insect species.
		5 APPLICANT'S SUMMARY AND CONCLUSION
5.1	**Materials and methods**	The efficacy of sulfuryl fluoride against eggs, larvae and adults of Anthrenus flavipes, Attagenus megatoma, Lasioderma serricorne and Dermestes maculatus was determined. Eggs at least 48 hours and adults 7 – 14 days. Larvae 6 – 9 months, 1 month and two months for A. flavipes, A. megatoma, L. serricorne and D. maculatus respectively. Fifteen to 20 insects were prepared in each stage-species combinations for exposure to 12 sulfuryl fluoride concentrations and one control. The insects were exposed to sulfuryl fluoride contained in glass desiccators at a range of concentrations for 22 hours at 26.5 ± 0.5°C. After

Section B5.10.2 **Efficacy Data**

Annex Point IIB5.10
TNsG: Pt. I-B5.10, Pt. III-Ch. 6

B5.10.2/09 Furniture carpet beetle (*Anthrenus flavipes*)
Black carpet beetle (*Attagenus megatoma*)
Cigarette beetle (*Lasioderma serricorne*)
Hide beetle (*Dermestes maculatus*)
Laboratory studies (Ref. Z9)

		fumigation daily assessments for larvae and pupae mortality and egg hatch was recorded until no further changes occurred.
5.2	**Reliability**	Reliability indicator 2: Study conducted in accordance with generally accepted scientific principles, possibly with incomplete reporting or methodological deficiencies, which do not affect the quality of relevant results.
5.3	**Assessment of efficacy, data analysis and interpretation**	Larvae and adults of *A. flavipes*, *A. megatoma*, *L. serricorne* and *D. maculatus* were more susceptible to sulfuryl fluoride compared to the egg stage. The egg stage is more tolerant probably because of its lower permeability potential and uptake of the fumigant by epiembryonic tissues, especially the chorion. *A. flavipes* and *A. megatoma* were generally more difficult to kill with sulfuryl fluoride compared with *L. serricorne. D. maculatus* was the most susceptible species. The reason for its higher susceptibility was probably because it is the most mobile and thus absorbed more fumigant than the other species. *A. megatoma* eggs were approximately twice as tolerant to sulfuryl fluoride as the egg stage of *A. flavipes*. However, *A. megatoma* adults and larvae were almost two times more susceptible than those of *A. flavipes*.
5.4	**Conclusion**	Total control of eggs, larvae and adults of *A. flavipes*, *A. megatoma*, *L. serricorne* and *D. maculatus* can be achieved with sulfuryl fluoride at 26°C The dosage required to achieve total control is higher for eggs compared to the other life stages. For post embryonic stages a dosage (CT, concentration x time) of 200 g-h/m^3 would provide total control whilst a X 10 egg rate, i.e. 2000 g-h/m^3 would be needed.
5.5	**Proposed efficacy specification**	Complete mortality (eradication) of eggs, larvae and adults *A. flavipes, A. megatoma, L. serricorne* and *D. maculatus*.

Evaluation by Competent Authorities

EVALUATION BY RAPPORTEUR MEMBER STATE

Date	October 2004.
Comments	Field 3.1 The unit for the LC_{50} and LC_{99} values given in the table should be in g/m^3.
Summary and conclusion	Applicant's version is adopted.

1.1 Test organisms - House Longhorn beetle

Criteria	Details
Family	Dermestidae. Anobiidae.
Species	Furniture carpet beetle (*Anthrenus flavipes*). Black carpet beetle (*Attagenus megatoma*). Cigarette beetle (*Lasioderma serricorne*). Hide beetle (*Dermestes maculatus*).
Source	*A. flavipes* and *A. megatoma* obtained from the Entomology Department, University of California, Riverside, USA. *L. serricorne* and *D. maculatus* were collected from the Florida State Museum, Gainesville, USA.
Life stage	Eggs, larvae and adults.
Insect age	Eggs at least 48 hours and adults 7 – 14 days. Larvae 6 – 9 months, 1 month and two months for *A. flavipes*, *A. megatoma*, *L. serricorne* and *D. maculatus* respectively.
Total number in test	Fifteen to 20 insects were prepared in each stage-species combinations for exposure to 12 sulfuryl fluoride concentrations and one control.

1.2 Test system

Criteria	Details
Test chamber	Grease sealed 9 litre glass desiccator fumitorium fitted with septa mounted injection ports.
Number of chambers	Twelve.
Test insects introduction into chamber	All insects were placed in metal cages during the fumigation. The cages consisted of circular canisters (6.0 cm diameter, 1.9 cm high) capped snugly with a cover of 0.9 cm deep. A 6 cm^2 opening was made in the cover and a 60-mesh metal screen was attached to allow free diffusion of sulfuryl fluoride.
Measuring equipment	Concentration of sulfuryl fluoride was measured with a gas chromatograph.

1.3 Application of test substance

Criteria	Details
Application procedure	Syringe.
Delivery method	Sulfuryl fluoride was introduced to the fumigatoria with gas tight syringes of appropriate volume.
Dosage rate	Fumigation was completed for 22 hours at the following concentration ranges Stage A. fla. A. meg. L. ser. D. mac. Egg 5 – 60 5 – 60 9 – 42 6 – 39 Larva 3 – 5.2 2 – 4.2 1.7 – 2.8 0.15 – 39 Adult 2 – 4.2 0.2 –2.4 0.5 – 1.6 0.1 – 1.2

1.4 Test conditions

Criteria	Details
Substrate	A piece of filter paper (4.25 cm diameter) was placed in the cage on which a small amount of dried beef and a thin layer of flour were placed for *D. maculatus* and *L. serricorne* respectively. Chicken feathers and finely ground cat food were provided for A. *megatoma* and *A. flavipes* adults and larvae during and after fumigation. Eggs were placed on double sided sticky tape attached to a microscope slide cover slip. For *D. maculatus* eggs, a dried piece of dried beef wrapped in cotton wool was attached to the centre of the tape. In the absence of food, newly emerged *D. maculatus* larvae cannibalised the unhatched eggs. No medium was provided for eggs other coleopterans because the sticky tape effectively trapped the emerging larvae.
Incubation temperature	26.5 ± 0.5°C.
Moisture	Not available from report.

Section B5.10.2 Efficacy Data

Annex Point IIB5.10
TNsG: Pt. I-B5.10, Pt. III-Ch. 6

B5.10.2/10 Powderpost beetle (*Lyctus brunneus*) Anobiid beetle (*Euvrilletta peltata* formerly *Xyletinus peltatus*) Field studies (Ref. Z10)

			Official use only
		1 REFERENCE: Z10, B5.10.2/10	
1.1	**Reference**	[1]William, L.H., and [2]Sprenkel, R.J. (1990). [1]Southern Forest Experiment Station, United States Department of Agriculture Forestry Service, Box 2008, GMF Gulfport, Mississippi, USA. [2]Field Technical Service, Agricultural Products, DowElanco, Atlanta, Georgia, 30346, USA. Ovicidal activity of sulfuryl fluoride to Anobiid and Lyctid beetle eggs of various ages. Journal of Entomological Science, Volume 25(3), pages 366 - 375.	
1.2	**Data protection**	Not protected.	
1.2.1	Data owner	Data in the public domain in published paper.	
1.2.2	Companies with letter of Access	Not relevant.	
1.2.3	Criteria for data protection	No data protection claimed.	
1.3	**Guideline study**	The studies were undertaken on the basis of sound principles of fumigation practice.	
1.4	**Deviations**	Not applicable as the study was not conducted to an international standard method.	
		2 METHOD	
2.1	**Test Substance (Biocidal Product)**	Sulfuryl fluoride.	
2.1.1	Trade name/ proposed trade name	Vikane.	
2.1.2	Composition of Product tested	Sulfuryl fluoride.	
2.1.3	Physical state and nature	Fumigant.	
2.1.4	Monitoring of active substance concentration	Monitoring was undertaken using a Fumiscope gas analyser.	
2.1.5	Method of analysis	Not applicable.	
2.2	**Reference substance**	No reference substance was included in the study.	
2.2.1	Method of analysis for reference	Not applicable.	

	substance	
2.3	**Testing procedure**	
2.3.1	Test population / inoculum / test organism	See Table 1.1.
2.3.2	Test system	See Table 1.2.
2.3.3	Application of test substance	See Table 1.3.
2.3.4	Test conditions	See Table 1.4.
2.3.5	Exposure time	6.5, 16 and 18 hours.
2.3.6	Number of replicates performed	*E. peltata* 6 replicates for each fumigation. *L. brunneus* 3 replicates for each fumigation.
2.3.7	Controls	One control was included for each species and for each egg age combination.
2.4	**Examination**	
2.4.1	Effect investigated	Mortality after fumigation with sulfuryl fluoride.
2.4.2	Method for recording	Failure to hatch or develop embryo. For the Lyctid test units were examined 10 days eggs were laid because hatching should occur within 7 – 10 days at the conditions at which the controls were stored. Eggs beneath the glass were examined first with a microscope. Then the paraffin sealed eggs were separated so eggs on the inner surfaces of each wood wafer could be examined. Mortality of control eggs was determined by counting eclosed larvae. Because many eggs contained developing embryos that may have survived, this evaluation procedure provided a conservative estimate for comparison with survival in treated test units. Survival of larvae could not be determined because the test units were destroyed as they were examined. First instar anobid larvae bored into the wood directly beneath the egg without moving the shell; thus, egg shells ruptured carefully with a needle to determine if fumigation arrested development of the embryo. Developing embryos may have been injured by rupturing the egg shell, particularly when eggs were deep with the cracks; therefore two evaluations procedures were used for confirmation of mortality. Contents of half of the eggs on each test block were examined after 14 days for developing live larvae by rupturing egg shells. Blocks bearing the remaining eggs were stored for 10 months at 25 ± 2.0°C and 60 – 70% relative humidity and then x-rayed to count the developing larvae

within wood.

2.4.3 Intervals of examination — See 2.4.2.

2.4.4 Statistics — Mean percentage survival for eggs aged 1 – 7 days was determined.

2.4.5 Post fumigation monitoring — See 2.4.2.

3 RESULTS

3.1 Efficacy

Lyctus brunneus eggs

At the lower dosages tested, 289 and 470 g-h/m^3, some survival of eggs of 1 and 2 days old was recorded compared with all other old eggs where 100% mortality was recorded. Total mortality was recorded for all egg ages at the higher dosages of 1120 and 1900 g-h/m^3.

Mean percentage survival of 1 – 7 day old *Lyctus brunneus* eggs following fumigation with sulfuryl fluoride.

Dosage	Mean percentage survival of eggs aged 1 – 7 days[1]							
g-h/m^3	7	6	5	4	3	2	1	All Ages
289	0.0	0.0	0.0	0.0	0.0	70.2	11.1	11.6
470	0.0	0.0	0.0	0.0	0.0	24.7	2.3	3.9
1120	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1900	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Untreated	49.5	78.7	46.9	49.2	74.8	93.0	61.9	54.6

Eurilletta peltata eggs

At the lower dosages tested, 289 and 470 g-h/m^3, some survival of eggs of 2, 3 and 4 was recorded. A low level of survival was also recorded for 5 day old eggs following at 289 g-h/m^3. Total mortality was for all other egg ages. No survival of all egg ages at the higher dosages of 1120 and 1900 g-h/m^3 observed by egg hatch or by x-ray determination of developing larvae.

Mean percentage survival of 1 – 7 day old *Euvrilletta peltata* eggs following fumigation with sulfuryl fluoride.

Dosage	Mean percentage survival of eggs aged 1 – 7 days[1]							
g-h/m^3	7	6	5	4	3	2	1	All Ages
289	6.0	0.0	7.6	15.0	8.7	7.4	0.0	6.4
470	0.0	0.0	0.0	15.2	31.7	15.8	0.0	9.0
1120	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1900	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Untreated	78.9	97.9	65.0	100.0	100.0	100.0	-	91.8

Mean percentage survival of 1 – 7 day old *Euvrilletta peltata* eggs following fumigation with sulfuryl fluoride as determined by x-ray examination for developing larvae 10 months later.

Dosage	Mean percentage survival of eggs aged 1 – 7 days[1]							
g-h/m^3	7	6	5	4	3	2	1	All Ages
289	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
470	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1120	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1900	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Untreated	20.0	88.9	41.6	36.6	69.4	56.4	48.7	51.6

3.1.1	Dose/Efficacy curve	For *L. brunneus* eggs of all ages, 1 – 7 days old, sulfuryl fluoride dosages of 289, 470 and 1120 g-h/m^3 achieved 88.4, 96.1 and 100% control respectively. For *E. peltata* eggs of all ages, 1 – 7 days old, sulfuryl fluoride dosages of 289, 470 and 1120 g-h/m^3 achieved 93.6, 91.0 and 100% control respectively.
3.1.2	Begin and duration of effects	Mortality effects assessed after fumigation.
3.1.3	Observed effects in the post monitoring phase	No unusual effect observed.
3.2	**Effects against organisms or objects to be protected**	None reported.
3.3	**Other effects**	None reported.
3.4	**Efficacy of the reference substance**	No reference substance was used.
3.5	**Tabular and/or graphical presentation of the summarised results**	See 3.1.
3.6	**Efficacy limiting factors**	
3.6.1	Occurrences of resistances	None reported.
3.6.2	Other limiting	None reported.

	factors		
		4 RELEVANCE OF THE RESULTS COMPARED TO FIELD CONDITIONS	
4.1	**Reasons for laboratory testing**	Field study undertaken.	
4.2	**Intended actual scale of biocide application**	In structures and wooden material infested with the beetles.	
4.3	**Relevance compared to field conditions**		
4.3.1	Application method	The principle of fumigation is to confine a sufficient concentration for a sufficient period of time to enable a toxic dose to be received by the target pest. There are a number of ways in laboratory and field studies to achieve this although the principle is the same.	
4.3.2	Test organism	Powderpost beetle (*Lyctus brunneus*) Anobiid beetle (*Euvrilletta peltata* formerly *Xyletinus peltatus*)	
4.3.3	Observed effect	The desired result through fumigation of eggs of *L. brunneus* and *E. peltata* is to achieve 100% control, i.e., eradication. Using a range of dosages it was possible to establish dosages which achieved this result.	
4.4	**Relevance for read-across**	Data considered to be relevant for powder post beetles and anobiids.	
		5 APPLICANT'S SUMMARY AND CONCLUSION	
5.1	**Materials and methods**	Eggs of 1-7 day old of *Lyctus brunneus* and *Euvrilletta peltata* were fumigated with sulfuryl fluoride under field conditions. The test building was a vacant three bedroom house covered with polyethylene sheeting. Fans were used to introduce sulfuryl fluoride. Beetle eggs were obtained from laboratory insects and introduced into the house in wooden test units at various locations. The ovicidal activity of the fumigant was tested by exposing the eggs to dosages of 289, 470 1120 and 1900 g-h/m^3 at 22.2^{o}C. Four tests were completed with exposure periods of 6.5, 16 and 19 hours. Fumigant concentration was measured with a Fumiscope gas analyser. After fumigation mortality assessment was completed by examination for egg hatch and larval development.	X
5.2	**Reliability**	Reliability indicator 2: Study conducted in accordance with generally accepted scientific principles, possibly with incomplete reporting or methodological deficiencies, which do not affect the quality of relevant results.	
5.3	**Assessment of efficacy, data**	The results of this study suggests that eggs of *L. brunneus* beetles that have been laid 48 to 72 hours before fumigation and eggs of *E. peltata*	

Section B5.10.2 **Efficacy Data**

Annex Point IIB5.10
TNsG: Pt. I-B5.10, Pt. III-Ch. 6

B5.10.2/10 Powderpost beetle (*Lyctus brunneus*) Anobiid beetle (*Euvrilletta peltata* formerly *Xyletinus peltatus*) Field studies (Ref. Z10)

	analysis and interpretation	that have been laid < 4 days before fumigation are the respective ages most tolerant to sulfuryl fluoride. This difference in ages of tolerant anobiid and lyctid eggs is probably due to the longer time required for the formation of embryos in anobiid eggs. Control of most eggs of both species at the lower rate of 289 g-h/m^3 suggests that the toxic activity of sulfuryl fluoride might occur quickly for beetles. The quick action of sulfuryl fluoride appears particularly true for anobiid eggs based on results obtained by rupturing egg shells. Because anobiid beetles produce only one generation per year there is an alternative strategy to using the high rates necessary to achieve complete kill of the more tolerant eggs that may only represent a small percentage of the population. Fumigations could be done before or after the period when anobiid adults are likely to be emerging and laying eggs normally early spring and late summer. This would mean lower dosages could be used as the most tolerant egg stage would be absent.
5.4	**Conclusion**	Total control of eggs of *L. brunneus* and *E. peltata* can be achieved with sulfuryl fluoride at 22.2°C The dosage tested which achieved total mortality of eggs of 1 - 7 days old of these species was 1120 g-h/m^3.
5.5	**Proposed efficacy specification**	Complete mortality (eradication) of powdery post and Lyctid beetles eggs.

Evaluation by Competent Authorities	
	EVALUATION BY RAPPORTEUR MEMBER STATE
Date	October 2004.
Comments	Field 5.1 The sentence should read: Four tests were completed with exposure periods of 6.5, 16 and 18 hours.
Summary and conclusion	Applicant's summary and conclusion is adopted.

1.1 Test organisms - Anobiid beetle (*Euvilletta peltata*), powder post beetle (*Lyctus brunneus*).

Criteria	Details
Family	Anobiidae. Lycidae
Species	Anobiid beetle - *Euvilletta peltata.* Powder post beetle - *Lyctus brunneus*.
Source	Laboratory reared.
Life stage	Eggs.
Egg age	1 – 7 days old.
Total number in test	*E. peltata* Test 1: 1455

	Test 2: 1638 *L. brunneus* 2553

1.2 Test system

Criteria	Details
Test chamber	The test building was a vacant three bedroom house with a crawl space and partial basement on the Harrison Experimental Forest of the Southern Forest Experiment Station located 48.3 km north of Gulfport, Mississippi, USA. The building was covered with a 6 - mil clear polyethylene plastic and all seams were sealed with clamps and duct tape. After soaking the perimeter soil with water a ground seal (cover – to ground juncture) was created by placing the rolled ends of the tent in a trench and covering the plastic with wet sand continuously around the structure.
Number of chambers	One.
Test insects introduction into chamber	*E. peltata* Cages containing the eggs were placed at 6 locations within the house. *L. brunneus* Cages containing the eggs were placed at 3 locations within the house. Controls Controls were brought to the fumigation site and stored in a nearby building.
Measuring equipment	Concentration of sulfuryl fluoride was measured with a Fumiscope gas analyser.

1.3 Application of test substance

Criteria	Details
Application procedure	See delivery method.
Delivery method	Sulfuryl fluoride was introduced into the basement and kitchen hallway and rapidly distributed throughout the structure with the use of fans.
Dosage rate	A 'slide rule' calculator Fumiguide B was used to estimate how well the structure confined the gas. This dosage calculation is used to compensate for field variations when instruments are not used to monitor and confirm HLT (half loss time – time taken in hours to lose 50% concentration). The actual accumulated dosages (CT concentration x time) evaluated in four fumigations were 289, 470, 1,120 and 1900 g-h/m^3.

1.4 Test conditions

Criteria	Details
Substrate	*E. peltata* Sanded yellow popular (*Liriodendron tulipifera*) sapwood blocks measuring 12.7 x 51.0 x 76 mm were nutrient treated and dried. Approximately 125 egg laying sites were impressed on each tangential surface of each block with a 44.5 mm diameter metal cut flower holder. A plastic spacer ring exposed only the points of the metal tines. From 2 – 10 laboratory adults beetles were confined over the egg laying sites in an inverted hollow polyethylene stopper held in place with a rubber band. A 32 mesh copper screen fused in place of the stopper bottom allowed air movement into the unit. *L. brunneus* Yellow poplar wood wafers, 3.2 mm thick and the same size as microscope slides, containing pores too small for insertion of eggs were soaked in 3.0% starch solution to make them attractive to egg laying female beetles and then dried . Two starch soaked wafers were sealed between two glass microscope slides by dipping each end of the 'sandwich' in melted paraffin. Individual test units were confined with 5 – 40 adults in Pyrex storage jars containing a layer of plaster of paris on the bottom as a foothold for crawling beetles. Both species of beetles were placed on new test units every 24 hours until sufficient test units with eggs aged 1 – 7 days old were obtained for each of four fumigations. After 24 hours the beetles were removed and units with eggs were marked with the day's date as '0' day. Each age, day 1 to day 7, represents 48 hours; therefore, day 1 is 1 – 2 day old eggs, day 2 is 2 – 3 day old eggs etc.
Incubation temperature	Fumigation temperature: 22.2^{o}C. Before and after fumigation all egg test units and comparable controls were stored at 25 ± 2.0^{o}C.
Moisture	Before and after fumigation all egg test units and comparable controls were stored at 60 – 70% relative humidity.

Section B5.10.2 Efficacy Data

Annex Point IIB5.10
TNsG: Pt. I-B5.10, Pt. III-Ch. 6

B5.10.2/11 Anobium punctatum Laboratory study (Ref. Z11)

			Official use only
		1 REFERENCE: Z11, B5.10.2/11	
1.1	**Reference**	[1]Binker, G., [1]Binker, J., [1]Fröba G., [2]Graf, E. and [2]Lanz, B (1995). [1]Binker Materialschutz GmbH, Westendstr. 3, D-91207 Lauf, Germany [2]EMPA, Swiss Federal Laboratories for Materials Testing and Research Lerchenfeldstr. 5, CH-9014 St. Gallen, Switzerland. Laboratory study on *Anobium punctatum* Number: 121641.	
1.2	**Data protection**	Yes.	
1.2.1	Data owner	Dow AgroSciences LLC.	
1.2.2	Companies with letter of Access	None.	
1.2.3	Criteria for data protection	Data submitted to the MS after 13 May 2000 on existing b.p.for the purpose of its entry into Annex I	
1.3	**Guideline study**	The study was undertaken on the basis of sound principles of fumigation practice.	
1.4	**Deviations**	Not applicable as the study not conducted to an international standard method.	
		2 METHOD	
2.1	**Test Substance (Biocidal Product)**	Sulfuryl fluoride.	
2.1.1	Trade name/ proposed trade name	Vikane.	
2.1.2	Composition of Product tested	> 99% Sulfuryl fluoride.	
2.1.3	Physical state and nature	Fumigant.	
2.1.4	Monitoring of active substance concentration	Monitoring was undertaken using a Fumiscope gas analyser.	
2.1.5	Method of analysis	Not applicable.	
2.2	**Reference substance**	No reference substance was included in the study.	
2.2.1	Method of analysis for reference substance	Not applicable.	
2.3	**Testing procedure**		
2.3.1	Test population / inoculum / test organism	See Table 1.1.	

Section B5.10.2 Efficacy Data

Annex Point IIB5.10
TNsG: Pt. I-B5.10, Pt. III-Ch. 6

B5.10.2/11 Anobium punctatum Laboratory study (Ref. Z11)

2.3.2	Test system	See Table 1.2.	
2.3.3	Application of TS	See Table 1.3.	
2.3.4	Test conditions	See Table 1.4.	
2.3.5	Duration of the test / Exposure time	85 hours and 15 minutes.	
2.3.6	Number of replicates performed	One.	
2.3.7	Controls	Untreated controls were included; these were kept and stored under the same conditions as the treated eggs of *A. punctatum*.	X
2.4	**Examination**		
2.4.1	Effect investigated	Lethal accumulated dosage (LAD) expressed as g-h/m^3. The LAD was determined 114 days after treatment.	
2.4.2	Method for recording / scoring of the effect	Egg mortality by examination (count) of larvae hatched from treated eggs 114 days after treatment.	
2.4.3	Intervals of examination	Larvae hatched from treated eggs 114 days after treatment.	
2.4.4	Statistics	Post fumigation mean total mortality was calculated by dividing the number of dead eggs by the total number of treated eggs 114 days after treatment.	
2.4.5	Post fumigation monitoring of the test organism	The total mortality-effect of sufuryl fluoride on eggs was determined 114 days after fumigation.	
		3 RESULTS	
3.1	**Efficacy**	The percentage mortality was calculated by dividing the total number of hatched and surviving larvae by the total number of treated eggs.	X

Percentage mortality of eggs of *Anobium punctatum* 114 days after exposure to sulfuryl fluoride

A	Untreated Control			
No.	Eggs	Larvae hatched	Larvae penetrated	Dead larvae
1	95	54	54	0
2	40	27	27	0
3	299	257	257	0
4	67	52	52	0
5	77	53	53	0
6	44	10	10	0
8	36	11	11	0
9	227	158	158	0
10	54	30	30	0
total	939	652	652	0

Total mortality of untreated eggs: 30.56%

B	Treated eggs			
No.	Eggs	Larvae hatched	Larvae penetrated	Dead larvae
11	139	35	29	6
12	82	28	17	11
13	169	15	15	0
14	45	13	11	2
15	166	12	12	0
16	67	23	19	4
17	122	15	15	0
18	98	5	5	0
19	40	13	11	2
20	158	12	11	1
21	56	1	0	1
22	20	4	2	2
23	79	12	8	4
24	139	40	40	0
25	83	11	11	0
26	91	10	4	6
27	87	19	13	6
28	112	22	20	2
29	49	8	6	2
30	156	62	57	5
31	118	25	18	7
32	59	26	20	6
33	157	42	38	4
34	173	47	47	0
35	94	36	35	1
36	109	40	31	9
37	101	5	4	1
38	144	27	22	5
39	58	4	4	0
40	82	4	2	2
41	112	16	2	0
42	38	8	3	0
43	181	17	5	0
44	194	43	40	3
45	81	24	24	0
46	98	27	26	1
47	153	25	23	2
48	67	8	8	0
49	122	17	17	0
50	79	21	10	11
51	73	55	55	0
52	103	90	90	0
53	125	117	117	0
54	54	47	47	0
55	57	56	56	0
56	63	48	48	0
57	129	117	117	0
58	108	99	99	0
59	108	88	88	0
60	144	112	112	0
total	5142	1651	1514	106

Total mortality of treated eggs: 69.95%

Section B5.10.2 Efficacy Data

Annex Point IIB5.10
TNsG: Pt. I-B5.10, Pt. III-Ch. 6

B5.10.2/11 Anobium punctatum Laboratory study (Ref. Z11)

3.1.1	Dose/Efficacy curve	Not available from report.
3.1.2	Begin and duration of effects	The mortality of 69.96 % was achieved 114 days after treatment.
3.1.3	Observed effects in the post monitoring phase	No unusual effect observed.
3.2	**Effects against organisms or objects to be protected**	None reported.
3.3	**Other effects**	None reported.
3.4	**Efficacy of the reference substance**	No reference substance was used.
3.5	**Tabular and/or graphical presentation of the summarised results**	See 3.1
3.6	**Efficacy limiting factors**	
3.6.1	Occurrences of resistances	None reported
3.6.2	Other limiting factors	None reported
		4 RELEVANCE OF THE RESULTS COMPARED TO FIELD CONDITIONS
4.1	**Reasons for laboratory testing**	1 Precise conditions could be determined. 2 Practical, accurate procedure. Data generated is considered relevant for field of use, test insects obtained from the field.
4.2	**Intended actual scale of biocide application**	Not applicable.
4.3	**Relevance compared to field conditions**	
4.3.1	Application method	The principle of fumigation is to confine a sufficient concentration for a sufficient period of time to enable a toxic dose to be received by the target pest. There are a number of ways in laboratory and field studies

		to achieve this although the principle is the same.
4.3.2	Test organism	There are different life stages of *Anobium punctatum.* Eggs are considered to be the stage which would require a higher dose of sulfuryl fluoride compared to the other stages.
4.3.3	Observed effect	The limited mortality effect, recorded in the laboratory test is too low to achieve complete control of eggs under field conditions, but nevertheless it is important to determine sub-lethal dose rates for precise definition of LAD.
4.4	**Relevance for read-across**	Not applicable.

5 APPLICANT'S SUMMARY AND CONCLUSION

5.1	**Materials and methods**	Eggs of *Anobium punctatum* were fumigated with sulfuryl fluoride for 85 hours and 15 minutes at 24 ^{o}C and 50 % relative humidity in laboratory fumitoria. Bioassays from laboratory population according to EN 49.1 (1992) ("Holzschutzmittel - Bestimmung der vorbeugenden Wirkung gegenüber Anobium punctatum (De Geer) durch Beobachten der Eiablage und des Überlebens von Larven - Teil 1: Oberflächen-behandlung (Laboratoriumsverfahren)") were tested to determine LAD. Fumigant concentration was measured using a Fumiscope gas-analyser. Mortality was evaluated 114 days after treatment.
5.2	**Reliability**	Reliability indicator 2: Study conducted in accordance with generally accepted scientific principles, possibly with incomplete reporting or methodological deficiencies, which do not affect the quality of relevant results.
5.3	**Assessment of efficacy, data analysis and interpretation**	The result of this investigation demonstrates that under the described conditions complete control of *A. punctatum* eggs was not achieved. Additional trials need to be undertaken to determine the dosage required for complete mortality of this life stage.
5.4	**Conclusion**	There are different life stages of *A. punctatum* present in infested wooden structures. The laboratory fumigation test undertaken was considered to be a valid and effective procedure for evaluating the efficacy of sulfuryl fluoride on the eggs of *A. punctatum*. Since the insect egg stage is known to be less susceptible to sulfuryl fluoride it is necessary to evaluate the required higher fumigant dose rate to achieve 100 % LAD to control this life stage.
5.5	**Proposed efficacy specification**	Total control – (not achieved in this study).

Evaluation by Competent Authorities

EVALUATION BY RAPPORTEUR MEMBER STATE

Date	October 2004.
Comments	Field 2.3.7, The following is a revised version of the present entry: The untreated controls and treated eggs were kept and stored under the same incubation conditions before and after the test fumigations. These incubation conditions were: temperature 20 C , 75% relative humidity. The conditions during fumigation is given in Table 1.4 with the untreated controls remaining under incubation conditions of 20 °C , 75% relative humidity. Field 3.1: Within the body of each table the numbers are counts and not percentages (as stated in the table legend above the table). For clarification: Total mortality of treated eggs were calculated according: No of total eggs – (no of larvae hatched – dead larvae) / no of total eggs i.e. 5142-(1651-106)/5142*100 = 69.95%
Summary and conclusion	Applicant's version is acceptable.

1.1 Test organism - *Anobium puntatum*

Criteria	Details
Family	Anobiidae.
Species	*Anobium punctatum.*
Source	Laboratory population according to EN 49.1 (1992) ("Holzschutzmittel - Bestimmung der vorbeugenden Wirkung gegenüber Anobium punctatum (De Geer) durch Beobachten der Eiablage und des Überlebens von Larven - Teil 1: Oberflächenbehandlung (Laboratoriumsverfahren)").
Life stage	Eggs.
Mixed age population	Not applicable.
Number of eggs in test	5142.

1.2 Test system

Criteria	Details
Test chamber	Fumitoria (fumigation chambers) aluminium, 3 x 2 x 2 m = 12 m³, gas introduction via polyamide (PA) - lines 6 mm external diameter/4 mm internal diameter, gas monitoring via separate PA-lines 6 mm external diameter/4 mm internal diameter.
Test insects introduction into chamber	In totally 5142 eggs on fifty boards of pine-wood (*Pinus silvestris* L.), ca. 100x40x10 mm according to EMPA ("Für Insektenversuche darf nur Kiefernsplintholz, gerade gewachsen, ohne Äste und arm an Harz verwendet werden. Mittleres Wachstum von 2.5-8 Jahrringe je cm. Der Anteil des Spätholzes

	an der Gesamtbreite der Jahrringe soll 30% nicht überschreiten. Das Holz darf weder chemisch behandelt noch geflößt oder mit Wärme behandelt sein; es muss lufttrocken und nicht länger als 5 Jahre gelagert sein.“).
Measuring equipment	Gas concentrations were verified upon initiation, periodically during fumigation and upon termination using a Fumiscope gas-analyser.

1.3 Application of test substance

Criteria	Details
Application procedure	Sulfuryl fluoride was supplied in commercial steel cylinders as liquid under pressure. It was introduced into the fumitoria in its gaseous form.
Delivery method	Sulfuryl fluoride was made available for introduction into the fumitorium by using a heat-exchanger-system. Exact amounts of sulfuryl fluoride were transferred from the cylinder to the fumatorium using a digital scale. Gas was mixed as it was injected into the fumatorium using a fan inside the fumitorium.
Dosage rate	**Eggs** All eggs were fumigated at 7.7 g/m^3 for a total exposure period of 85 hours and 15 minutes leading to an accumulated dosage of 657 g-h/m^3.

1.4 Test conditions

Criteria	Details
Incubation temperature	Fumigation was conducted at an average temperature of 24 ^{o}C.
Moisture	Fumigation was conducted at an average 50 % relative humidity.

Section B5.10.2 Efficacy Data

Annex Point IIB5.10
TNsG: Pt. I-B5.10, Pt. III-Ch. 6

B5.10.2/12 Anobium punctatum Field study (Ref. Z12)

			Official use only
		1 REFERENCE: Z12, B5.10.2/12	
1.1	**Reference**	[1]Binker, G., [1]Binker, J., [1]Fröba G., [2]Graf, E. and [2]Lanz, B (1996). [1]Binker Materialschutz GmbH, Westendstr. 3, D-91207 Lauf, Germany [2]EMPA, Swiss Federal Laboratories for Materials Testing and Research Lerchenfeldstr. 5, CH-9014 St. Gallen, Switzerland. Field study on *Anobium punctatum* Number: .123418/B and 123418/D.	
1.2	**Data protection**	Yes.	
1.2.1	Data owner	Dow AgroSciences LLC.	
1.2.2	Companies with letter of Access	None.	
1.2.3	Criteria for data protection	Data submitted to the MS after 13 May 2000 on existing b.p.for the purpose of its entry into Annex I	
1.3	**Guideline study**	The study was undertaken on the basis of sound principles of fumigation practice.	
1.4	**Deviations**	Not applicable as the study not conducted to an international standard method.	
		2 METHOD	
2.1	**Test Substance (Biocidal Product)**	Sulfuryl fluoride.	
2.1.1	Trade name/ proposed trade name	Vikane.	
2.1.2	Composition of Product tested	> 99% Sulfuryl fluoride.	
2.1.3	Physical state and nature	Fumigant.	
2.1.4	Monitoring of active substance concentration	Monitoring was undertaken using a Fumiscope gas analyser.	
2.1.5	Method of analysis	Not applicable.	
2.2	**Reference substance**	No reference substance was included in the study.	
2.2.1	Method of analysis for reference substance	Not applicable.	
2.3	**Testing procedure**		
2.3.1	Test population / inoculum / test organism	See Table 1.1.	

Section B5.10.2 Efficacy Data

Annex Point IIB5.10
TNsG: Pt. I-B5.10, Pt. III-Ch. 6

B5.10.2/12 Anobium punctatum Field study (Ref. Z12)

2.3.2	Test system	See Table 1.2.	
2.3.3	Application of TS	See Table 1.3.	
2.3.4	Test conditions	See Table 1.4.	
2.3.5	Duration of the test / Exposure time	66 hours.	
2.3.6	Number of replicates performed	One.	
2.3.7	Controls	Untreated controls were included, these were kept and stored under the same conditions as the treated eggs of *Anobium punctatum*.	X
2.4	**Examination**		
2.4.1	Effect investigated	Lethal accumulated dosage (LAD) expressed as g-h/m^3. Two effects were determined – LAD 101 days after treatment and LAD 242 days after treatment.	
2.4.2	Method for recording / scoring of the effect	Egg-mortality by examination (count) of larvae hatched from treated eggs 101 days after treatment and survival of these larvae 131 days later (i.e. 242 days after treatment).	X
2.4.3	Intervals of examination	Larvae hatched from treated eggs 101 days after treatment and larvae survival 242 days after treatment.	
2.4.4	Statistics	Post fumigation mean total mortality was calculated by dividing the number of dead eggs by the total number of treated eggs 101 days after treatment and 242 days after treatment.	
2.4.5	Post fumigation monitoring of the test organism	See 2.4.4.	
		3 RESULTS	
3.1	**Efficacy**	The percentage mortality was calculated by dividing the total number of hatched and surviving larvae by the total number of treated eggs.	X

Percentage mortality of eggs of *Anobium punctatum* 101 days after exposure to sulfuryl fluoride.

A	Untreated Control			
No.	Eggs	Larvae hatched	Larvae penetrated	Dead larvae
71	269	266	266	0
72	103	80	80	0
73	158	154	154	0
74	120	118	118	0
75	76	72	72	0
76	156	154	154	0
77	89	82	82	0
78	117	112	112	0
79	156	154	154	0

80	100	82	82	0
total	1344	1274	1274	0

Total mortality of untreated eggs 5.21%.

B	Treated Eggs			
No.	Eggs	Larvae hatched	Larvae penetrated	Dead larvae
81	262	7	7	0
82	159	2	2	0
83	65	0	0	0
84	91	0	0	0
85	132	1	1	0
86	162	1	1	0
87	205	1	1	0
88	186	2	2	0
89	267	1	1	0
90	175	5	5	0
91	67	2	2	0
92	137	1	1	0
93	272	6	6	0
94	181	3	3	0
95	129	0	0	0
96	100	5	5	0
97	184	1	1	0
98	249	0	0	0
99	159	5	5	0
100	337	0	0	0
101	70	0	0	0
102	162	1	1	0
103	194	0	0	0
104	98	0	0	0
105	157	4	4	0
106	58	4	4	0
107	205	23	23	1
108	237	8	8	1
109	200	3	3	0
110	154	3	3	0
111	216	1	1	0
112	59	11	11	0
113	55	0	0	0
114	178	1	1	0
115	243	1	1	0
116	112	1	1	0
117	231	1	1	0
118	235	2	2	0
119	351	8	8	0
120	92	2	2	0
121	104	1	1	0
122	78	0	0	0
123	177	10	10	0
124	83	0	0	0

125	117	6	6	0
126	156	0	0	0
127	165	4	4	0
128	61	5	5	0
129	56	0	0	0
130	58	1	1	0
total	7881	146	144	0

Total mortality of treated eggs: 98.17%.

Percentage mortality of eggs of *Anobium punctatum* 242 days after exposure to sulfuryl fluoride.

A	Untreated Control			
No.	Eggs	Larvae hatched	Larvae penetrated	Larvae survived
71	269	266	266	81
72	103	80	80	76
73	158	154	154	93
74	120	118	118	73
75	76	72	72	65
76	156	154	154	96
77	89	82	82	52
78	117	112	112	83
79	156	154	154	98
80	100	82	82	45
total	1344	1274	1274	762

Total mortality of untreated eggs: 43.3%.

B	Treated Eggs			
No.	Eggs	Larvae hatched	Larvae penetrated	Larvae survived
81	262	7	7	0
82	159	2	2	0
83	65	0	0	0
84	91	0	0	0
85	132	1	1	0
86	162	1	1	0
87	205	1	1	1
88	186	2	2	0
89	267	1	1	1
90	175	5	5	0
91	67	2	2	0
92	137	1	1	1
93	272	6	6	1
94	181	3	3	1
95	129	0	0	0
96	100	5	5	4
97	184	1	1	0
98	249	0	0	0
99	159	5	5	2

100	337	0	0	0
101	70	0	0	0
102	162	1	1	0
103	194	0	0	0
104	98	0	0	0
105	157	4	4	1
106	58	4	4	0
107	205	24	23	6
108	237	9	8	3
109	200	3	3	0
110	154	3	3	0
111	216	1	1	1
112	59	11	11	0
113	55	0	0	0
114	178	1	1	0
115	243	1	1	0
116	112	1	1	0
117	231	1	1	0
118	235	2	2	1
119	351	8	8	1
120	92	2	2	0
121	104	1	1	0
122	78	0	0	0
123	177	10	10	3
124	83	0	0	0
125	117	6	6	2
126	156	0	0	0
127	165	4	4	0
128	61	5	5	0
129	56	0	0	0
130	58	1	1	0
total	7881	146	144	29

Total mortality of treated eggs: 99.63%.

Section B5.10.2 **Efficacy Data**

Annex Point IIB5.10
TNsG: Pt. I-B5.10, Pt. III-Ch. 6

B5.10.2/12 Anobium punctatum
Field study (Ref. Z12)y

3.1.1	Dose/Efficacy curve	Not available from report.
3.1.2	Begin and duration of effects	A mortality of 98.17 % was achieved 101 days after treatment and of 99.63 % 242 days after treatment.
3.1.3	Observed effects in the post monitoring phase	No unusual effect observed.
3.2	**Effects against organisms or objects to be protected**	None reported.
3.3	**Other effects**	None reported.
3.4	**Efficacy of the reference substance**	No reference substance was used.
3.5	**Tabular and/or graphical presentation of the summarised results**	See 3.1.
3.6	**Efficacy limiting factors**	
3.6.1	Occurrences of resistances	None reported.
3.6.2	Other limiting factors	None reported.
	4 RELEVANCE OF THE RESULTS COMPARED TO FIELD CONDITIONS	
4.1	**Reasons for laboratory testing**	Not applicable.
4.2	**Intended actual scale of biocide application**	Not applicable.
4.3	**Relevance compared to field conditions**	Not applicable.
4.3.1	Application method	Not applicable.
4.3.2	Test organism	*Anobium punctatum* eggs.
4.3.3	Observed effect	Egg mortality.
4.4	**Relevance for read-across**	Not applicable.

Section B5.10.2 **Efficacy Data**

Annex Point IIB5.10
TNsG: Pt. I-B5.10, Pt. III-Ch. 6

B5.10.2/12 Anobium punctatum Field study (Ref. Z12)y

5 APPLICANT'S SUMMARY AND CONCLUSION

5.1	**Materials and methods**	Eggs of *Anobium punctatum* were fumigated with sulfuryl fluoride for 66 hours at 12 °C in a practical fumigation under field condition (church of a volume of 1000 m³). Bioassays from laboratory population according to EN 49.1 (1992) ("Holzschutzmittel - Bestimmung der vorbeugenden Wirkung gegenüber Anobium punctatum (De Geer) durch Beobachten der Eiablage und des Überlebens von Larven - Teil 1: Oberflächenbehandlung (Laboratoriumsverfahren)") were tested to determine LAD. Fumigant concentration was measured using a Fumiscope gas analyser. Mortality rate was evaluated 101 days and 242 days after treatment.
5.2	**Reliability**	Reliability indicator 2: Study conducted in accordance with generally accepted scientific principles, possibly with incomplete reporting or methodological deficiencies, which do not affect the quality of relevant results.
5.3	**Assessment of efficacy, data analysis and interpretation**	The result of this investigation that under the described conditions a complete a high level of control of *Anobium punctatum* eggs was achieved. Additional trials need to be performed to understand the variability of the dose rates of the fumigant to achieve the LAD for this specific life stage at different temperatures.
5.4	**Conclusion**	There are different life stages of *Anobium punctatum* present in infested wooden structures. The field fumigation test undertaken was considered to be a valid and effective procedure for evaluating the efficacy of sulfuryl fluoride on the eggs of *A. punctatum*. The efficacy results showed that sulfuryl fluoride was highly effective on eggs of this pest species.
5.5	**Proposed efficacy specification**	Control of eggs is excellent 99.63% mortality at the evaluated LAD of 2085 g-h/m³ at a temperature of 12 °C.

Evaluation by Competent Authorities

EVALUATION BY RAPPORTEUR MEMBER STATE

Date	October 2004.
Comments	Field 2.3.7, The following is a revised version of the present entry: The untreated controls and treated eggs were kept and stored under the same incubation conditions before and after the test fumigations. These incubation conditions were: temperature 20 C , 75% relative humidity. The conditions during fumigation is given in Table 1.4 with the untreated controls remaining under incubation conditions of 20 °C , 75% relative humidity. Field 2.4.2. The sentence should read: Egg-mortality by examination (count) of larvae penetrated from treated eggs 101 days after treatment and survival of these larvae 131 days later (i.e. 242 days after treatment). Field 3.1: Within the body of each table the numbers are counts and not percentages (as stated in the table legends above the tables).
Summary and conclusion	Applicant's version is acceptable.

1.1 Test organisms - *Anobium punctatum*

Criteria	Details
Family	Anobiidae.
Species	*Anobium punctatum.*
Source	Laboratory population according to EN 49.1 (1992) ("Holzschutzmittel - Bestimmung der vorbeugenden Wirkung gegenüber Anobium punctatum (De Geer) durch Beobachten der Eiablage und des Überlebens von Larven - Teil 1: Oberflächenbehandlung (Laboratoriumsverfahren)").
Life stage	Eggs.
Mixed age population	Not applicable.
Number of eggs in test	7881.

1.2 Test system

Criteria	Details
Test chamber	Fumigation was carried out under field conditions in a typical Bavarian church in Germany (volume: 1000 m^3). Gas introduction via polyamide (PA) lines 6 mm external diameter 4 mm internal diameter, gas monitoring via separate PA-lines 6 mm external diameter/4 mm internal diameter.
Test insects introduction into chamber	In totally 7881 eggs on fifty boards of pine-wood (*Pinus silvestris* L.), ca. 100x40x10 mm according to EMPA ("Für Insektenversuche darf nur Kiefernsplintholz, gerade gewachsen, ohne Äste und arm an Harz verwendet werden. Mittleres Wachstum von 2.5-8 Jahrringe je cm. Der Anteil des Spätholzes an der Gesamtbreite der Jahrringe soll 30% nicht überschreiten. Das Holz darf weder chemisch behandelt noch geflößt oder mit Wärme behandelt sein; es muss lufttrocken und nicht länger als 5 Jahre gelagert sein.").
Measuring equipment	Gas concentrations were verified upon initiation, periodically during fumigation and upon termination using a Fumiscope gas analyser.

1.3 Application of test substance

Criteria	Details
Application procedure	Sulfuryl fluoride was supplied in commercial steel cylinders as liquid under pressure. It was introduced into the structure in its gaseous form.
Delivery method	Sulfuryl fluoride was made available for introduction into the structure by using a heat-exchanger-system. Exact amounts of sulfuryl fluoride were transferred from the cylinder to the structure using a digital scale. Gas was mixed as it was injected into the structure using a fan inside the structure.
Dosage rate	Eggs All eggs were fumigated at a mean concentration of 31.6 g/m^3 for a total exposure period of 66 hours leading to an accumulated dosage of 2085 $g\text{-}h/m^3$.

1.4 Test conditions

Criteria	Details
Incubation temperature	Fumigation was conducted at an average temperature of 12 ^oC.
Moisture	Not available from report.

Section B5.10.2 Efficacy Data

Annex Point IIB5.10
TNsG: Pt. I-B5.10, Pt. III-Ch. 6

B5.10.2/13 Anobium punctatum Field study (Ref. Z13)

			Official use only
		1 REFERENCE: Z13, B5.10.2/13	
1.1	**Reference**	[1]Binker, G., [1]Binker, J., [1]Fröba G., [2]Graf, E. and [2]Lanz, B (1996). [1]Binker Materialschutz GmbH, Westendstr. 3, D-91207 Lauf, Germany [2]EMPA, Swiss Federal Laboratories for Materials Testing and Research Lerchenfeldstr. 5, CH-9014 St. Gallen, Switzerland. Field study on *Anobium punctatum* Number: 123418/C and 123418/D.	
1.2	**Data protection**	Yes.	
1.2.1	Data owner	Dow AgroSciences LLC.	
1.2.2	Companies with letter of Access	None.	
1.2.3	Criteria for data protection	Data submitted to the MS after 13 May 2000 on existing b.p. for the purpose of its entry into Annex I	
1.3	**Guideline study**	The study was undertaken on the basis of sound principles of fumigation practice.	
1.4	**Deviations**	Not applicable as the study not conducted to an international standard method.	
		2 METHOD	
2.1	**Test Substance (Biocidal Product)**	Sulfuryl fluoride.	
2.1.1	Trade name/ proposed trade name	Vikane.	
2.1.2	Composition of Product tested	> 99% Sulfuryl fluoride.	
2.1.3	Physical state and nature	Fumigant.	
2.1.4	Monitoring of active substance concentration	Monitoring was undertaken using a Fumiscope gas analyser.	
2.1.5	Method of analysis	Not applicable.	
2.2	**Reference substance**	No reference substance was included in the study.	
2.2.1	Method of analysis for reference substance	Not applicable.	
2.3	**Testing procedure**		
2.3.1	Test population / inoculum / test organism	See Table 1.1.	

Section B5.10.2 Efficacy Data

Annex Point IIB5.10
TNsG: Pt. I-B5.10, Pt. III-Ch. 6

B5.10.2/13 Anobium punctatum Field study (Ref. Z13)

2.3.2	Test system	See Table 1.2.	
2.3.3	Application of TS	See Table 1.3.	
2.3.4	Test conditions	See Table 1.4.	
2.3.5	Duration of the test / Exposure time	62 hours and 30 minutes.	
2.3.6	Number of replicates performed	One.	
2.3.7	Controls	Untreated controls were included; these were kept and stored under the same conditions as the treated eggs of *Anobium punctatum*.	X
2.4	**Examination**		
2.4.1	Effect investigated	Lethal accumulated dosage (LAD) expressed as g-h/m^3. Two effects were determined – LAD 97 days after treatment and LAD 236 days after treatment.	
2.4.2	Method for recording / scoring of the effect	Egg-mortality by examination (count) of larvae hatched from treated eggs 97 days after treatment and survival of these larvae 139 days later (i.e. 236 days after treatment).	
2.4.3	Intervals of examination	Larvae hatched from treated eggs 97 days after treatment and larvae survival 236 days after treatment.	
2.4.4	Statistics	Post fumigation mean total mortality was calculated by dividing the number of dead eggs by the total number of treated eggs 97 days after treatment and 236 days after treatment.	
2.4.5	Post fumigation monitoring of the test organism	See 2.4.4.	
		3 RESULTS	
3.1	**Efficacy**	The percentage mortality was calculated by dividing the total number of hatched and surviving larvae by the total number of treated eggs.	X

Percentage mortality of eggs of *Anobium punctatum* 97 days after exposure to sulfuryl fluoride.

A	Untreated Control			
No.	Eggs	Larvae hatched	Larvae penetrated	Dead larvae
141	226	204	204	0
142	227	209	209	0
143	221	204	204	0
144	184	164	164	0
145	177	171	171	0
146	212	200	200	0
147	213	209	209	0
148	338	310	310	0
149	292	282	282	0

150	262	248	248	0
total	2352	2201	2201	0

Total mortality of untreated eggs 6.42%.

B	Treated Eggs			
No.	Eggs	Larvae hatched	Larvae penetrated	Dead larvae
151	159	0	0	0
152	211	0	0	0
153	154	0	0	0
154	121	1	1	0
155	248	4	4	0
156	209	0	0	0
157	308	5	5	0
158	314	0	0	0
159	247	0	0	0
160	128	4	4	0
161	276	1	1	0
162	175	0	0	0
163	312	3	3	0
164	211	3	3	0
165	391	1	1	0
166	337	1	1	0
167	342	0	0	0
168	344	1	1	0
169	239	10	10	0
170	249	18	18	0
171	121	1	1	0
172	193	1	1	0
173	206	0	0	0
174	224	2	2	0
175	269	0	0	0
176	280	1	1	0
177	326	1	1	0
178	266	1	1	0
179	311	1	1	0
180	362	20	20	0
181	270	1	1	0
182	234	2	2	0
183	359	6	6	0
184	201	2	2	0
185	235	29	29	0
186	278	5	5	0
187	130	0	0	0
188	269	3	3	0
189	304	2	2	0
190	212	8	8	0
191	351	0	0	0
192	249	6	6	0

193	209	9	9	0
194	281	3	3	0
195	305	25	25	0
196	176	1	1	0
197	236	4	4	0
198	275	3	3	0
199	217	1	1	0
200	150	3	3	0
total	12474	193	193	0

Total mortality of treated eggs: 98.45%.

Percentage mortality of eggs of *Anobium punctatum* 236 days after exposure to sulfuryl fluoride.

	Untreated Control			
No.	Eggs	Larvae hatched	Larvae penetrated	Larvae survived
141	226	204	204	151
142	227	209	209	112
143	221	204	204	97
144	184	164	164	89
145	177	171	171	113
146	212	200	200	121
147	213	209	209	98
148	338	310	310	109
149	292	282	282	116
150	262	248	248	94
total	2352	2201	2201	1100

Total mortality of untreated eggs: 53.23%.

B	Treated Eggs			
No.	Eggs	Larvae hatched	Larvae penetrated	Larvae survived
151	159	0	0	0
152	211	0	0	0
153	154	0	0	0
154	121	1	1	0
155	248	4	4	0
156	209	0	0	0
157	308	5	5	0
158	314	0	0	0
159	247	0	0	0
160	128	4	4	0
161	276	1	1	0
162	175	0	0	0
163	312	3	3	0
164	211	3	3	0
165	391	1	1	0
166	337	1	1	0
167	342	0	0	0

168	344	1	1	0
169	239	10	10	0
170	249	18	18	0
171	121	1	1	0
172	193	1	1	0
173	206	0	0	0
174	224	2	2	0
175	269	0	0	0
176	280	1	1	0
177	326	1	1	0
178	266	1	1	0
179	311	1	1	0
180	362	20	20	3
181	270	1	1	0
182	234	2	2	0
183	359	6	6	0
184	201	2	2	1
185	235	29	29	3
186	278	5	5	0
187	130	0	0	0
188	269	3	3	2
189	304	2	2	0
190	212	8	8	1
191	351	0	0	0
192	249	6	6	0
193	209	9	9	0
194	281	3	3	0
195	305	25	25	4
196	176	1	1	1
197	236	4	4	0
198	275	3	3	0
199	217	1	1	1
200	150	3	3	0
total	12474	193	193	16

Total mortality of treated eggs: 99.87%.

Section B5.10.2 Efficacy Data

Annex Point IIB5.10
TNsG: Pt. I-B5.10, Pt. III-Ch. 6

B5.10.2/13 Anobium punctatum Field study (Ref. Z13)

3.1.1	Dose/Efficacy curve	Not available from report.
3.1.2	Begin and duration of effects	A mortality of 98.45 % was achieved 97 days after treatment and of 99.87 % 236 days after treatment.
3.1.3	Observed effects in the post monitoring phase	No unusual effect observed.
3.2	**Effects against organisms or objects to be protected**	None reported.
3.3	**Other effects**	None reported.
3.4	**Efficacy of the reference substance**	No reference substance was used.
3.5	**Tabular and/or graphical presentation of the summarised results**	See 3.1.
3.6	**Efficacy limiting factors**	
3.6.1	Occurrences of resistances	None reported.
3.6.2	Other limiting factors	None reported.
	4 RELEVANCE OF THE RESULTS COMPARED TO FIELD CONDITIONS	
4.1	**Reasons for laboratory testing**	Not applicable.
4.2	**Intended actual scale of biocide application**	Not applicable.
4.3	**Relevance compared to field conditions**	Not applicable.
4.3.1	Application method	Not applicable.
4.3.2	Test organism	Not applicable.
4.3.3	Observed effect	Not applicable.
4.4	**Relevance for read-across**	Not applicable.

Section B5.10.2 **Efficacy Data**

Annex Point IIB5.10
TNsG: Pt. I-B5.10, Pt. III-Ch. 6

B5.10.2/13 Anobium punctatum Field study (Ref. Z13)

5 APPLICANT'S SUMMARY AND CONCLUSION

5.1	**Materials and methods**	Eggs of *Anobium punctatum* were fumigated with sulfuryl fluoride for 62 hours and 30 minutes at 19.8 °C in a practical fumigation under field condition (church of a volume of 500 m³). Bioassays from laboratory population according to EN 49.1 (1992) ("Holzschutzmittel - Bestimmung der vorbeugenden Wirkung gegenüber Anobium punctatum (De Geer) durch Beobachten der Eiablage und des Überlebens von Larven - Teil 1: Oberflächenbehandlung (Laboratoriumsverfahren)") were tested to determine LAD. Fumigant concentration was measured using a Fumiscope gas analyser. Mortality rate was evaluated 97 days and 236 days after treatment.
5.2	**Reliability**	Reliability indicator 2: Study conducted in accordance with generally accepted scientific principles, possibly with incomplete reporting or methodological deficiencies, which do not affect the quality of relevant results.
5.3	**Assessment of efficacy, data analysis and interpretation**	The result of this investigation was that under the described conditions a high level of control of *Anobium punctatum* eggs was achieved. Additional trials have to be performed to understand the variability of the dose rates of the fumigant to achieve the LAD for this specific life stage at different temperatures.
5.4	**Conclusion**	There are different life stages of *Anobium punctatum* present in infested wooden structures. The field fumigation test undertaken was considered to be a valid and effective procedure for evaluating the efficacy of sulfuryl fluoride on the eggs of *A. punctatum*. The efficacy results showed that sulfuryl fluoride was highly effective on eggs of this pest species.
5.5	**Proposed efficacy specification**	Control of eggs is excellent 99.87% mortality at the evaluated LAD of 1269 g-h/m³ at a temperature of 19.8 °C.

Evaluation by Competent Authorities

EVALUATION BY RAPPORTEUR MEMBER STATE

Date	October 2004.
Comments	Field 2.3.7, The following is a revised version of the present entry: The untreated controls and treated eggs were kept and stored under the same incubation conditions before and after the test fumigations. These incubation conditions were: temperature 20 C , 75% relative humidity. The conditions during fumigation is given in Table 1.4 with the untreated controls remaining under incubation conditions of 20 °C , 75% relative humidity. Field 3.1: Within the body of each table the numbers are counts and not percentages (as stated in the table legends above the tables).
Summary and conclusion	Applicant's version is adopted.

1.1 Test organisms - *Anobium punctatum*

Criteria	Details
Family	Anobiidae.
Species	*Anobium punctatum*
Source	Laboratory population according to EN 49.1 (1992) ("Holzschutzmittel - Bestimmung der vorbeugenden Wirkung gegenüber *Anobium punctatum* (De Geer) durch Beobachten der Eiablage und des Überlebens von Larven - Teil 1: Oberflächenbehandlung (Laboratoriumsverfahren)").
Life stage	Eggs.
Mixed age population	Not applicable.
Number of eggs in test	12474.

1.2 Test system

Criteria	Details
Test chamber	Fumigation was carried out under field conditions in a typical Bavarian church in Germany (volume: 500 m^3). Gas introduction via polyamide (PA) lines 6 mm external diameter 4 mm internal diameter, gas monitoring via separate PA-lines 6 mm external diameter/4 mm internal diameter.
Test insects introduction into chamber	In total12474 eggs on fifty boards of pine-wood (*Pinus silvestris* L.), ca. 100x40x10 mm according to EMPA ("Für Insektenversuche darf nur Kiefernsplintholz, gerade gewachsen, ohne Äste und arm an Harz verwendet werden. Mittleres Wachstum von 2.5-8 Jahrringe je cm. Der Anteil des Spätholzes an der Gesamtbreite der Jahrringe soll 30% nicht überschreiten. Das Holz darf weder chemisch behandelt noch geflößt oder mit Wärme behandelt sein; es muss lufttrocken und nicht länger als 5 Jahre gelagert sein.").
Measuring equipment	Gas concentrations were verified upon initiation, periodically during fumigation and upon termination using a Fumiscope gas analyser.

1.3 Application of test substance

Criteria	Details
Application procedure	Sulfuryl fluoride was supplied in commercial steel cylinders as liquid under pressure. It was introduced into the structure in its gaseous form.
Delivery method	Sulfuryl fluoride was made available for introduction into the structure by using a heat-exchanger-system. Exact amounts of sulfuryl fluoride were transferred from the cylinder to the structure using a digital scale. Gas was mixed as it was injected using a fan positioned in the structure.
Dosage rate	Eggs All eggs were fumigated at a mean concentration of 20.3 g/m^3 for a total exposure period of 62 hours and 30 minutes leading to an accumulated dosage of 1269 $g\text{-}h/m^3$.

1.4 Test conditions

Criteria	Details
Incubation temperature	Fumigation was conducted at an average temperature of 19.8 ^oC.
Moisture	Not available from report.

Section B5.10.2 Efficacy Data

Annex Point IIB5.10
TNsG: Pt. I-B5.10, Pt. III-Ch. 6

B5.10.2/14 Anobium punctatum Laboratory study (Ref. Z14)

			Official use only
		1 REFERENCE: Z14, B5.10.2/14	
1.1	**Reference**	[1]Binker, G., [1]Binker, J., [1]Fröba G., [2]Graf, E. and [2]Lanz, B (1997). [1]Binker Materialschutz GmbH, Westendstr. 3, D-91207 Lauf, Germany [2]EMPA, Swiss Federal Laboratories for Materials Testing and Research Lerchenfeldstr. 5, CH-9014 St. Gallen, Switzerland. Laboratory study on *Anobium punctatum* Number: 125749/C and 125749/E (Bioassay 151 – 160).	
1.2	**Data protection**	Yes.	
1.2.1	Data owner	Dow AgroSciences LLC.	
1.2.2	Companies with letter of Access	None.	
1.2.3	Criteria for data protection	Data submitted to the MS after 13 May 2000 on existing a.s. for the purpose of its entry into Annex I	
1.3	**Guideline study**	The study was undertaken on the basis of sound principles of fumigation practice.	
1.4	**Deviations**	Not applicable as the study not conducted to an international standard method.	
		2 METHOD	
2.1	**Test Substance (Biocidal Product)**	Sulfuryl fluoride.	
2.1.1	Trade name/ proposed trade name	Vikane.	
2.1.2	Composition of Product tested	> 99% Sulfuryl fluoride.	
2.1.3	Physical state and nature	Fumigant.	
2.1.4	Monitoring of active substance concentration	Monitoring was undertaken using a Fumiscope gas analyser.	
2.1.5	Method of analysis	Not applicable.	
2.2	**Reference substance**	No reference substance was included in the study.	
2.2.1	Method of analysis for reference substance	Not applicable.	
2.3	**Testing procedure**		
2.3.1	Test population / inoculum / test organism	See Table 1.1.	

Section B5.10.2 **Efficacy Data**

Annex Point IIB5.10
TNsG: Pt. I-B5.10, Pt. III-Ch. 6

B5.10.2/14 Anobium punctatum Laboratory study (Ref. Z14)

2.3.2	Test system	See Table 1.2.	
2.3.3	Application of TS	See Table 1.3.	
2.3.4	Test conditions	See Table 1.4.	
2.3.5	Duration of the test / Exposure time	54 hours and 45 minutes.	
2.3.6	Number of replicates performed	One.	
2.3.7	Controls	Untreated controls were included, these were kept and stored under the same conditions as the treated eggs of *Anobium punctatum*.	X
2.4	**Examination**		
2.4.1	Effect investigated	Lethal accumulated dosage (LAD) expressed as g-h/m^3. Two effects were determined – LAD 89 days after treatment and LAD 228 days after treatment.	
2.4.2	Method for recording / scoring of the effect	Egg-mortality by examination (count) of larvae hatched from treated eggs 89 days after treatment and survival of these larvae 139 days later (i.e. 228 days after treatment).	
2.4.3	Intervals of examination	Larvae hatched from treated eggs 89 days after treatment and larvae survival 228 days after treatment.	
2.4.4	Statistics	Post fumigation mean total mortality was calculated by dividing the number of dead eggs by the total number of treated eggs 89 days after treatment and 228 days after treatment.	
2.4.5	Post fumigation monitoring of the test organism	See 2.4.4.	
		3 RESULTS	
3.1	**Efficacy**	The percentage mortality was calculated by dividing the total number of hatched and surviving larvae by the total number of treated eggs.	X

Percentage mortality of eggs of *Anobium punctatum* 89 days after exposure to sulfuryl fluoride.

A	Untreated Control			
No.	Eggs	Larvae hatched	Larvae penetrated	Dead larvae
141	150	120	120	0
142	91	87	87	0
143	113	107	107	0
144	101	99	99	0
145	143	134	134	0
146	438	427	427	0
147	103	96	96	0
148	135	126	126	0
149	237	227	227	0
150	107	92	92	0
total	1618	1515	1515	0

Total mortality of untreated eggs: 6.37%.

B	Treated Eggs			
No.	Eggs	Larvae hatched	Larvae penetrated	Dead larvae
151	241	0	0	0
152	259	0	0	0
153	85	2	2	0
154	268	9	9	0
155	76	0	0	0
156	226	2	2	0
157	258	5	5	0
158	225	4	4	0
159	104	8	8	0
160	278	1	1	0
total	2020	31	31	0

Total mortality of treated eggs: 98.47%.

Percentage mortality of eggs of *Anobium punctatum* 228 days after exposure to sulfuryl fluoride.

A	Untreated Control			
No.	Eggs	Larvae hatched	Larvae penetrated	Larvae survived
141	150	120	120	95
142	91	87	87	49
143	113	107	107	86
144	101	99	99	78
145	143	134	134	104
146	438	427	427	321
147	103	96	96	86
148	135	126	126	79
149	237	227	227	119
150	107	92	92	55
total	1618	1515	1515	1072

Total mortality of untreated eggs: 33.75%.

B	Treated Eggs			
No.	Eggs	Larvae hatched	Larvae penetrated	Larvae survived
151	241	0	0	0
152	259	0	0	0
153	85	2	2	0
154	268	9	9	0
155	76	0	0	0
156	226	2	2	0
157	258	5	5	0
158	225	4	4	1
159	104	8	8	1
160	278	1	1	0
total	2020	31	31	2

Total mortality of treated eggs: 99.90%.

Section B5.10.2 **Efficacy Data**

Annex Point IIB5.10
TNsG: Pt. I-B5.10,
Pt. III-Ch. 6

B5.10.2/14 Anobium punctatum
Laboratory study (Ref. Z14)

3.1.1	Dose/Efficacy curve	Not available from report.
3.1.2	Begin and duration of effects	A mortality of 98.47 % was achieved 89 days after treatment and of 99.90 % 228 days after treatment.
3.1.3	Observed effects in the post monitoring phase	No unusual effect observed.
3.2	**Effects against organisms or objects to be protected**	None reported.
3.3	**Other effects**	None reported.
3.4	**Efficacy of the reference substance**	No reference substance was used.
3.5	**Tabular and/or graphical presentation of the summarised results**	See 3.1.
3.6	**Efficacy limiting factors**	
3.6.1	Occurrences of resistances	None reported.
3.6.2	Other limiting factors	None reported.

4 RELEVANCE OF THE RESULTS COMPARED TO FIELD CONDITIONS

4.1	**Reasons for laboratory testing**	1 Precise conditions could be determined. 2 Practical, accurate procedure. Data generated is considered relevant for field of use. Test insects obtained from the field.
4.2	**Intended actual scale of biocide application**	Not applicable.
4.3	**Relevance compared to field conditions**	
4.3.1	Application method	The principle of fumigation is to confine a sufficient concentration for a sufficient period of time to enable a toxic dose to be received by the target pest. There are a number of ways in laboratory and field studies to achieve this although the principle is the same.
4.3.2	Test organism	There are different life stages of *Anobium punctatum.* Eggs are considered to be the stage which would require a higher dose of sulfuryl

		fluoride compared to the other stages.
4.3.3	Observed effect	The high mortality effect, recorded in the laboratory test is considered as the desired field response for eradication of eggs of *Anobium punctatum*.
4.4	**Relevance for read-across**	Not applicable.

5 APPLICANT'S SUMMARY AND CONCLUSION

5.1	**Materials and methods**	Eggs of *Anobium punctatum* were fumigated with sulfuryl fluoride for 54 hours and 45 minutes at 17.4 °C and 46 % relative humidity in laboratory fumitoria. Bioassays from laboratory population according to EN 49.1 (1992) ("Holzschutzmittel - Bestimmung der vorbeugenden Wirkung gegenüber Anobium punctatum (De Geer) durch Beobachten der Eiablage und des Überlebens von Larven - Teil 1: Oberflächenbehandlung (Laboratoriumsverfahren)") were tested to determine LAD. Fumigant concentration was measured using a Fumiscope gas analyser. Mortality rate was evaluated 89 days and 228 days after treatment.
5.2	**Reliability**	Reliability indicator 2: Study conducted in accordance with generally accepted scientific principles, possibly with incomplete reporting or methodological deficiencies, which do not affect the quality of relevant results.
5.3	**Assessment of efficacy, data analysis and interpretation**	The result of this investigation was that under the described conditions a high level of control of *Anobium punctatum* eggs was achieved. Additional trials have to be performed to understand the variability of the dose rates of the fumigant to achieve the LAD for this specific life stage at different temperatures.
5.4	**Conclusion**	There are different life stages of *Anobium punctatum* present in infested wooden structures. The laboratory fumigation test undertaken was considered to be a valid and effective procedure for evaluating the efficacy of sulfuryl fluoride on the eggs of *A. punctatum*. The efficacy results showed that sulfuryl fluoride was highly effective on eggs of this pest species.
5.5	**Proposed efficacy specification**	Control of eggs is excellent 99.90% mortality at the evaluated LAD of 1695 g-h/m³ at a temperature of 17.4 °C and 46 % relative humidity.

Evaluation by Competent Authorities

EVALUATION BY RAPPORTEUR MEMBER STATE

Date	October 2004.
Comments	Field 2.3.7, The following is a revised version of the present entry: The untreated controls and treated eggs were kept and stored under the same incubation conditions before and after the test fumigations. These incubation conditions were: temperature 20 C , 75% relative humidity. The conditions during fumigation is given in Table 1.4 with the untreated controls remaining under incubation conditions of 20 °C , 75% relative humidity. Field 3.1: Within the body of each table the numbers are counts and not percentages (as stated in the table legends above the tables).
Summary and conclusion	Applicant's version is adopted.

1.1 Test organisms - *Anobium punctatum*

Criteria	Details
Family	Anobiidae.
Species	*Anobium punctatum.*
Source	Laboratory population according to EN 49.1 (1992) ("Holzschutzmittel - Bestimmung der vorbeugenden Wirkung gegenüber *Anobium punctatum* (De Geer) durch Beobachten der Eiablage und des Überlebens von Larven - Teil 1: Oberflächenbehandlung (Laboratoriumsverfahren)").
Life stage	Eggs.
Mixed age population	Not applicable.
Number of eggs in test	2020.

1.2 Test system

Criteria	Details
Test chamber	Fumitoria (fumigation chambers) aluminium, 3 x 2 x 2 m = 12 m³, gas introduction via polyamide (PA) - lines 6 mm external diameter/4 mm internal diameter, gas monitoring via separate PA-lines 6 mm external diameter/4 mm internal diameter.
Test insects introduction into chamber	In total 2020 eggs on ten boards of pine-wood (*Pinus silvestris* L.), ca. 100x40x10 mm according to EMPA ("Für Insektenversuche darf nur Kiefernsplintholz, gerade gewachsen, ohne Äste und arm an Harz verwendet werden. Mittleres Wachstum von 2.5-8 Jahrringe je cm. Der Anteil des Spätholzes an der Gesamtbreite der Jahrringe soll 30% nicht überschreiten. Das Holz darf weder chemisch behandelt noch geflößt oder mit Wärme behandelt sein; es muss lufttrocken und nicht länger als 5 Jahre gelagert sein.").

Measuring equipment	Gas concentrations were verified upon initiation, periodically during fumigation and upon termination using a Fumiscope gas analyser.

1.3 Application of test substance

Criteria	Details
Application procedure	Sulfuryl fluoride was supplied in commercial steel cylinders as liquid under pressure. It was introduced into the fumitorium in its gaseous form.
Delivery method	Sulfuryl fluoride was made available for introduction into the fumitorium by using a heat-exchanger-system. Exact amounts of sulfuryl fluoride were transferred from the cylinder to the fumatorium using a digital scale. Gas was mixed as it was injected into the fumatorium using a fan inside the fumitorium.
Dosage rate	<u>Eggs</u> All eggs were fumigated at a mean concentration of 31.0 g/m^3 for a total exposure period of 54 hours and 45 minutes leading to an accumulated dosage of 1695 g-h/m^3.

1.4 Test conditions

Criteria	Details
Incubation temperature	Fumigation was conducted at an average temperature of 17.4 ^oC.
Moisture	Fumigation was conducted at an average 46 % relative humidity.

Section B5.10.2 Efficacy Data

Annex Point IIB5.10
TNsG: Pt. I-B5.10, Pt. III-Ch. 6

B5.10.2/15 Anobium punctatum Laboratory study (Ref. Z15)

			Official use only
		1 REFERENCE: Z15, B5.10.2/15	
1.1	**Reference**	[1]Binker, G., [1]Binker, J., [1]Fröba G., [2]Graf, E. and [2]Lanz, B (1997). [1]Binker Materialschutz GmbH, Westendstr. 3, D-91207 Lauf, Germany [2]EMPA, Swiss Federal Laboratories for Materials Testing and Research Lerchenfeldstr. 5, CH-9014 St. Gallen, Switzerland. Laboratory study on *Anobium punctatum* Number: 125749/C and 125749/E (Bioassay 161 – 180).	
1.2	**Data protection**	Yes.	
1.2.1	Data owner	Dow AgroSciences LLC.	
1.2.2	Companies with letter of Access	None.	
1.2.3	Criteria for data protection	Data submitted to the MS after 13 May 2000 on existing b.p. for the purpose of its entry into Annex I	
1.3	**Guideline study**	The study was undertaken on the basis of sound principles of fumigation practice.	
1.4	**Deviations**	Not applicable as the study not conducted to an international standard method.	
		2 METHOD	
2.1	**Test Substance (Biocidal Product)**	Sulfuryl fluoride.	
2.1.1	Trade name/ proposed trade name	Vikane.	
2.1.2	Composition of Product tested	> 99% Sulfuryl fluoride.	
2.1.3	Physical state and nature	Fumigant.	
2.1.4	Monitoring of active substance concentration	Monitoring was undertaken using a Fumiscope gas analyser.	
2.1.5	Method of analysis	Not applicable.	
2.2	**Reference substance**	No reference substance was included in the study.	
2.2.1	Method of analysis for reference substance	Not applicable.	
2.3	**Testing procedure**		
2.3.1	Test population / inoculum / test organism	See Table 1.1.	

2.3.2	Test system	See Table 1.2.	
2.3.3	Application of TS	See Table 1.3.	
2.3.4	Test conditions	See Table 1.4.	
2.3.5	Duration of the test / Exposure time	59 hours and 5 minutes.	
2.3.6	Number of replicates performed	One.	
2.3.7	Controls	Untreated controls were included; these were kept and stored under the same conditions as the treated eggs of *Anobium punctatum*.	X
2.4	**Examination**		
2.4.1	Effect investigated	Lethal accumulated dosage (LAD) expressed as g-h/m^3. Two effects were determined – LAD 89 days after treatment and LAD 228 days after treatment.	
2.4.2	Method for recording / scoring of the effect	Egg-mortality by examination (count) of larvae hatched from treated eggs 89 days after treatment and survival of these larvae 139 days later (i.e. 228 days after treatment).	
2.4.3	Intervals of examination	Larvae hatched from treated eggs 89 days after treatment and larvae survival 228 days after treatment.	
2.4.4	Statistics	Post fumigation mean total mortality was calculated by dividing the number of dead eggs by the total number of treated eggs 89 days after treatment and 228 days after treatment.	
2.4.5	Post fumigation monitoring of the test organism	See 2.4.4.	
		3 RESULTS	
3.1	**Efficacy**	The percentage mortality was calculated by dividing the total number of hatched and surviving larvae by the total number of treated eggs.	X

Percentage mortality of eggs of *Anobium punctatum* 89 days after exposure to sulfuryl fluoride.

A	Untreated Control			
No.	Eggs	Larvae hatched	Larvae penetrated	Dead larvae
141	150	120	120	0
142	91	87	87	0
143	113	107	107	0
144	101	99	99	0
145	143	134	134	0
146	438	427	427	0
147	103	96	96	0
148	135	126	126	0
149	237	227	227	0

150	107	92	92	0
total	1618	1515	1515	0

Total mortality of untreated eggs 6.37%.

B	Treated Eggs			
No.	Eggs	Larvae hatched	Larvae penetrated	Dead larvae
161	375	0	0	0
162	286	7	7	0
163	301	2	2	0
164	104	1	1	0
165	302	1	1	0
166	170	0	0	0
167	180	0	0	0
168	281	1	1	0
169	156	0	0	0
170	365	3	3	0
171	293	5	5	0
172	247	0	0	0
173	155	0	0	0
174	175	0	0	0
175	85	0	0	0
176	271	3	3	0
177	214	11	11	0
178	177	3	3	0
179	207	2	2	0
180	181	4	4	0
total	4525	43	43	0

Total mortality of treated eggs: 99.05%.

Percentage mortality of eggs of *Anobium punctatum* 228 days after exposure to sulfuryl fluoride.

A	Untreated Control			
No.	Eggs	Larvae hatched	Larvae penetrated	Larvae survived
141	150	120	120	95
142	91	87	87	49
143	113	107	107	86
144	101	99	99	78
145	143	134	134	104
146	438	427	427	321
147	103	96	96	86
148	135	126	126	79
149	237	227	227	119
150	107	92	92	55
total	1618	1515	1515	1072

Total mortality of untreated eggs: 33.75%.

B	Treated Eggs			
No.	Eggs	Larvae hatched	Larvae penetrated	Larvae survived
161	375	0	0	0
162	286	7	7	0
163	301	2	2	0
164	104	1	1	0
165	302	1	1	0
166	170	0	0	0
167	180	0	0	0
168	281	1	1	0
169	156	0	0	0
170	365	3	3	0
171	293	5	5	0
172	247	0	0	0
173	155	0	0	0
174	175	0	0	0
175	85	0	0	0
176	271	3	3	2
177	214	11	11	2
178	177	3	3	0
179	207	2	2	0
180	181	4	4	0
total	4525	43	43	4

Total mortality of treated eggs: 99.91%.

Section B5.10.2 **Efficacy Data**

Annex Point IIB5.10 TNsG: Pt. I-B5.10, Pt. III-Ch. 6

B5.10.2/15 Anobium punctatum Laboratory study (Ref. Z15)

3.1.1	Dose/Efficacy curve	Not available from report.
3.1.2	Begin and duration of effects	A mortality of 99.05% was achieved 89 days after treatment and of 99.91% 228 days after treatment.
3.1.3	Observed effects in the post monitoring phase	No unusual effect observed.
3.2	**Effects against organisms or objects to be protected**	None reported.
3.3	**Other effects**	None reported.
3.4	**Efficacy of the reference substance**	No reference substance was used.
3.5	**Tabular and/or graphical presentation of the summarised results**	See 3.1.
3.6	**Efficacy limiting factors**	
3.6.1	Occurrences of resistances	None reported.
3.6.2	Other limiting factors	None reported.
		4 RELEVANCE OF THE RESULTS COMPARED TO FIELD CONDITIONS
4.1	**Reasons for laboratory testing**	1. Precise conditions could be determined. 2. Practical, accurate procedure. Data generated is considered relevant for field of use. Test insects obtained from the field.
4.2	**Intended actual scale of biocide application**	Not applicable.
4.3	**Relevance compared to field conditions**	Not applicable.
4.3.1	Application method	The principle of fumigation is to confine a sufficient concentration for a sufficient period of time to enable a toxic dose to be received by the target pest. There are a number of ways in laboratory and field studies to achieve this although the principle is the same.
4.3.2	Test organism	There are different life stages of *Anobium punctatum.* Eggs are considered to be the stage which would require a higher dose of sulfuryl

		fluoride compared to the other stages.
4.3.3	Observed effect	The high mortality effect, recorded in the laboratory test is considered as the desired field response for eradication of eggs of *Anobium punctatum*.
4.4	**Relevance for read-across**	Not applicable.

5 APPLICANT'S SUMMARY AND CONCLUSION

5.1	**Materials and methods**	Eggs of *Anobium punctatum* were fumigated with sulfuryl fluoride for 59 hours and 5 minutes at 17.4 °C and 46 % relative humidity in laboratory fumitoria. Bioassays from laboratory population according to EN 49.1 (1992) ("Holzschutzmittel - Bestimmung der vorbeugenden Wirkung gegenüber Anobium punctatum (De Geer) durch Beobachten der Eiablage und des Überlebens von Larven - Teil 1: Oberflächenbehandlung (Laboratoriumsverfahren)") were tested to determine LAD. Fumigant concentration was measured using a Fumiscope gas analyser. Mortality rate was evaluated 89 days and 228 days after treatment.
5.2	**Reliability**	Reliability indicator 2: Study conducted in accordance with generally accepted scientific principles, possibly with incomplete reporting or methodological deficiencies, which do not affect the quality of relevant results.
5.3	**Assessment of efficacy, data analysis and interpretation**	The result of this investigation was that under the described conditions a high level of control of *Anobium punctatum* eggs was achieved. Additional trials have to be performed to understand the variability of the dose rates of the fumigant to achieve the LAD for this specific life stage at different temperatures.
5.4	**Conclusion**	There are different life stages of *Anobium punctatum* present in infested wooden structures. The laboratory fumigation test undertaken was considered to be a valid and effective procedure for evaluating the efficacy of sulfuryl fluoride on the eggs of *A. punctatum*. The efficacy results showed that sulfuryl fluoride was highly effective on eggs of this pest species.
5.5	**Proposed efficacy specification**	Control of eggs is excellent 99.91% mortality at the evaluated LAD of 1830 g-h/m³ at a temperature of 17.4 °C and a moisture of 46 % relative humidity.

Evaluation by Competent Authorities

EVALUATION BY RAPPORTEUR MEMBER STATE

Date	October 2004.
Comments	Field 2.3.7, The following is a revised version of the present entry: The untreated controls and treated eggs were kept and stored under the same incubation conditions before and after the test fumigations. These incubation conditions were: temperature 20 C , 75% relative humidity. The conditions during fumigation is given in Table 1.4 with the untreated controls remaining under incubation conditions of 20 °C , 75% relative humidity. Field 3.1: Within the body of each table the numbers are counts and not percentages (as stated in the table legends above the tables).
Summary and conclusion	Applicant's version is adopted.

1.1 Test organisms - *Anobium punctatum*

Criteria	Details
Family	Anobiidae.
Species	*Anobium punctatum.*
Source	Laboratory population according to EN 49.1 (1992) ("Holzschutzmittel - Bestimmung der vorbeugenden Wirkung gegenüber *Anobium punctatum* (De Geer) durch Beobachten der Eiablage und des Überlebens von Larven - Teil 1: Oberflächenbehandlung (Laboratoriumsverfahren)").
Life stage	Eggs.
Mixed age population	Not applicable.
Number of eggs in test	4525.

1.2 Test system

Criteria	Details
Test chamber	Fumitoria (fumigation chambers) aluminium, 3 x 2 x 2 m = 12 m³, gas introduction via polyamide (PA) - lines 6 mm external diameter/4 mm internal diameter, gas monitoring via separate PA-lines 6 mm external diameter/4 mm internal diameter.
Test insects introduction into chamber	In total 4525 eggs on twenty boards of pine-wood (*Pinus silvestris* L.), ca. 100x40x10 mm according to EMPA ("Für Insektenversuche darf nur Kiefernsplintholz, gerade gewachsen, ohne Äste und arm an Harz verwendet werden. Mittleres Wachstum von 2.5-8 Jahrringe je cm. Der Anteil des Spätholzes an der Gesamtbreite der Jahrringe soll 30% nicht überschreiten. Das Holz darf weder chemisch behandelt noch geflößt oder mit Wärme behandelt sein; es muss lufttrocken und nicht länger als 5 Jahre gelagert sein.").

Measuring equipment	Gas concentrations were verified upon initiation, periodically during fumigation and upon termination using a Fumiscope gas analyser.

1.3 Application of test substance

Criteria	Details
Application procedure	Sulfuryl fluoride was supplied in commercial steel cylinders as liquid under pressure. It was introduced into the fumitorium in its gaseous form.
Delivery method	Sulfuryl fluoride was made available for introduction into the fumitorium by using a heat-exchanger-system. Exact amounts of sulfuryl fluoride were transferred from the cylinder to the fumatorium using a digital scale. Gas was mixed as it was injected into the fumatorium using a fan inside the fumitorium.
Dosage rate	Eggs All eggs were fumigated at a mean concentration of 31.0 g/m^3 for a total exposure period of 59 hours and 5 minutes leading to an accumulated dosage of 1830 g-h/m^3.

1.4 Test conditions

Criteria	Details
Incubation temperature	Fumigation was conducted at an average temperature of 17.4 ^oC.
Moisture	Fumigation was conducted at an average 46 % relative humidity.

Section B5.10.2 Efficacy Data

Annex Point IIB5.10
TNsG: Pt. I-B5.10, Pt. III-Ch. 6

B5.10.2/16 Anobium punctatum Laboratory study (Ref. Z16)

			Official use only
		1 REFERENCE: Z16, B5.10.2/16	
1.1	**Reference**	[1]Binker, G., [1]Binker, J., [1]Fröba G., [2]Graf, E. and [2]Lanz, B (1997). [1]Binker Materialschutz GmbH, Westendstr. 3, D-91207 Lauf, Germany [2]EMPA, Swiss Federal Laboratories for Materials Testing and Research Lerchenfeldstr. 5, CH-9014 St. Gallen, Switzerland. Laboratory study on *Anobium punctatum* Number: 125749/C and 125749/E (Bioassay 181 – 200).	
1.2	**Data protection**	Yes.	
1.2.1	Data owner	Dow AgroSciences LLC.	
1.2.2	Companies with letter of Access	None.	
1.2.3	Criteria for data protection	Data submitted to the MS after 13 May 2000 on existing b.p. for the purpose of its entry into Annex I	
1.3	**Guideline study**	The study was undertaken on the basis of sound principles of fumigation practice.	
1.4	**Deviations**	Not applicable as the study not conducted to an international standard method.	
		2 METHOD	
2.1	**Test Substance (Biocidal Product)**	Sulfuryl fluoride.	
2.1.1	Trade name/ proposed trade name	Vikane.	
2.1.2	Composition of Product tested	> 99% Sulfuryl fluoride.	
2.1.3	Physical state and nature	Fumigant.	
2.1.4	Monitoring of active substance concentration	Monitoring was undertaken using a Fumiscope gas analyser.	
2.1.5	Method of analysis	Not applicable.	
2.2	**Reference substance**	No reference substance was included in the study.	
2.2.1	Method of analysis for reference substance	Not applicable.	
2.3	**Testing procedure**		
2.3.1	Test population / inoculum / test organism	See Table 1.1.	

Section B5.10.2 **Efficacy Data**

Annex Point IIB5.10
TNsG: Pt. I-B5.10,
Pt. III-Ch. 6

B5.10.2/16 Anobium punctatum Laboratory study (Ref. Z16)

2.3.2	Test system	See Table 1.2.	
2.3.3	Application of TS	See Table 1.3.	
2.3.4	Test conditions	See Table 1.4.	
2.3.5	Duration of the test / Exposure time	62 hours and 57 minutes.	
2.3.6	Number of replicates performed	One.	
2.3.7	Controls	Untreated controls were included, these were kept and stored under the same conditions as the treated eggs of *Anobium punctatum*.	X
2.4	**Examination**		
2.4.1	Effect investigated	Lethal accumulated dosage (LAD) expressed as g-h/m^3. Two effects were determined – LAD 89 days after treatment and LAD 228 days after treatment.	
2.4.2	Method for recording / scoring of the effect	Egg-mortality by examination (count) of larvae hatched from treated eggs 89 days after treatment and surving of these larvae 139 days later (i.e. 228 days after treatment).	
2.4.3	Intervals of examination	Larvae hatched from treated eggs 89 days after treatment and larvae survival 228 days after treatment.	
2.4.4	Statistics	Post fumigation mean total mortality was calculated by dividing the number of dead eggs by the total number of treated eggs 89 days after treatment and 228 days after treatment.	
2.4.5	Post fumigation monitoring of the test organism	See 2.4.4.	
		3 RESULTS	
3.1	**Efficacy**	The percentage mortality was calculated by dividing the total number of hatched and surviving larvae by the total number of treated eggs.	X

Percentage mortality of eggs of *Anobium punctatum* 89 days after exposure to sulfuryl fluoride.

A	Untreated Control			
No.	Eggs	Larvae hatched	Larvae penetrated	Dead larvae
141	150	120	120	0
142	91	87	87	0
143	113	107	107	0
144	101	99	99	0
145	143	134	134	0
146	438	427	427	0
147	103	96	96	0
148	135	126	126	0
149	237	227	227	0
150	107	92	92	0
total	1618	1515	1515	0

Total mortality of untreated eggs 6.37%.

B	Treated Eggs			
No.	Eggs	Larvae hatched	Larvae penetrated	Dead larvae
181	152	0	0	0
182	227	3	3	0
183	359	2	2	0
184	242	0	0	0
185	200	1	1	0
186	196	4	4	0
187	316	1	1	0
188	203	0	0	0
189	228	0	0	0
190	215	0	0	0
191	346	14	14	0
192	229	1	1	0
193	264	0	0	0
194	251	1	1	0
195	282	6	6	0
196	291	1	1	0
197	90	1	1	0
198	289	5	5	0
199	255	6	6	0
200	213	3	3	0
total	4848	49	49	0

Total mortality of treated eggs: 98.99%.

Percentage mortality of eggs of *Anobium punctatum* 228 days after exposure to sulfuryl fluoride.

A	Untreated Control			
No.	Eggs	Larvae hatched	Larvae penetrated	Larvae survived
141	150	120	120	95
142	91	87	87	49
143	113	107	107	86
144	101	99	99	78
145	143	134	134	104
146	438	427	427	321
147	103	96	96	86
148	135	126	126	79
149	237	227	227	119
150	107	92	92	55
total	1618	1515	1515	1072

Total mortality of untreated eggs: 33.75%.

B	Treated Eggs			
No.	Eggs	Larvae hatched	Larvae penetrated	Larvae survived
181	152	0	0	0
182	227	3	3	0
183	359	2	2	0
184	242	0	0	0
185	200	1	1	1
186	196	4	4	0
187	316	1	1	0
188	203	0	0	0
189	228	0	0	0
190	215	0	0	0
191	346	14	14	0
192	229	1	1	0
193	264	0	0	0
194	251	1	1	0
195	282	6	6	0
196	291	1	1	0
197	90	1	1	0
198	289	5	5	0
199	255	6	6	1
200	213	3	3	1
total	4848	49	49	3

Total mortality of treated eggs: 99.94%.

Section B5.10.2 **Efficacy Data**

Annex Point IIB5.10
TNsG: Pt. I-B5.10, Pt. III-Ch. 6

B5.10.2/16 Anobium punctatum Laboratory study (Ref. Z16)

3.1.1	Dose/Efficacy curve	Not available from report.
3.1.2	Begin and duration of effects	A mortality of 98.99% was achieved 89 days after treatment and of 99.94% 228 days after treatment.
3.1.3	Observed effects in the post monitoring phase	No unusual effect observed.
3.2	**Effects against organisms or objects to be protected**	None reported.
3.3	**Other effects**	None reported.
3.4	**Efficacy of the reference substance**	No reference substance was used.
3.5	**Tabular and/or graphical presentation of the summarised results**	See 3.1.
3.6	**Efficacy limiting factors**	
3.6.1	Occurrences of resistances	None reported.
3.6.2	Other limiting factors	None reported.
		4 RELEVANCE OF THE RESULTS COMPARED TO FIELD CONDITIONS
4.1	**Reasons for laboratory testing**	1 Precise conditions could be determined. 2 Practical, accurate procedure. Data generated is considered relevant for field of use. Test insects obtained from the field.
4.2	**Intended actual scale of biocide application**	Not applicable.
4.3	**Relevance compared to field conditions**	
4.3.1	Application method	The principle of fumigation is to confine a sufficient concentration for a sufficient period of time to enable a toxic dose to be received by the target pest. There are a number of ways in laboratory and field studies to achieve this although the principle is the same.
4.3.2	Test organism	There are different life stages of *Anobium punctatum.* Eggs are considered to be the stage which would require a higher dose of sulfuryl

		fluoride compared to the other stages.
4.3.3	Observed effect	The high mortality effect, recorded in the laboratory test is considered as the desired field response for eradication of eggs of *Anobium punctatum*.
4.4	**Relevance for read-across**	Not applicable.

5 APPLICANT'S SUMMARY AND CONCLUSION

5.1	**Materials and methods**	Eggs of *Anobium punctatum* were fumigated with sulfuryl fluoride for 62 hours and 57 minutes at 17.7 °C and 46 % relative humidity in laboratory fumitoria. Bioassays from laboratory population according to EN 49.1 (1992) ("Holzschutzmittel - Bestimmung der vorbeugenden Wirkung gegenüber Anobium punctatum (De Geer) durch Beobachten der Eiablage und des Überlebens von Larven - Teil 1: Oberflächenbehandlung (Laboratoriumsverfahren)") were tested to determine LAD. Fumigant concentration was measured using a Fumiscope gas analyser. Mortality rate was evaluated 89 days and 228 days after treatment.
5.2	**Reliability**	Reliability indicator 2: Study conducted in accordance with generally accepted scientific principles, possibly with incomplete reporting or methodological deficiencies, which do not affect the quality of relevant results.
5.3	**Assessment of efficacy, data analysis and interpretation**	The result of this investigation was that under the described conditions a high level of control of *Anobium punctatum* eggs was achieved. Additional trials have to be performed to understand the variability of the dose rates of the fumigant to achieve the LAD for this specific life stage at different temperatures.
5.4	**Conclusion**	There are different life stages of *Anobium punctatum* present in infested wooden structures. The laboratory fumigation test undertaken was considered to be a valid and effective procedure for evaluating the efficacy of sulfuryl fluoride on the eggs of *A. punctatum*. The efficacy results showed that sulfuryl fluoride was highly effective on eggs of this pest species.
5.5	**Proposed efficacy specification**	Control of eggs is excellent 99.91% mortality at the evaluated LAD of 1951 g-h/m³ at a temperature of 17.7 °C and a moisture of 46 % relative humidity.

Evaluation by Competent Authorities

EVALUATION BY RAPPORTEUR MEMBER STATE

Date	October 2004.
Comments	Field 2.3.7, The following is a revised version of the present entry: The untreated controls and treated eggs were kept and stored under the same incubation conditions before and after the test fumigations. These incubation conditions were: temperature 20 C , 75% relative humidity. The conditions during fumigation is given in Table 1.4 with the untreated controls remaining under incubation conditions of 20 °C , 75% relative humidity. Field 3.1: Within the body of each table the numbers are counts and not percentages (as stated in the table legends above the tables).
Summary and conclusion	Applicant's version is accepted.

1.1 Test organisms - *Anobium punctatum*

Criteria	Details
Family	Anobiidae.
Species	*Anobium punctatum.*
Source	Laboratory population according to EN 49.1 (1992) ("Holzschutzmittel - Bestimmung der vorbeugenden Wirkung gegenüber *Anobium punctatum* (De Geer) durch Beobachten der Eiablage und des Überlebens von Larven - Teil 1: Oberflächenbehandlung (Laboratoriumsverfahren)").
Life stage	Eggs.
Mixed age population	Not applicable.
Number of eggs in test	4848.

1.2 Test system

Criteria	Details
Test chamber	Fumitoria (fumigation chambers) aluminium, 3 x 2 x 2 m = 12 m³, gas introduction via polyamide (PA) - lines 6 mm external diameter/4 mm internal diameter, gas monitoring via separate PA-lines 6 mm external diameter/4 mm internal diameter.
Test insects introduction into chamber	In total 4848 eggs on twenty boards of pine-wood (*Pinus silvestris* L.), ca. 100x40x10 mm according to EMPA ("Für Insektenversuche darf nur Kiefernsplintholz, gerade gewachsen, ohne Äste und arm an Harz verwendet werden. Mittleres Wachstum von 2.5-8 Jahrringe je cm. Der Anteil des Spätholzes an der Gesamtbreite der Jahrringe soll 30% nicht überschreiten. Das Holz darf weder chemisch behandelt noch geflößt oder mit Wärme behandelt sein; es muss lufttrocken und nicht länger als 5 Jahre gelagert sein.").

Measuring equipment	Gas concentrations were verified upon initiation, periodically during fumigation and upon termination using a Fumiscope gas analyser.

1.3 Application of test substance

Criteria	Details
Application procedure	Sulfuryl fluoride was supplied in commercial steel cylinders as liquid under pressure. It was introduced into the fumitorium in its gaseous form.
Delivery method	Sulfuryl fluoride was made available for introduction into the fumitorium by using a heat-exchanger-system. Exact amounts of sulfuryl fluoride were transferred from the cylinder to the fumatorium using a digital scale. Gas was mixed as it was injected into the fumatorium using a fan inside the fumitorium.
Dosage rate	<u>Eggs</u> All eggs were fumigated at a mean concentration of 31.0 g/m^3 for a total exposure period of 62 hours and 57 minutes leading to an accumulated dosage of 1951 $g\text{-}h/m^3$.

1.4 Test conditions

Criteria	Details
Incubation temperature	Fumigation was conducted at an average temperature of 17.7 ^oC.
Moisture	Fumigation was conducted at an average 46 % relative humidity.

Section B5.10.2 Efficacy Data

Annex Point IIB5.10
TNsG: Pt. I-B5.10, Pt. III-Ch. 6

B5.10.2/17 Anobium punctatum Field study (Ref. Z17)

			Official use only
		1 REFERENCE: Z17, B5.10.2/17	
1.1	**Reference**	[1]Binker, G., [1]Binker, J., [1]Fröba G., [2]Graf, E. and [2]Lanz, B (2000). [1]Binker Materialschutz GmbH, Westendstr. 3, D-91207 Lauf, Germany [2]EMPA, Swiss Federal Laboratories for Materials Testing and Research Lerchenfeldstr. 5, CH-9014 St. Gallen, Switzerland. Laboratory study on *Anobium punctatum* Number: 402741/A and 402741/B (Bioassay 1 – 60).	X
1.2	**Data protection**	Yes.	
1.2.1	Data owner	Dow AgroSciences LLC.	
1.2.2	Companies with letter of Access	None.	
1.2.3	Criteria for data protection	Data submitted to the MS after 13 May 2000 on existing b.p. for the purpose of its entry into Annex I	
1.3	**Guideline study**	The study was undertaken on the basis of sound principles of fumigation practice.	
1.4	**Deviations**	Not applicable as the study not conducted to an international standard method.	
		2 METHOD	
2.1	**Test Substance (Biocidal Product)**	Sulfuryl fluoride.	
2.1.1	Trade name/ proposed trade name	Vikane.	
2.1.2	Composition of Product tested	> 99% Sulfuryl fluoride.	
2.1.3	Physical state and nature	Fumigant.	
2.1.4	Monitoring of active substance concentration	Monitoring was undertaken using a Fumiscope gas analyser.	
2.1.5	Method of analysis	Not applicable.	
2.2	**Reference substance**	No reference substance was included in the study.	
2.2.1	Method of analysis for reference substance	Not applicable.	
2.3	**Testing procedure**		
2.3.1	Test population / inoculum /	See Table 1.1.	

	test organism		
2.3.2	Test system	See Table 1.2.	
2.3.3	Application of TS	See Table 1.3.	
2.3.4	Test conditions	See Table 1.4.	
2.3.5	Duration of the test / Exposure time	72 hours and 25 minutes.	
2.3.6	Number of replicates performed	One.	
2.3.7	Controls	Untreated controls were included; these were kept and stored under the same conditions as the treated eggs of *Anobium punctatum*.	X
2.4	**Examination**		
2.4.1	Effect investigated	Lethal accumulated dosage (LAD) expressed as g-h/m^3. Two effects were determined – LAD 90 days after treatment and LAD 221 days after treatment.	
2.4.2	Method for recording / scoring of the effect	Egg-mortality by examination (count) of larvae hatched from treated eggs 90 days after treatment and survival of these larvae 131 days later (i.e. 221 days after treatment).	
2.4.3	Intervals of examination	Larvae hatched from treated eggs 90 days after treatment and larvae survival 221 days after treatment.	
2.4.4	Statistics	Post fumigation mean total mortality was calculated by dividing the number of dead eggs by the total number of treated eggs 90 days after treatment and 221 days after treatment.	
2.4.5	Post fumigation monitoring of the test organism	See 2.4.4.	
		3 RESULTS	
3.1	**Efficacy**	The percentage mortality was calculated by dividing the total number of hatched and surviving larvae by the total number of treated eggs.	X

Percentage mortality of eggs of *Anobium punctatum* 90 days after exposure to sulfuryl fluoride.

A	Untreated Control			
No.	Eggs	Larvae hatched	Larvae penetrated	Dead larvae
1	83	80	80	0
2	241	233	233	0
3	81	74	74	0
4	119	115	115	0
5	60	58	58	0
6	105	95	95	0
7	98	96	96	0
8	54	54	54	0
9	54	53	53	0
10	136	133	133	0
total	1031	991	991	0

Total mortality of untreated eggs 3.88 %.

B	Treated Eggs			
No.	Eggs	Larvae hatched	Larvae penetrated	Dead larvae
11	138	0	0	0
12	220	0	0	0
13	71	1	1	0
14	205	0	0	0
15	187	0	0	0
16	199	0	0	0
17	273	1	1	0
18	228	0	0	0
19	241	0	0	0
20	96	0	0	0
21	91	0	0	0
22	198	0	0	0
23	223	0	0	0
24	105	0	0	0
25	152	0	0	0
26	85	0	0	0
27	197	0	0	0
28	163	0	0	0
34	219	0	0	0
35	191	0	0	0
36	158	0	0	0
37	211	0	0	0
38	131	0	0	0
39	158	0	0	0
40	93	2	2	0
41	234	4	4	0
42	157	0	0	0
43	319	1	1	0
44	104	0	0	0

45	232	0	0	0
46	281	2	2	0
47	95	0	0	0
48	106	0	0	0
49	60	0	0	0
50	118	1	1	0
51	108	0	0	0
52	175	0	0	0
53	88	0	0	0
54	128	2	2	0
55	266	0	0	0
56	201	0	0	0
57	207	1	1	0
58	223	1	1	0
59	249	0	0	0
60	214	0	0	0
total	7798	16	16	0

Total mortality of treated eggs: 99.79 %.

Percentage mortality of eggs of *Anobium punctatum* 221 days after exposure to sulfuryl fluoride.

A	Untreated Control			
No.	Eggs	Larvae hatched	Larvae penetrated	Larvae survived
1	83	80	80	78
2	241	233	233	198
3	81	74	74	74
4	119	115	115	109
5	60	58	58	58
6	105	95	95	93
7	98	96	96	95
8	54	54	54	54
9	54	53	53	53
10	136	133	133	127
total	1031	991	991	939

Total mortality of untreated eggs: 8.92 %.

B	Treated Eggs			
No.	Eggs	Larvae hatched	Larvae penetrated	Larvae survived
11	138	0	0	0
12	220	0	0	0
13	71	1	1	0
14	205	0	0	0
15	187	0	0	0
16	199	0	0	0
17	273	1	1	0
18	228	0	0	0

19	241	0	0	0
20	96	0	0	0
21	91	0	0	0
22	198	0	0	0
23	223	0	0	0
24	105	0	0	0
25	152	0	0	0
26	85	0	0	0
27	197	0	0	0
28	163	0	0	0
34	219	0	0	0
35	191	0	0	0
36	158	0	0	0
37	211	0	0	0
38	131	0	0	0
39	158	0	0	0
40	93	2	2	0
41	234	4	4	0
42	157	0	0	0
43	319	1	1	0
44	104	0	0	0
45	232	0	0	0
46	281	2	2	0
47	95	0	0	0
48	106	0	0	0
49	60	0	0	0
50	118	1	1	0
51	108	0	0	0
52	175	0	0	0
53	88	0	0	0
54	128	2	2	0
55	266	0	0	0
56	201	0	0	0
57	207	1	1	0
58	223	1	1	0
59	249	0	0	0
60	214	0	0	0
total	7798	16	16	0

Total mortality of treated eggs: 100 %.

Section B5.10.2 Efficacy Data

Annex Point IIB5.10
TNsG: Pt. I-B5.10, Pt. III-Ch. 6

B5.10.2/17 Anobium punctatum Field study (Ref. Z17)

3.1.1	Dose/Efficacy curve	Not available from report.
3.1.2	Begin and duration of effects	A mortality of 99.79 % was achieved 90 days after treatment and of 100 % 221 days after treatment.
3.1.3	Observed effects in the post monitoring phase	No unusual effect observed.
3.2	**Effects against organisms or objects to be protected**	None reported.
3.3	**Other effects**	None reported.
3.4	**Efficacy of the reference substance**	No reference substance was used.
3.5	**Tabular and/or graphical presentation of the summarised results**	See 3.1.
3.6	**Efficacy limiting factors**	
3.6.1	Occurrences of resistances	None reported.
3.6.2	Other limiting factors	None reported.
	4 RELEVANCE OF THE RESULTS COMPARED TO FIELD CONDITIONS	
4.1	**Reasons for laboratory testing**	Not applicable.
4.2	**Intended actual scale of biocide application**	Not applicable.
4.3	**Relevance compared to field conditions**	Not applicable.
4.3.1	Application method	Not applicable.
4.3.2	Test organism	Not applicable.
4.3.3	Observed effect	Not applicable.
4.4	**Relevance for read-across**	Not applicable.

Section B5.10.2 Efficacy Data

Annex Point IIB5.10
TNsG: Pt. I-B5.10, Pt. III-Ch. 6

B5.10.2/17 Anobium punctatum Field study (Ref. Z17)

5 APPLICANT'S SUMMARY AND CONCLUSION

5.1	**Materials and methods**	Eggs of *Anobium punctatum* were fumigated with sulfuryl fluoride for 72 hours and 25 minutes at 19.1 ^{o}C in a practical fumigation under field condition (church of a volume of 460 m³). Bioassays from laboratory population according to EN 49.1 (1992) ("Holzschutzmittel - Bestimmung der vorbeugenden Wirkung gegenüber Anobium punctatum (De Geer) durch Beobachten der Eiablage und des Überlebens von Larven - Teil 1: Oberflächenbehandlung (Laboratoriumsverfahren)") were tested to determine LAD. Fumigant concentration was measured using a Fumiscope gas analyser. Mortality rate was evaluated 90 days and 221 days after treatment.
5.2	**Reliability**	Reliability indicator 2: Study conducted in accordance with generally accepted scientific principles, possibly with incomplete reporting or methodological deficiencies, which do not affect the quality of relevant results.
5.3	**Assessment of efficacy, data analysis and interpretation**	The result of this investigation was that under the described conditions a high level of control of *Anobium punctatum* eggs was achieved. Additional trials have to be performed to understand the variability of the dose rates of the fumigant to achieve the LAD for this specific life stage at different temperatures.
5.4	**Conclusion**	There are different life stages of *Anobium punctatum* present in infested wooden structures. The field fumigation test undertaken was considered to be a valid and effective procedure for evaluating the efficacy of sulfuryl fluoride on the eggs of *A. punctatum*. The efficacy results showed that sulfuryl fluoride was highly effective on eggs of this pest species.
5.5	**Proposed efficacy specification**	Control of eggs is excellent 100 % mortality at the evaluated LAD of 2237 g-h/m³ at a temperature of 19.1 °C and 79 % relative humidity.

Evaluation by Competent Authorities

EVALUATION BY RAPPORTEUR MEMBER STATE

Date	October 2004.
Comments	Field 1.1. Second last line should read: Field study on *Anobium punctatum*…
	Field 2.3.7, The following is a revised version of the present entry: The untreated controls and treated eggs were kept and stored under the same incubation conditions before and after the test fumigations. These incubation conditions were: temperature 20 C , 75% relative humidity. The conditions during fumigation is given in Table 1.4 with the untreated controls remaining under incubation conditions of 20 °C , 75% relative humidity.
	Field 3.1: Within the body of each table the numbers are counts and not percentages (as stated in the table legends above the tables).
Summary and conclusion	Applicant's version is adopted.

1.1 Test organisms - *Anobium punctatum*

Criteria	Details
Family	Anobiidae.
Species	*Anobium punctatum.*
Source	Laboratory population according to EN 49.1 (1992) ("Holzschutzmittel - Bestimmung der vorbeugenden Wirkung gegenüber *Anobium punctatum* (De Geer) durch Beobachten der Eiablage und des Überlebens von Larven - Teil 1: Oberflächenbehandlung (Laboratoriumsverfahren)").
Life stage	Eggs.
Mixed age population	Not applicable.
Number of eggs in test	7798.

1.2 Test system

Criteria	Details
Test chamber	Fumigation was carried out under field conditions in a typical Bavarian church in Germany (volume: 460 m^3). Gas introduction via polyamide (PA) lines 6 mm external diameter 4 mm internal diameter, gas monitoring via separate PA-lines 6 mm external diameter/4 mm internal diameter.
Test insects introduction into chamber	In total 7881 eggs on 45 boards of pine-wood (*Pinus silvestris* L.), ca. 100x40x10 mm according to EMPA ("Für Insektenversuche darf nur Kiefernsplintholz, gerade gewachsen, ohne Äste und arm an Harz verwendet werden. Mittleres Wachstum von 2.5-8 Jahrringe je cm. Der Anteil des Spätholzes an der Gesamtbreite der Jahrringe soll 30% nicht überschreiten. Das Holz darf weder chemisch behandelt noch geflößt oder mit Wärme behandelt sein; es muss lufttrocken und nicht länger als 5 Jahre gelagert sein.").
Measuring equipment	Gas concentrations were verified upon initiation, periodically during fumigation and upon termination using a Fumiscope gas analyser.

1.3 Application of test substance

Criteria	Details
Application procedure	Sulfuryl fluoride was supplied in commercial steel cylinders as liquid under pressure. It was introduced into the structure in its gaseous form.
Delivery method	Sulfuryl fluoride was made available for introduction into the structure by using a heat-exchanger-system. Exact amounts of sulfuryl fluoride were transferred from the cylinder to the structure using a digital scale. Gas was mixed as it was injected using a fan positioned in the structure.
Dosage rate	Eggs All eggs were fumigated at a mean concentration of 30.9 g/m^3 for a total exposure period of 72 hours and 25 minutes leading to an accumulated dosage of 2237 $g\text{-}h/m^3$.

1.4 Test conditions

Criteria	Details
Incubation temperature	Fumigation was conducted at an average temperature of 19.1 ^oC.
Moisture	Fumigation was conducted at an average 79 % relative humidity.

Section B5.10.2 Efficacy Data

Annex Point IIB5.10
TNsG: Pt. I-B5.10, Pt. III-Ch. 6

B5.10.2/18 Anobium punctatum Field study (Ref. Z18)

			Official use only
		1 REFERENCE: Z18, B5.10.2/18	
1.1	**Reference**	[1]Binker, G., [1]Binker, J., [1]Fröba G., [2]Graf, E. and [2]Lanz, B (2000). [1]Binker Materialschutz GmbH, Westendstr. 3, D-91207 Lauf, Germany [2]EMPA, Swiss Federal Laboratories for Materials Testing and Research Lerchenfeldstr. 5, CH-9014 St. Gallen, Switzerland. Field study on *Anobium punctatum* Number: 402741/A and 402741/B (Bioassay 61 – 120).	
1.2	**Data protection**	Yes.	
1.2.1	Data owner	Dow AgroSciences LLC.	
1.2.2	Companies with letter of Access	None.	
1.2.3	Criteria for data protection	Data submitted to the MS after 13 May 2000 on existing b.p. for the purpose of its entry into Annex I	
1.3	**Guideline study**	The study was undertaken on the basis of sound principles of fumigation practice.	
1.4	**Deviations**	Not applicable as the study not conducted to an international standard method.	
		2 METHOD	
2.1	**Test Substance (Biocidal Product)**	Sulfuryl fluoride.	
2.1.1	Trade name/ proposed trade name	Vikane.	
2.1.2	Composition of Product tested	> 99% Sulfuryl fluoride.	
2.1.3	Physical state and nature	Fumigant.	
2.1.4	Monitoring of active substance concentration	Monitoring was undertaken using a Fumiscope gas analyser.	
2.1.5	Method of analysis	Not applicable.	
2.2	**Reference substance**	No reference substance was included in the study.	
2.2.1	Method of analysis for reference substance	Not applicable.	
2.3	**Testing procedure**		
2.3.1	Test population / inoculum /	See Table 1.1.	

	test organism		
2.3.2	Test system	See Table 1.2.	
2.3.3	Application of TS	See Table 1.3.	
2.3.4	Test conditions	See Table 1.4.	
2.3.5	Duration of the test / Exposure time	72 hours and 25 minutes.	
2.3.6	Number of replicates performed	One.	
2.3.7	Controls	Untreated controls were included, these were kept and stored under the same conditions as the treated eggs of *Anobium punctatum*.	X
2.4	**Examination**		
2.4.1	Effect investigated	Lethal accumulated dosage (LAD) expressed as g-h/m^3. Two effects were determined – LAD 90 days after treatment and LAD 221 days after treatment.	
2.4.2	Method for recording / scoring of the effect	Egg-mortality by examination (count) of larvae hatched from treated eggs 90 days after treatment and survival of these larvae 131 days later (i.e. 221 days after treatment).	
2.4.3	Intervals of examination	Larvae hatched from treated eggs 90 days after treatment and larvae survival 221 days after treatment.	
2.4.4	Statistics	Post fumigation mean total mortality was calculated by dividing the number of dead eggs by the total number of treated eggs 90 days after treatment and 221 days after treatment.	
2.4.5	Post fumigation monitoring of the test organism	See 2.4.4.	
		3 RESULTS	
3.1	**Efficacy**	The percentage mortality was calculated by dividing the total number of hatched and surviving larvae by the total number of treated eggs.	X

Percentage mortality of eggs of *Anobium punctatum* 90 days after exposure to sulfuryl fluoride.

A	Untreated Control			
No.	Eggs	Larvae hatched	Larvae penetrated	Dead larvae
61	92	90	90	0
62	201	190	190	0
63	292	262	262	0
64	143	93	93	0
65	182	180	180	0
66	85	80	80	0

67	64	60	60	0
68	162	154	154	0
69	52	35	35	0
70	69	57	57	0
total	1342	1201	1201	0

Total mortality of untreated eggs 10.51 %.

B	Treated Eggs			
No.	Eggs	Larvae hatched	Larvae penetrated	Dead larvae
71	136	0	0	0
72	126	0	0	0
73	307	44	44	0
74	95	1	1	0
75	123	0	0	0
76	65	1	1	0
77	84	1	1	0
78	70	0	0	0
79	147	0	0	0
80	211	0	0	0
81	231	0	0	0
82	118	0	0	0
83	143	0	0	0
84	215	0	0	0
85	166	0	0	0
86	246	0	0	0
87	321	0	0	0
88	61	0	0	0
89	155	0	0	0
90	190	0	0	0
91	87	0	0	0
92	240	2	2	0
93	109	0	0	0
94	77	0	0	0
95	91	0	0	0
96	162	0	0	0
102	126	0	0	0
103	78	0	0	0
104	193	0	0	0
105	133	0	0	0
106	144	0	0	0
107	87	0	0	0
108	140	0	0	0
109	143	0	0	0
110	78	0	0	0
111	167	0	0	0
112	104	0	0	0
113	228	1	1	0
114	149	0	0	0
115	98	0	0	0

116	81	0	0	0
117	76	0	0	0
118	191	0	0	0
119	84	0	0	0
120	222	0	0	0
total	6498	50	50	0

Total mortality of treated eggs: 99.23 %.

Percentage mortality of eggs of *Anobium punctatum* 221 days after exposure to sulfuryl fluoride.

A	Untreated Control			
No.	Eggs	Larvae hatched	Larvae penetrated	Larvae survived
61	92	90	90	87
62	201	190	190	158
63	292	262	262	249
64	143	93	93	90
65	182	180	180	175
66	85	80	80	79
67	64	60	60	60
68	162	154	154	151
69	52	35	35	35
70	69	57	57	57
total	1342	1201	1201	1141

Total mortality of untreated eggs: 14.98%.

B	Treated Eggs			
No.	Eggs	Larvae hatched	Larvae penetrated	Larvae survived
71	136	0	0	0
72	126	0	0	0
73	307	44	44	0
74	95	1	1	0
75	123	0	0	0
76	65	1	1	0
77	84	1	1	0
78	70	0	0	0
79	147	0	0	0
80	211	0	0	0
81	231	0	0	0
82	118	0	0	0
83	143	0	0	0
84	215	0	0	0
85	166	0	0	0
86	246	0	0	0
87	321	0	0	0
88	61	0	0	0
89	155	0	0	0
90	190	0	0	0

91	87	0	0	0
92	240	2	2	0
93	109	0	0	0
94	77	0	0	0
95	91	0	0	0
96	162	0	0	0
102	126	0	0	0
103	78	0	0	0
104	193	0	0	0
105	133	0	0	0
106	144	0	0	0
107	87	0	0	0
108	140	0	0	0
109	143	0	0	0
110	78	0	0	0
111	167	0	0	0
112	104	0	0	0
113	228	1	1	0
114	149	0	0	0
115	98	0	0	0
116	81	0	0	0
117	76	0	0	0
118	191	0	0	0
119	84	0	0	0
120	222	0	0	0
total	6498	50	50	0

Total mortality of treated eggs: 100 %.

Section B5.10.2 **Efficacy Data**

Annex Point IIB5.10
TNsG: Pt. I-B5.10, Pt. III-Ch. 6

B5.10.2/18 Anobium punctatum
Field study (Ref. Z18)

3.1.1	Dose/Efficacy curve	Not available from report.
3.1.2	Begin and duration of effects	A mortality of 99.23 % was achieved 90 days after treatment and of 100% 221 days after treatment.
3.1.3	Observed effects in the post monitoring phase	No unusual effect observed.
3.2	**Effects against organisms or objects to be protected**	None reported.
3.3	**Other effects**	None reported.
3.4	**Efficacy of the reference substance**	No reference substance was used.
3.5	**Tabular and/or graphical presentation of the summarised results**	See 3.1.
3.6	**Efficacy limiting factors**	
3.6.1	Occurrences of resistances	None reported.
3.6.2	Other limiting factors	None reported.
	4 RELEVANCE OF THE RESULTS COMPARED TO FIELD CONDITIONS	
4.1	**Reasons for laboratory testing**	Not applicable.
4.2	**Intended actual scale of biocide application**	Not applicable.
4.3	**Relevance compared to field conditions**	Not applicable.
4.3.1	Application method	Not applicable.
4.3.2	Test organism	Not applicable.
4.3.3	Observed effect	Not applicable.
4.4	**Relevance for read-across**	Not applicable.

Section B5.10.2 Efficacy Data

Annex Point IIB5.10
TNsG: Pt. I-B5.10, Pt. III-Ch. 6

B5.10.2/18 Anobium punctatum Field study (Ref. Z18)

5 APPLICANT'S SUMMARY AND CONCLUSION

5.1	**Materials and methods**	Eggs of *Anobium punctatum* were fumigated with sulfuryl fluoride for 72 hours and 25 minutes at 19.1 ^{o}C in a practical fumigation under field condition (church of a volume of 460 m³). Bioassays from laboratory population according to EN 49.1 (1992) ("Holzschutzmittel - Bestimmung der vorbeugenden Wirkung gegenüber Anobium punctatum (De Geer) durch Beobachten der Eiablage und des Überlebens von Larven - Teil 1: Oberflächenbehandlung (Laboratoriumsverfahren)") were tested to determine LAD. Fumigant concentration was measured using a Fumiscope gas analyser. Mortality rate was evaluated 90 days and 221 days after treatment.
5.2	**Reliability**	Reliability indicator 2: Study conducted in accordance with generally accepted scientific principles, possibly with incomplete reporting or methodological deficiencies, which do not affect the quality of relevant results.
5.3	**Assessment of efficacy, data analysis and interpretation**	The result of this investigation was that under the described conditions a high level of control of *Anobium punctatum* eggs was achieved. Additional trials have to be performed to understand the variability of the dose rates of the fumigant to achieve the LAD for this specific life stage at different temperatures.
5.4	**Conclusion**	There are different life stages of *Anobium punctatum* present in infested wooden structures. The field fumigation test undertaken was considered to be a valid and effective procedure for evaluating the efficacy of sulfuryl fluoride on the eggs of *A. punctatum*. The efficacy results showed that sulfuryl fluoride was highly effective on eggs of this pest species.
5.5	**Proposed efficacy specification**	Control of eggs is excellent 100 % mortality at the evaluated LAD of 2237 g-h/m³ at a temperature of 19.1 °C and 79 % relative humidity.

Evaluation by Competent Authorities

EVALUATION BY RAPPORTEUR MEMBER STATE

Date	October 2004.
Comments	Field 2.3.7, The following is a revised version of the present entry: The untreated controls and treated eggs were kept and stored under the same incubation conditions before and after the test fumigations. These incubation conditions were: temperature 20 C , 75% relative humidity. The conditions during fumigation is given in Table 1.4 with the untreated controls remaining under incubation conditions of 20 °C , 75% relative humidity. Field 3.1: Within the body of each table the numbers are counts and not percentages (as stated in the table legend above the tables).
Summary and conclusion	Applicant's version is adopted.

1.1 Test organisms - *Anobium punctatum*

Criteria	Details
Family	Anobiidae.
Species	*Anobium punctatum.*
Source	Laboratory population according to EN 49.1 (1992) ("Holzschutzmittel - Bestimmung der vorbeugenden Wirkung gegenüber *Anobium punctatum* (De Geer) durch Beobachten der Eiablage und des Überlebens von Larven - Teil 1: Oberflächenbehandlung (Laboratoriumsverfahren)").
Life stage	Eggs.
Mixed age population	Not applicable.
Number of eggs in test	6498.

1.2 Test system

Criteria	Details
Test chamber	Fumigation was carried out under field conditions in a typical Bavarian church in Germany (volume: 460 m^3). Gas introduction via polyamide (PA) lines 6 mm external diameter 4 mm internal diameter, gas monitoring via separate PA-lines 6 mm external diameter/4 mm internal diameter.
Test insects introduction into chamber	In total 6498 eggs on fifty boards of pine-wood (*Pinus silvestris* L.), ca. 100x40x10 mm according to EMPA ("Für Insektenversuche darf nur Kiefernsplintholz, gerade gewachsen, ohne Äste und arm an Harz verwendet werden. Mittleres Wachstum von 2.5-8 Jahrringe je cm. Der Anteil des Spätholzes an der Gesamtbreite der Jahrringe soll 30% nicht überschreiten. Das Holz darf weder chemisch behandelt noch geflößt oder mit Wärme behandelt sein; es muss lufttrocken und nicht länger als 5 Jahre gelagert sein.").
Measuring equipment	Gas concentrations were verified upon initiation, periodically during fumigation and upon termination using a Fumiscope gas analyser.

1.3 Application of test substance

Criteria	Details
Application procedure	Sulfuryl fluoride was supplied in commercial steel cylinders as liquid under pressure. It was introduced into the structure in its gaseous form.
Delivery method	Sulfuryl fluoride was made available for introduction into the structure by using a heat-exchanger-system. Exact amounts of sulfuryl fluoride were transferred from the cylinder to the structure using a digital scale. Gas was mixed as it was injected using a fan positioned in the structure.
Dosage rate	Eggs All eggs were fumigated at a mean concentration of 30.9 g/m^3 for a total exposure period of 72 hours and 25 minutes leading to an accumulated dosage of 2237 $g\text{-}h/m^3$.

1.4 Test conditions

Criteria	Details
Incubation temperature	Fumigation was conducted at an average temperature of 19.1 ^oC.
Moisture	Fumigation was conducted at an average 79 % relative humidity.

Section B5.10.2 Efficacy Data

Annex Point IIB5.10
TNsG: Pt. I-B5.10, Pt. III-Ch. 6

B5.10.2/19 Anobium punctatum Laboratory study (Ref. Z19)

			Official use only
		1 REFERENCE: Z19, B5.10.2/19	
1.1	**Reference**	[1]Binker, G., [1]Binker, J., [1]Fröba G., [2]Graf, E. and [2]Lanz, B (2000). [1]Binker Materialschutz GmbH, Westendstr. 3, D-91207 Lauf, Germany [2]EMPA, Swiss Federal Laboratories for Materials Testing and Research Lerchenfeldstr. 5, CH-9014 St. Gallen, Switzerland. Laboratory study on *Anobium punctatum* Number: 402741/C and 402741/D (Bioassay 143 – 165).	
1.2	**Data protection**	Yes.	
1.2.1	Data owner	Dow AgroSciences LLC.	
1.2.2	Companies with letter of Access	None.	
1.2.3	Criteria for data protection	Data submitted to the MS after 13 May 2000 on existing b.p. for the purpose of its entry into Annex I	
1.3	**Guideline study**	The study was undertaken on the basis of sound principles of fumigation practice.	
1.4	**Deviations**	Not applicable as the study not conducted to an international standard method.	
		2 METHOD	
2.1	**Test Substance (Biocidal Product)**	Sulfuryl fluoride.	
2.1.1	Trade name/ proposed trade name	Vikane.	
2.1.2	Composition of Product tested	> 99% Sulfuryl fluoride.	
2.1.3	Physical state and nature	Fumigant.	
2.1.4	Monitoring of active substance concentration	Monitoring was undertaken using a Fumiscope gas analyser.	
2.1.5	Method of analysis	Not applicable.	
2.2	**Reference substance**	No reference substance was included in the study.	
2.2.1	Method of analysis for reference substance	Not applicable.	
2.3	**Testing procedure**		

2.3.1	Test population / inoculum / test organism	See Table 1.1.	
2.3.2	Test system	See Table 1.2.	
2.3.3	Application of TS	See Table 1.3.	
2.3.4	Test conditions	See Table 1.4.	
2.3.5	Duration of the test / Exposure time	67 hours and 30 minutes.	
2.3.6	Number of replicates performed	One.	
2.3.7	Controls	Untreated controls were included; these were kept and stored under the same conditions as the treated eggs of *Anobium punctatum*.	X
2.4	**Examination**		
2.4.1	Effect investigated	Lethal accumulated dosage (LAD) expressed as g-h/m^3. Two effects were determined – LAD 84 days after treatment and LAD 227 days after treatment.	
2.4.2	Method for recording / scoring of the effect	Egg-mortality by examination (count) of larvae hatched from treated eggs 84 days after treatment and survival of these larvae 143 days later. (i.e. 227 days after treatment).	
2.4.3	Intervals of examination	Larvae hatched from treated eggs 84 days after treatment and larvae survival 227 days after treatment.	
2.4.4	Statistics	Post fumigation mean total mortality was calculated by dividing the number of dead eggs by the total number of treated eggs 84 days after treatment and 227 days after treatment.	
2.4.5	Post fumigation monitoring of the test organism	See 2.4.4.	
		3 RESULTS	
3.1	**Efficacy**	The percentage mortality was calculated by dividing the total number of hatched and surviving larvae by the total number of treated eggs.	X

Percentage mortality of eggs of *Anobium punctatum* 84 days after exposure to sulfuryl fluoride.

A	Untreated Control			
No.	Eggs	Larvae hatched	Larvae penetrated	Dead larvae
131	117	103	103	0
132	218	210	210	0
133	196	189	189	0
134	215	208	208	0

135	127	122	122	0
136	206	202	202	0
137	113	111	111	0
138	179	153	153	0
139	123	116	116	0
140	110	102	102	0
total	1604	1516	1516	0

Total mortality of untreated eggs 5.49 %.

B	Treated Eggs			
No.	Eggs	Larvae hatched	Larvae penetrated	Dead larvae
166	180	1	1	0
167	317	0	0	0
168	207	0	0	0
169	149	1	1	0
170	393	1	1	0
171	123	0	0	0
172	215	2	2	0
173	268	0	0	0
174	323	0	0	0
175	191	0	0	0
176	240	0	0	0
177	349	0	0	0
178	200	5	5	0
179	255	0	0	0
180	204	0	0	0
181	179	0	0	0
182	224	0	0	0
183	245	0	0	0
184	276	0	0	0
185	348	4	4	0
186	179	0	0	0
187	117	0	0	0
188	136	0	0	0
Total	5318	14	14	0

Total mortality of treated eggs: 99.74 %.

Percentage mortality of eggs of *Anobium punctatum* 227 days after exposure to sulfuryl fluoride.

A	Untreated Control			
No.	Eggs	Larvae hatched	Larvae penetrated	Larvae survived
131	117	103	103	100
132	218	210	210	205
133	196	189	189	185
134	215	208	208	205
135	127	122	122	120
136	206	202	202	197

137	113	111	111	106
138	179	153	153	150
139	123	116	116	110
140	110	102	102	95
total	1604	1516	1516	1473

Total mortality of untreated eggs: 8.17 %.

B	Treated Eggs			
No.	Eggs	Larvae hatched	Larvae penetrated	Larvae survived
143	214	0	0	0
144	183	0	0	0
145	281	0	0	0
146	190	0	0	0
147	204	0	0	0
148	292	1	1	0
149	117	0	0	0
150	182	0	0	0
151	257	0	0	0
152	409	0	0	0
153	250	0	0	0
154	219	0	0	0
155	187	0	0	0
156	151	0	0	0
157	218	0	0	0
158	231	0	0	0
159	418	0	0	0
160	228	0	0	0
161	158	0	0	0
162	252	0	0	0
163	235	0	0	0
164	326	0	0	0
165	138	0	0	0
Total	5340	1	1	0

Total mortality of treated eggs: 100 %.

Section B5.10.2 **Efficacy Data**

Annex Point IIB5.10
TNsG: Pt. I-B5.10, Pt. III-Ch. 6

B5.10.2/19 Anobium punctatum Laboratory study (Ref. Z19)

3.1.1	Dose/Efficacy curve	Not available from report.
3.1.2	Begin and duration of effects	A mortality of 99.98 % was achieved 84 days after treatment and of 100 % 227 days after treatment.
3.1.3	Observed effects in the post monitoring phase	No unusual effect observed.
3.2	**Effects against organisms or objects to be protected**	None reported.
3.3	**Other effects**	None reported.
3.4	**Efficacy of the reference substance**	No reference substance was used.
3.5	**Tabular and/or graphical presentation of the summarised results**	See 3.1.
3.6	**Efficacy limiting factors**	
3.6.1	Occurrences of resistances	None reported.
3.6.2	Other limiting factors	None reported.
		4 RELEVANCE OF THE RESULTS COMPARED TO FIELD CONDITIONS
4.1	**Reasons for laboratory testing**	1 Precise conditions could be determined. 2 Practical, accurate procedure. Data generated is considered relevant for field of use. Test insects obtained from the field.
4.2	**Intended actual scale of biocide application**	Not applicable.
4.3	**Relevance compared to field conditions**	
4.3.1	Application method	The principle of fumigation is to confine a sufficient concentration for a sufficient period of time to enable a toxic dose to be received by the target pest. There are a number of ways in the laboratory and field studies to achieve this although the principle is the same.
4.3.2	Test organism	There are different life stages of *Anobium punctatum.* Eggs are

		considered to be the stage which would require a higher dose of sulfuryl fluoride compared to the other stages.
4.3.3	Observed effect	The high mortality effect, recorded in the laboratory test is considered as the desired field response for eradication of eggs of *Anobium punctatum*.
4.4	**Relevance for read-across**	Not applicable.

5 APPLICANT'S SUMMARY AND CONCLUSION

5.1	**Materials and methods**	Eggs of *Anobium punctatum* were fumigated with sulfuryl fluoride for 67 hours and 30 minutes at 21.3 °C in laboratory fumitoria. Bioassays from laboratory population according to EN 49.1 (1992) "Holzschutzmittel - Bestimmung der vorbeugenden Wirkung gegenüber Anobium punctatum (De Geer) durch Beobachten der Eiablage und des Überlebens von Larven - Teil 1: Oberflächenbehandlung (Laboratoriumsverfahren)") were tested to determine LAD. Fumigant concentration was measured using a Fumiscope gas analyser. Mortality rate was evaluated 84 days and 227 days after treatment.
5.2	**Reliability**	Reliability indicator 2: Study conducted in accordance with generally accepted scientific principles, possibly with incomplete reporting or methodological deficiencies, which do not affect the quality of relevant results.
5.3	**Assessment of efficacy, data analysis and interpretation**	The result of this investigation was that under the described conditions a high level of control of *Anobium punctatum* eggs was achieved. Additional trials have to be performed to understand the variability of the dose rates of the fumigant to achieve the LAD for this specific life stage at different temperatures.
5.4	**Conclusion**	There are different life stages of *Anobium punctatum* present in infested wooden structures. The field fumigation test undertaken was considered to be a valid and effective procedure for evaluating the efficacy of sulfuryl fluoride on the eggs of *A. punctatum*. The efficacy results showed that sulfuryl fluoride was highly effective on eggs of this pest species.
5.5	**Proposed efficacy specification**	Control of eggs is excellent 100 % mortality at the evaluated LAD of 1457 g-h/m³ at a temperature of 21.3 °C.

Evaluation by Competent Authorities	
	EVALUATION BY RAPPORTEUR MEMBER STATE
Date	October 2004.
Comments	Field 2.3.7, The following is a revised version of the present entry: The untreated controls and treated eggs were kept and stored under the same incubation conditions before and after the test fumigations. These incubation conditions were: temperature 20 C , 75% relative humidity. The conditions during fumigation is given in Table 1.4 with the untreated controls remaining under incubation conditions of 20 °C , 75% relative humidity. Field 3.1: Within the body of each table the numbers are counts and not percentages (as stated in the table legend above the tables). The content of the second table (examination of treated eggs after 84 days) is wrong and should be identical with the content of the last table but with a total mortality of: 99.98%.
Summary and conclusion	Applicant's version is adopted.

1.1 Test organisms - *Anobium punctatum*

Criteria	Details
Family	Anobiidae.
Species	*Anobium punctatum.*
Source	Laboratory population according to EN 49.1 (1992) ("Holzschutzmittel - Bestimmung der vorbeugenden Wirkung gegenüber *Anobium punctatum* (De Geer) durch Beobachten der Eiablage und des Überlebens von Larven - Teil 1: Oberflächenbehandlung (Laboratoriumsverfahren)").
Life stage	Eggs.
Mixed age population	Not applicable.
Number of eggs in test	5340.

1.2 Test system

Criteria	Details
Test chamber	Fumitoria (fumigation chambers) made of acrylic glass, 40 x 25 x 14.5 cm = 14.5 litres, gas introduction via polyamide (PA) -lines 6 mm external diameter/4 mm internal diameter, gas monitoring via separate PA-lines 6 mm external diameter/4 mm internal diameter.
Test insects introduction into chamber	In total 5340 eggs on 23 boards of pine-wood (*Pinus silvestris* L.), ca. 100x40x10 mm according to EMPA ("Für Insektenversuche darf nur Kiefernsplintholz, gerade gewachsen, ohne Äste und arm an Harz verwendet werden. Mittleres Wachstum von 2.5-8 Jahrringe je cm. Der Anteil des Spätholzes an der

	Gesamtbreite der Jahrringe soll 30% nicht überschreiten. Das Holz darf weder chemisch behandelt noch geflößt oder mit Wärme behandelt sein; es muss lufttrocken und nicht länger als 5 Jahre gelagert sein.“).
Measuring equipment	Gas concentrations were verified upon initiation, periodically during fumigation and upon termination using a Fumiscope gas analyser.

1.3 Application of test substance

Criteria	Details
Application procedure	Sulfuryl fluoride was supplied in commercial steel cylinders as a liquid under pressure. It was introduced into the fumitorium in its gaseous form.
Delivery method	Sulfuryl fluoride was made available for introduction into the fumitorium by using a heat-exchanger-system. Exact amounts of sulfuryl fluoride were transferred from the cylinder to the fumatorium using a gas syringe.
Dosage rate	Eggs All eggs were fumigated at a mean concentration of 21.6 g/m^3 for a total exposure period of 67 hours and 30 minutes leading to an accumulated dosage of 1457 $g\text{-}h/m^3$.

1.4 Test conditions

Criteria	Details
Incubation temperature	Fumigation was conducted at an average temperature of 21.3 ^oC.
Moisture	Not available from report.

Section B5.10.2 Efficacy Data

Annex Point IIB5.10
TNsG: Pt. I-B5.10, Pt. III-Ch. 6

B5.10.2/20 Anobium punctatum Laboratory study (Ref. Z20)

			Official use only
		1 REFERENCE: Z20, B5.10.2/20	
1.1	**Reference**	[1]Binker, G., [1]Binker, J., [1]Fröba G., [2]Graf, E. and [2]Lanz, B (2000). [1]Binker Materialschutz GmbH, Westendstr. 3, D-91207 Lauf, Germany [2]EMPA, Swiss Federal Laboratories for Materials Testing and Research Lerchenfeldstr. 5, CH-9014 St. Gallen, Switzerland. Laboratory study on *Anobium punctatum* Number: 402741/C and 402741/D (Bioassay 166 – 188).	
1.2	**Data protection**	Yes.	
1.2.1	Data owner	Dow AgroSciences LLC.	
1.2.2	Companies with letter of Access	None.	
1.2.3	Criteria for data protection	Data submitted to the MS after 13 May 2000 on existing b.p. for the purpose of its entry into Annex I	
1.3	**Guideline study**	The study was undertaken on the basis of sound principles of fumigation practice.	
1.4	**Deviations**	Not applicable as the study not conducted to an international standard method.	
		2 METHOD	
2.1	**Test Substance (Biocidal Product)**	Sulfuryl fluoride.	
2.1.1	Trade name/ proposed trade name	Vikane.	
2.1.2	Composition of Product tested	> 99% Sulfuryl fluoride.	
2.1.3	Physical state and nature	Fumigant.	
2.1.4	Monitoring of active substance concentration	Monitoring was undertaken using a Fumiscope gas analyser.	
2.1.5	Method of analysis	Not applicable.	
2.2	**Reference substance**	No reference substance was included in the study.	
2.2.1	Method of analysis for reference substance	Not applicable.	
2.3	**Testing procedure**		
2.3.1	Test population / inoculum /	See Table 1.1.	

	test organism		
2.3.2	Test system	See Table 1.2.	
2.3.3	Application of TS	See Table 1.3.	
2.3.4	Test conditions	See Table 1.4.	
2.3.5	Duration of the test / Exposure time	67 hours and 30 minutes.	
2.3.6	Number of replicates performed	One.	
2.3.7	Controls	Untreated controls were included; these were kept and stored under the same conditions as the treated eggs of *Anobium punctatum*.	X
2.4	**Examination**		
2.4.1	Effect investigated	Lethal accumulated dosage (LAD) expressed as g-h/m^3. Two effects were determined – LAD 84 days after treatment and LAD 227 days after treatment.	
2.4.2	Method for recording / scoring of the effect	Egg-mortality by examination (count) of larvae hatched from treated eggs 84 days after treatment and survival of these larvae 143 days later (i.e. 227 days after treatment).	
2.4.3	Intervals of examination	Larvae hatched from treated eggs 84 days after treatment and larvae survival 227 days after treatment.	
2.4.4	Statistics	Post fumigation mean total mortality was calculated by dividing the number of dead eggs by the total number of treated eggs 84 days after treatment and 227 days after treatment.	
2.4.5	Post fumigation monitoring of the test organism	See 2.4.4.	
		3 RESULTS	
3.1	**Efficacy**	The percentage mortality was calculated by dividing the total number of hatched and surviving larvae by the total number of treated eggs.	X

Percentage mortality of eggs of *Anobium punctatum* 84 days after exposure to sulfuryl fluoride.

A	Untreated Control			
No.	Eggs	Larvae hatched	Larvae penetrated	Dead larvae
131	117	103	103	0
132	218	210	210	0
133	196	189	189	0
134	215	208	208	0
135	127	122	122	0
136	206	202	202	0

137	113	111	111	0
138	179	153	153	0
139	123	116	116	0
140	110	102	102	0
total	1604	1516	1516	0

Total mortality of untreated eggs 5.49 %.

B	Treated Eggs			
No.	Eggs	Larvae hatched	Larvae penetrated	Dead larvae
166	180	1	1	0
167	317	0	0	0
168	207	0	0	0
169	149	1	1	0
170	393	1	1	0
171	123	0	0	0
172	215	2	2	0
173	268	0	0	0
174	323	0	0	0
175	191	0	0	0
176	240	0	0	0
177	349	0	0	0
178	200	5	5	0
179	255	0	0	0
180	204	0	0	0
181	179	0	0	0
182	224	0	0	0
183	245	0	0	0
184	276	0	0	0
185	348	4	4	0
186	179	0	0	0
187	117	0	0	0
188	136	0	0	0
Total	5318	14	14	0

Total mortality of treated eggs: 99.74 %.

Percentage mortality of eggs of *Anobium punctatum* 227 days after exposure to sulfuryl fluoride.

A	Untreated Control			
No.	Eggs	Larvae hatched	Larvae penetrated	Larvae survived
131	117	103	103	100
132	218	210	210	205
133	196	189	189	185
134	215	208	208	205
135	127	122	122	120
136	206	202	202	197
137	113	111	111	106
138	179	153	153	150

139	123	116	116	110
140	110	102	102	95
total	1604	1516	1516	1473

Total mortality of untreated eggs: 8.17 %.

B	Treated Eggs			
No.	Eggs	Larvae hatched	Larvae penetrated	Larvae survived
166	180	1	1	0
167	317	0	0	0
168	207	0	0	0
169	149	1	1	0
170	393	1	1	0
171	123	0	0	0
172	215	2	2	0
173	268	0	0	0
174	323	0	0	0
175	191	0	0	0
176	240	0	0	0
177	349	0	0	0
178	200	5	5	0
179	255	0	0	0
180	204	0	0	0
181	179	0	0	0
182	224	0	0	0
183	245	0	0	0
184	276	0	0	0
185	348	4	4	0
186	179	0	0	0
187	117	0	0	0
188	136	0	0	0
Total	5318	14	14	0

Total mortality of treated eggs: 100 %.

Section B5.10.2 **Efficacy Data**

Annex Point IIB5.10
TNsG: Pt. I-B5.10,
Pt. III-Ch. 6

B5.10.2/20 Anobium punctatum Laboratory study (Ref. Z20)

3.1.1	Dose/Efficacy curve	Not available from report.
3.1.2	Begin and duration of effects	A mortality of 99.74 % was achieved 84 days after treatment and of 100 % 227 days after treatment.
3.1.3	Observed effects in the post monitoring phase	No unusual effect observed.
3.2	**Effects against organisms or objects to be protected**	None reported.
3.3	**Other effects**	None reported.
3.4	**Efficacy of the reference substance**	No reference substance was used.
3.5	**Tabular and/or graphical presentation of the summarised results**	See 3.1.
3.6	**Efficacy limiting factors**	
3.6.1	Occurrences of resistances	None reported.
3.6.2	Other limiting factors	None reported.
		4 RELEVANCE OF THE RESULTS COMPARED TO FIELD CONDITIONS
4.1	**Reasons for laboratory testing**	1 Precise conditions could be determined. 2 Practical, accurate procedure. Data generated is considered relevant for field of use. Test insects obtained from the field.
4.2	**Intended actual scale of biocide application**	Not applicable.
4.3	**Relevance compared to field conditions**	Not applicable.
4.3.1	Application method	The principle of fumigation is to confine a sufficient concentration for a sufficient period of time to enable a toxic dose to be received by the target pest. There are a number of ways in the laboratory and field studies to achieve this although the principle is the same.
4.3.2	Test organism	There are different life stages of *Anobium punctatum.* Eggs are

		considered to be the stage which would require a higher dose of sulfuryl fluoride compared to the other stages.
4.3.3	Observed effect	The high mortality effect, recorded in the laboratory test is considered as the desired field response for eradication of eggs of *Anobium punctatum*.
4.4	**Relevance for read-across**	Not applicable.

5 APPLICANT'S SUMMARY AND CONCLUSION

5.1	**Materials and methods**	Eggs of *Anobium punctatum* were fumigated with sulfuryl fluoride for 67 hours and 30 minutes at 23.3 ^{o}C in laboratory fumitoria. Bioassays from laboratory population according to EN 49.1 (1992) ("Holzschutzmittel - Bestimmung der vorbeugenden Wirkung gegenüber *Anobium punctatum* (De Geer) durch Beobachten der Eiablage und des Überlebens von Larven - Teil 1: Oberflächenbehandlung (Laboratoriumsverfahren)") were tested to determine LAD. Fumigant concentration was measured using a Fumiscope gas analyser. Mortality rate was evaluated 84 days and 227 days after treatment.
5.2	**Reliability**	Reliability indicator 2: Study conducted in accordance with generally accepted scientific principles, possibly with incomplete reporting or methodological deficiencies, which do not affect the quality of relevant results.
5.3	**Assessment of efficacy, data analysis and interpretation**	The result of this investigation was that under the described conditions a high level of control of *Anobium punctatum* eggs was achieved. Additional trials have to be performed to understand the variability of the dose rates of the fumigant to achieve the LAD for this specific life stage at different temperatures.
5.4	**Conclusion**	There are different life stages of *Anobium punctatum* present in infested wooden structures. The field fumigation test undertaken was considered to be a valid and effective procedure for evaluating the efficacy of sulfuryl fluoride on the eggs of *A. punctatum*. The efficacy results showed that sulfuryl fluoride was highly effective on eggs of this pest species.
5.5	**Proposed efficacy specification**	Control of eggs is excellent 100 % mortality at the evaluated LAD of 1880 g-h/m³ at a temperature of 23.3 °C.

Evaluation by Competent Authorities	
	EVALUATION BY RAPPORTEUR MEMBER STATE
Date	October 2004.
Comments	Field 2.3.7, The following is a revised version of the present entry: The untreated controls and treated eggs were kept and stored under the same incubation conditions before and after the test fumigations. These incubation conditions were: temperature 20 C , 75% relative humidity. The conditions during fumigation is given in Table 1.4 with the untreated controls remaining under incubation conditions of 20 °C , 75% relative humidity. Field 3.1: Within the body of each table the numbers are counts and not percentages (as stated in the table legend above the tables).
Summary and conclusion	Applicant's version is adopted.

1.1 Test organisms - *Anobium punctatum*

Criteria	Details
Family	Anobiidae.
Species	*Anobium punctatum.*
Source	Laboratory population according to EN 49.1 (1992) ("Holzschutzmittel - Bestimmung der vorbeugenden Wirkung gegenüber Anobium punctatum (De Geer) durch Beobachten der Eiablage und des Überlebens von Larven - Teil 1: Oberflächenbehandlung (Laboratoriumsverfahren)").
Life stage	Eggs.
Mixed age population	Not applicable.
Number of eggs in test	5318.

1.2 Test system

Criteria	Details
Test chamber	Fumitoria (fumigation chambers) made of acrylic glass, 40 x 25 x 14.5 cm = 14.5 litres, gas introduction via polyamide (PA) -lines 6 mm external diameter/4 mm internal diameter, gas monitoring via separate PA-lines 6 mm external diameter/4 mm internal diameter.
Test insects introduction into chamber	In total 5318 eggs on 23 boards of pine-wood (*Pinus silvestris* L.), ca. 100x40x10 mm according to EMPA ("Für Insektenversuche darf nur Kiefernsplintholz, gerade gewachsen, ohne Äste und arm an Harz verwendet werden. Mittleres Wachstum von 2.5-8 Jahrringe je cm. Der Anteil des Spätholzes an der Gesamtbreite der Jahrringe soll 30% nicht überschreiten. Das Holz darf weder chemisch behandelt noch geflößt oder mit Wärme behandelt

	sein; es muss lufttrocken und nicht länger als 5 Jahre gelagert sein.“).
Measuring equipment	Gas concentrations were verified upon initiation, periodically during fumigation and upon termination using a Fumiscope gas analyser.

1.3 Application of test substance

Criteria	Details
Application procedure	Sulfuryl fluoride was supplied in commercial steel cylinders as liquid under pressure. It was introduced into the fumitorium in its gaseous form.
Delivery method	Sulfuryl fluoride was made available for introduction into the fumitorium by using a heat-exchanger-system. Exact amounts of sulfuryl fluoride were transferred from the cylinder to the fumatorium using a gas syringe.
Dosage rate	Eggs All eggs were fumigated at a mean concentration of 27.9 g/m^3 for a total exposure period of 67 hours and 30 minutes leading to an accumulated dosage of 1880 $g\text{-}h/m^3$.

1.4 Test conditions

Criteria	Details
Incubation temperature	Fumigation was conducted at an average temperature of 23.3 ^oC.
Moisture	Not available from report.

Section B5.10.2 Efficacy Data

Annex Point IIB5.10
TNsG: Pt. I-B5.10, Pt. III-Ch. 6

B5.10.2/21 Anobium punctatum Laboratory study (Ref. Z21)

			Official use only
		1 REFERENCE: Z21, B5.10.2/21	
1.1	**Reference**	[1]Binker, G., [1]Binker, J., [1]Fröba G., [2]Graf, E. and [2]Lanz, B (1999). [1]Binker Materialschutz GmbH, Westendstr. 3, D-91207 Lauf, Germany [2]EMPA, Swiss Federal Laboratories for Materials Testing and Research Lerchenfeldstr. 5, CH-9014 St. Gallen, Switzerland. Laboratory study on *Anobium punctatum* Number: 130377/A and 403972 (Bioassay 11 – 15).	
1.2	**Data protection**	Yes.	
1.2.1	Data owner	Dow AgroSciences LLC.	
1.2.2	Companies with letter of Access	None.	
1.2.3	Criteria for data protection	Data submitted to the MS after 13 May 2000 on existing b.p. for the purpose of its entry into Annex I	
1.3	**Guideline study**	The study was undertaken on the basis of sound principles of fumigation practice.	
1.4	**Deviations**	Not applicable as the study not conducted to an international standard method.	
		2 METHOD	
2.1	**Test Substance (Biocidal Product)**	Sulfuryl fluoride.	
2.1.1	Trade name/ proposed trade name	Vikane.	
2.1.2	Composition of Product tested	> 99% Sulfuryl fluoride.	
2.1.3	Physical state and nature	Fumigant.	
2.1.4	Monitoring of active substance concentration	Monitoring was undertaken using a Fumiscope gas analyser.	
2.1.5	Method of analysis	Not applicable.	
2.2	**Reference substance**	No reference substance was included in the study.	
2.2.1	Method of analysis for reference substance	Not applicable.	
2.3	**Testing procedure**		
2.3.1	Test population / inoculum /	See Table 1.1.	

	test organism		
2.3.2	Test system	See Table 1.2.	
2.3.3	Application of TS	See Table 1.3.	
2.3.4	Test conditions	See Table 1.4.	
2.3.5	Duration of the test / Exposure time	42 hours and 20 minutes.	
2.3.6	Number of replicates performed	One.	
2.3.7	Controls	Untreated controls were included; these were kept and stored under the same conditions as the treated eggs of *Anobium punctatum*.	X
2.4	**Examination**		
2.4.1	Effect investigated	Lethal accumulated dosage (LAD) expressed as g-h/m^3. Two effects were determined – LAD 88 days after treatment and LAD 228 days after treatment.	
2.4.2	Method for recording / scoring of the effect	Egg-mortality by examination (count) of larvae hatched from treated eggs 88 days after treatment and survival of these larvae 140 days later (i.e. 228 days after treatment).	
2.4.3	Intervals of examination	Larvae hatched from treated eggs 88 days after treatment and larvae survival 228 days after treatment.	
2.4.4	Statistics	Post fumigation mean total mortality was calculated by dividing the number of dead eggs by the total number of treated eggs 88 days after treatment and 228 days after treatment.	
2.4.5	Post fumigation monitoring of the test organism	See 2.4.4.	
		3 RESULTS	
3.1	**Efficacy**	The percentage mortality was calculated by dividing the total number of hatched and surviving larvae by the total number of treated eggs.	X

Percentage mortality of eggs of *Anobium punctatum* 88 days after exposure to sulfuryl fluoride.

A	Untreated Control			
No.	Eggs	Larvae hatched	Larvae penetrated	Dead larvae
1	153	150	150	0
2	97	97	97	0
3	88	88	88	0
4	127	127	127	0
5	98	96	96	0
6	87	87	87	0
7	100	100	100	0

8	88	88	88	0
9	109	107	107	0
10	123	122	122	0
total	1070	1062	1062	0

Total mortality of untreated eggs 0.75 %.

B	Treated Eggs			
No.	Eggs	Larvae hatched	Larvae penetrated	Dead larvae
11	264	5	5	0
12	230	0	0	0
13	296	1	1	0
14	238	0	0	0
15	194	1	1	0
total	1222	7	7	0

Total mortality of treated eggs: 99.43 %.

Percentage mortality of eggs of *Anobium punctatum* 228 days after exposure to sulfuryl fluoride.

A	Untreated Control			
No.	Eggs	Larvae hatched	Larvae penetrated	Larvae survived
1	153	150	150	150
2	97	97	97	97
3	88	88	88	88
4	127	127	127	127
5	98	96	96	95
6	87	87	87	87
7	100	100	100	98
8	88	88	88	85
9	109	107	107	99
10	123	122	122	109
total	1070	1062	1062	1035

Total mortality of untreated eggs: 3.27%.

B	Treated Eggs			
No.	Eggs	Larvae hatched	Larvae penetrated	Larvae survived
11	264	5	5	5
12	230	0	0	0
13	296	1	1	0
14	238	0	0	0
15	194	1	1	0
total	1222	7	7	5

Total mortality of treated eggs: 99.59 %.

Section B5.10.2 Efficacy Data

Annex Point IIB5.10
TNsG: Pt. I-B5.10,
Pt. III-Ch. 6

B5.10.2/21 Anobium punctatum Laboratory study (Ref. Z21)

3.1.1	Dose/Efficacy curve	Not available from report.
3.1.2	Begin and duration of effects	A mortality of 99.43 % was achieved 88 days after treatment and of 99.59 % 228 days after treatment.
3.1.3	Observed effects in the post monitoring phase	No unusual effect observed.
3.2	**Effects against organisms or objects to be protected**	None reported.
3.3	**Other effects**	None reported.
3.4	**Efficacy of the reference substance**	No reference substance was used.
3.5	**Tabular and/or graphical presentation of the summarised results**	See 3.1.
3.6	**Efficacy limiting factors**	
3.6.1	Occurrences of resistances	None reported.
3.6.2	Other limiting factors	None reported.
		4 RELEVANCE OF THE RESULTS COMPARED TO FIELD CONDITIONS
4.1	**Reasons for laboratory testing**	1 Precise conditions could be determined. 2 Practical, accurate procedure. Data generated is considered relevant for field of use. Test insects obtained from the field.
4.2	**Intended actual scale of biocide application**	Not applicable.
4.3	**Relevance compared to field conditions**	Not applicable.
4.3.1	Application method	The principle of fumigation is to confine a sufficient concentration for a sufficient period of time to enable a toxic dose to be received by the target pest. There are a number of ways in laboratory and field studies to achieve this although the principle is the same.
4.3.2	Test organism	There are different life stages of *Anobium punctatum.* Eggs are considered to be the stage which would require a higher dose of sulfuryl

		fluoride compared to the other stages.
4.3.3	Observed effect	The high mortality effect, recorded in the laboratory test is considered as the desired field response for eradication of eggs of *Anobium punctatum*.
4.4	**Relevance for read-across**	Not applicable.

5 APPLICANT'S SUMMARY AND CONCLUSION

5.1	**Materials and methods**	Eggs of *Anobium punctatum* were fumigated with sulfuryl fluoride for 42 hours and 20 minutes at 19.9 °C and 84 % relative humidity in laboratory fumitoria Bioassays from laboratory population according to EN 49.1 (1992) ("Holzschutzmittel - Bestimmung der vorbeugenden Wirkung gegenüber *Anobium punctatum* (De Geer) durch Beobachten der Eiablage und des Überlebens von Larven - Teil 1: Oberflächenbehandlung (Laboratoriumsverfahren)") were tested to determine LAD. Fumigant concentration was measured using a Fumiscope gas analyser. Mortality rate was evaluated 88 days and 228 days after treatment.
5.2	**Reliability**	Reliability indicator 2: Study conducted in accordance with generally accepted scientific principles, possibly with incomplete reporting or methodological deficiencies, which do not affect the quality of relevant results.
5.3	**Assessment of efficacy, data analysis and interpretation**	The result of this investigation was that under the described conditions a high level of control of *Anobium punctatum* eggs was achieved. Additional trials have to be performed to understand the variability of the dose rates of the fumigant to achieve the LAD for this specific life stage at different temperatures.
5.4	**Conclusion**	There are different life stages of *Anobium punctatum* present in infested wooden structures. The laboratory fumigation test undertaken was considered to be a valid and effective procedure for evaluating the efficacy of sulfuryl fluoride on the eggs of *A. punctatum*. The efficacy results showed that sulfuryl fluoride was highly effective on eggs of this pest species.
5.5	**Proposed efficacy specification**	Control of eggs is excellent 99.59 % mortality at the evaluated LAD of 1327 g-h/m³ at a temperature of 19.9 °C and a moisture of 84 % relative humidity.

Evaluation by Competent Authorities	
	EVALUATION BY RAPPORTEUR MEMBER STATE
Date	October 2004.
Comments	Field 2.3.7, The following is a revised version of the present entry: The untreated controls and treated eggs were kept and stored under the same incubation conditions before and after the test fumigations. These incubation conditions were: temperature 20 C , 75% relative humidity. The conditions during fumigation is given in Table 1.4 with the untreated controls remaining under incubation conditions of 20 °C , 75% relative humidity. Field 3.1: Within the body of each table the numbers are counts and not percentages (as stated in the table legend above the tables).
Summary and conclusion	Applicant's version is adopted.

1.1 Test organisms - *Anobium punctatum*

Criteria	Details
Family	Anobiidae.
Species	*Anobium punctatum.*
Source	Laboratory population according to EN 49.1 (1992) ("Holzschutzmittel - Bestimmung der vorbeugenden Wirkung gegenüber Anobium punctatum (De Geer) durch Beobachten der Eiablage und des Überlebens von Larven - Teil 1: Oberflächenbehandlung (Laboratoriumsverfahren)").
Life stage	Eggs.
Mixed age population	Not applicable.
Number of eggs in test	1222.

1.2 Test system

Criteria	Details
Test chamber	Fumitoria (fumigation chambers) made of acrylic glass, 40 x 25 x 14.5 cm = 14.5 litres, gas introduction via polyamide (PA) -lines 6 mm external diameter/4 mm internal diameter, gas monitoring via separate PA-lines 6 mm external diameter/4 mm internal diameter.
Test insects introduction into chamber	In total 1222 eggs on five boards of pine-wood (*Pinus silvestris* L.), ca. 100x40x10 mm according to EMPA ("Für Insektenversuche darf nur Kiefernsplintholz, gerade gewachsen, ohne Äste und arm an Harz verwendet werden. Mittleres Wachstum von 2.5-8 Jahrringe je cm. Der Anteil des Spätholzes an der Gesamtbreite der Jahrringe soll 30% nicht überschreiten. Das Holz darf weder chemisch behandelt noch geflößt oder mit Wärme behandelt

	sein; es muss lufttrocken und nicht länger als 5 Jahre gelagert sein.“).
Measuring equipment	Gas concentrations were verified upon initiation, periodically during fumigation and upon termination using a Fumiscope gas analyser.

1.3 Application of test substance

Criteria	Details
Application procedure	Sulfuryl fluoride was supplied in commercial steel cylinders as liquid under pressure. It was introduced into the fumitorium in its gaseous form.
Delivery method	Sulfuryl fluoride was made available for introduction into the fumitorium by using a heat-exchanger-system. Exact amounts of sulfuryl fluoride were transferred from the cylinder to the fumatorium using a gas syringe.
Dosage rate	<u>Eggs</u> All eggs were fumigated at a mean concentration of 31.3 g/m^3 for a total exposure period of 42 hours and 20 minutes leading to an accumulated dosage of 1327 g-h/m^3.

1.4 Test conditions

Criteria	Details
Incubation temperature	Fumigation was conducted at an average temperature of 19.9 ^oC.
Moisture	Fumigation was conducted at an average 84 % relative humidity.

Section B5.10.2 Efficacy Data

Annex Point IIB5.10
TNsG: Pt. I-B5.10, Pt. III-Ch. 6

B5.10.2/22 Anobium punctatum Laboratory study (Ref. Z22)

			Official use only
		1 REFERENCE: Z22, B5.10.2/22	
1.1	**Reference**	[1]Binker, G., [1]Binker, J., [1]Fröba G., [2]Graf, E. and [2]Lanz, B (1999). [1]Binker Materialschutz GmbH, Westendstr. 3, D-91207 Lauf, Germany [2]EMPA, Swiss Federal Laboratories for Materials Testing and Research Lerchenfeldstr. 5, CH-9014 St. Gallen, Switzerland. Laboratory study on *Anobium punctatum* Number: 130377/A and 403972 (Bioassay 16 – 20).	
1.2	**Data protection**	Yes.	
1.2.1	Data owner	Dow AgroSciences LLC.	
1.2.2	Companies with letter of Access	None.	
1.2.3	Criteria for data protection	Data submitted to the MS after 13 May 2000 on existing b.p. for the purpose of its entry into Annex I	
1.3	**Guideline study**	The study was undertaken on the basis of sound principles of fumigation practice.	
1.4	**Deviations**	Not applicable as the study not conducted to an international standard method.	
		2 METHOD	
2.1	**Test Substance (Biocidal Product)**	Sulfuryl fluoride.	
2.1.1	Trade name/ proposed trade name	Vikane.	
2.1.2	Composition of Product tested	> 99% Sulfuryl fluoride.	
2.1.3	Physical state and nature	Fumigant.	
2.1.4	Monitoring of active substance concentration	Monitoring was undertaken using a Fumiscope gas analyser.	
2.1.5	Method of analysis	Not applicable.	
2.2	**Reference substance**	No reference substance was included in the study.	
2.2.1	Method of analysis for reference substance	Not applicable.	
2.3	**Testing procedure**		
2.3.1	Test population / inoculum /	See Table 1.1.	

	test organism		
2.3.2	Test system	See Table 1.2.	
2.3.3	Application of TS	See Table 1.3.	
2.3.4	Test conditions	See Table 1.4.	
2.3.5	Duration of the test / Exposure time	42 hours and 15 minutes.	
2.3.6	Number of replicates performed	One.	
2.3.7	Controls	Untreated controls were included; these were kept and stored under the same conditions as the treated eggs of *Anobium punctatum*.	X
2.4	**Examination**		
2.4.1	Effect investigated	Lethal accumulated dosage (LAD) expressed as g-h/m^3. Two effects were determined – LAD 88 days after treatment and LAD 228 days after treatment.	
2.4.2	Method for recording / scoring of the effect	Egg-mortality by examination (count) of larvae hatched from treated eggs 88 days after treatment and survival of these larvae 140 days later (i.e. 228 days after treatment).	
2.4.3	Intervals of examination	Larvae hatched from treated eggs 88 days after treatment and larvae survival 228 days after treatment.	
2.4.4	Statistics	Post fumigation mean total mortality was calculated by dividing the number of dead eggs by the total number of treated eggs 88 days after treatment and 228 days after treatment.	
2.4.5	Post fumigation monitoring of the test organism	See 2.4.4.	
		3 RESULTS	
3.1	**Efficacy**	The percentage mortality was calculated by dividing the total number of hatched and surviving larvae by the total number of treated eggs.	X

Percentage mortality of eggs of *Anobium punctatum* 88 days after exposure to sulfuryl fluoride.

A	Untreated Control			
No.	Eggs	Larvae hatched	Larvae penetrated	Dead larvae
1	153	150	150	0
2	97	97	97	0
3	88	88	88	0
4	127	127	127	0
5	98	96	96	0
6	87	87	87	0
7	100	100	100	0

8	88	88	88	0
9	109	107	107	0
10	123	122	122	0
total	1070	1062	1062	0

Total mortality of untreated eggs 0.75 %.

B	Treated Eggs			
No.	Eggs	Larvae hatched	Larvae penetrated	Dead larvae
16	133	0	0	0
17	293	1	1	0
18	161	3	3	0
19	243	1	1	0
total	1101	9	9	0

Total mortality of treated eggs: 99.18 %.

Percentage mortality of eggs of *Anobium punctatum* 228 days after exposure to sulfuryl fluoride.

A	Untreated Control			
No.	Eggs	Larvae hatched	Larvae penetrated	Larvae survived
1	153	150	150	150
2	97	97	97	97
3	88	88	88	88
4	127	127	127	127
5	98	96	96	95
6	87	87	87	87
7	100	100	100	98
8	88	88	88	85
9	109	107	107	99
10	123	122	122	109
total	1070	1062	1062	10352

Total mortality of untreated eggs: 3.27 %.

B	Treated Eggs			
No.	Eggs	Larvae hatched	Larvae penetrated	Larvae survived
16	133	0	0	0
17	293	1	1	0
18	161	3	3	0
19	243	1	1	0
20	271	4	4	0
total	1101	9	9	0

Total mortality of treated eggs: 100 %.

Section B5.10.2 **Efficacy Data**

Annex Point IIB5.10
TNsG: Pt. I-B5.10,
Pt. III-Ch. 6

B5.10.2/22 Anobium punctatum Laboratory study (Ref. Z22)

3.1.1	Dose/Efficacy curve	Not available from report.
3.1.2	Begin and duration of effects	A mortality of 99.18 % was achieved 88 days after treatment and of 100 % 228 days after treatment.
3.1.3	Observed effects in the post monitoring phase	No unusual effect observed.
3.2	**Effects against organisms or objects to be protected**	None reported.
3.3	**Other effects**	None reported.
3.4	**Efficacy of the reference substance**	No reference substance was used.
3.5	**Tabular and/or graphical presentation of the summarised results**	See 3.1.
3.6	**Efficacy limiting factors**	
3.6.1	Occurrences of resistances	None reported.
3.6.2	Other limiting factors	None reported.
		4 RELEVANCE OF THE RESULTS COMPARED TO FIELD CONDITIONS
4.1	**Reasons for laboratory testing**	1 Precise conditions could be determined. 2 Practical, accurate procedure. Data generated is considered relevant for field of use. Test insects obtained from the field.
4.2	**Intended actual scale of biocide application**	Not applicable.
4.3	**Relevance compared to field conditions**	
4.3.1	Application method	The principle of fumigation is to confine a sufficient concentration for a sufficient period of time to enable a toxic dose to be received by the target pest. There are a number of ways in laboratory and field studies to achieve this although the principle is the same.
4.3.2	Test organism	There are different life stages of *Anobium punctatum.* Eggs are considered to be the stage which would require a higher dose of sulfuryl

		fluoride compared to the other stages.
4.3.3	Observed effect	The high mortality effect, recorded in the laboratory test is considered as the desired field response for eradication of eggs of *Anobium punctatum*.
4.4	**Relevance for read-across**	Not applicable.

5 APPLICANT'S SUMMARY AND CONCLUSION

5.1	**Materials and methods**	Eggs of *Anobium punctatum* were fumigated with sulfuryl fluoride for 42 hours and 15 minutes at 20.6 °C and 83 % relative humidity in laboratory fumitoria. Bioassays from laboratory population according to EN 49.1 (1992) ("Holzschutzmittel - Bestimmung der vorbeugenden Wirkung gegenüber *Anobium punctatum* (De Geer) durch Beobachten der Eiablage und des Überlebens von Larven - Teil 1: Oberflächenbehandlung (Laboratoriumsverfahren)") were tested to determine LAD. Fumigant concentration was measured using a Fumiscope gas analyser. Mortality rate was evaluated 88 days and 228 days after treatment.
5.2	**Reliability**	Reliability indicator 2: Study conducted in accordance with generally accepted scientific principles, possibly with incomplete reporting or methodological deficiencies, which do not affect the quality of relevant results.
5.3	**Assessment of efficacy, data analysis and interpretation**	The result of this investigation was that under the described conditions a high level of control of *Anobium punctatum* eggs was achieved. Additional trials have to be performed to understand the variability of the dose rates of the fumigant to achieve the LAD for this specific life stage at different temperatures.
5.4	**Conclusion**	There are different life stages of *Anobium punctatum* present in infested wooden structures. The laboratory fumigation test undertaken was considered to be a valid and effective procedure for evaluating the efficacy of sulfuryl fluoride on the eggs of *A. punctatum*. The efficacy results showed that sulfuryl fluoride was highly effective on eggs of this pest species.
5.5	**Proposed efficacy specification**	Control of eggs is excellent 100 % mortality at the evaluated LAD of 1197 g-h/m³ at a temperature of 20.6 °C and 83 % relative humidity.

Evaluation by Competent Authorities

EVALUATION BY RAPPORTEUR MEMBER STATE

Date October 2004.

Comments

Field 2.3.7, The following is a revised version of the present entry:
The untreated controls and treated eggs were kept and stored under the same incubation conditions before and after the test fumigations. These incubation conditions were: temperature 20 C , 75% relative humidity. The conditions during fumigation is given in Table 1.4 with the untreated controls remaining under incubation conditions of 20 °C , 75% relative humidity.

Field 3.1: Within the body of each table the numbers are counts and not percentages (as stated in the table legend above the tables).

In the second table containing data on treated eggs, examined after 88 days there is a line missing. The whole, corrected table is given here:

B	Treated Eggs			
No.	Eggs	Larvae hatched	Larvae penetrated	Dead larvae
16	133	0	0	0
17	293	1	1	0
18	161	3	3	0
19	243	1	1	0
20	**271**	**4**	**4**	**0**
total	1101	9	9	0

In the next table, containing data on untreated control eggs, examined after 228 days, the sum of larvae survived should be 1035.

Summary and conclusion Applicant's version is adopted.

1.1 Test organisms - *Anobium punctatum*

Criteria	Details
Family	Anobiidae.
Species	*Anobium punctatum.*
Source	Laboratory population according to EN 49.1 (1992) ("Holzschutzmittel - Bestimmung der vorbeugenden Wirkung gegenüber *Anobium punctatum* (De Geer) durch Beobachten der Eiablage und des Überlebens von Larven - Teil 1: Oberflächenbehandlung (Laboratoriumsverfahren)").
Life stage	Eggs.
Mixed age population	Not applicable.
Number of eggs in test	1101.

1.2 Test system

Criteria	Details
Test chamber	Fumitoria (fumigation chambers) made of acrylic glass, 40 x 25 x 14.5 cm = 14.5 litres, gas introduction via polyamide (PA) -lines 6 mm external diameter/4 mm internal diameter, gas monitoring via separate PA-lines 6 mm external diameter/4 mm internal diameter.
Test insects introduction into chamber	In total 1101 eggs on five boards of pine-wood (*Pinus silvestris* L.), ca. 100x40x10 mm according to EMPA ("Für Insektenversuche darf nur Kiefernsplintholz, gerade gewachsen, ohne Äste und arm an Harz verwendet werden. Mittleres Wachstum von 2.5-8 Jahrringe je cm. Der Anteil des Spätholzes an der Gesamtbreite der Jahrringe soll 30% nicht überschreiten. Das Holz darf weder chemisch behandelt noch geflößt oder mit Wärme behandelt sein; es muss lufttrocken und nicht länger als 5 Jahre gelagert sein.").
Measuring equipment	Gas concentrations were verified upon initiation, periodically during fumigation and upon termination using a Fumiscope gas analyser.

1.3 Application of test substance

Criteria	Details
Application procedure	Sulfuryl fluoride was supplied in commercial steel cylinders as a liquid under pressure. It was introduced into the fumitorium in its gaseous form.
Delivery method	Sulfuryl fluoride was made available for introduction into the fumitorium by using a heat-exchanger-system. Exact amounts of sulfuryl fluoride were transferred from the cylinder to the fumatorium using a gas syringe.
Dosage rate	<u>Eggs</u> All eggs were fumigated at a mean concentration of 28.3 g/m^3 for a total exposure period of 42 hours and 15 minutes leading to an accumulated dosage of 1197 g-h/m^3.

1.4 Test conditions

Criteria	Details
Incubation temperature	Fumigation was conducted at an average temperature of 20.6 ^oC.
Moisture	Fumigation was conducted at an average 83 % relative humidity.

Section B5.10.2 Efficacy Data

Annex Point IIB5.10
TNsG: Pt. I-B5.10, Pt. III-Ch. 6

B5.10.2/23 Anobium punctatum Laboratory study (ref. Z23)

			Official use only
		1 REFERENCE: Z23, B5.10.2/23	
1.1	**Reference**	[1]Binker, G., [1]Binker, J., [1]Fröba G., [2]Graf, E. and [2]Lanz, B (1999). [1]Binker Materialschutz GmbH, Westendstr. 3, D-91207 Lauf, Germany [2]EMPA, Swiss Federal Laboratories for Materials Testing and Research Lerchenfeldstr. 5, CH-9014 St. Gallen, Switzerland. Laboratory study on *Anobium punctatum* Number: 130377/A and 403972 (Bioassay 21 – 25).	
1.2	**Data protection**	Yes.	
1.2.1	Data owner	Dow AgroSciences LLC.	
1.2.2	Companies with letter of Access	None.	
1.2.3	Criteria for data protection	Data submitted to the MS after 13 May 2000 on existing b.p. for the purpose of its entry into Annex I.	
1.3	**Guideline study**	The study was undertaken on the basis of sound principles of fumigation practice.	
1.4	**Deviations**	Not applicable as the study not conducted to an international standard method.	
		2 METHOD	
2.1	**Test Substance (Biocidal Product)**	Sulfuryl fluoride.	
2.1.1	Trade name/ proposed trade name	Vikane.	
2.1.2	Composition of Product tested	> 99% Sulfuryl fluoride.	
2.1.3	Physical state and nature	Fumigant.	
2.1.4	Monitoring of active substance concentration	Monitoring was undertaken using a Fumiscope gas analyser.	
2.1.5	Method of analysis	Not applicable.	
2.2	**Reference substance**	No reference substance was included in the study.	
2.2.1	Method of analysis for reference substance	Not applicable.	
2.3	**Testing procedure**		
2.3.1	Test population / inoculum /	See Table 1.1.	

	test organism		
2.3.2	Test system	See Table 1.2.	
2.3.3	Application of TS	See Table 1.3.	
2.3.4	Test conditions	See Table 1.4.	
2.3.5	Duration of the test / Exposure time	41 hours and 50 minutes.	
2.3.6	Number of replicates performed	One.	
2.3.7	Controls	Untreated controls were included; these were kept and stored under the same conditions as the treated eggs of *Anobium punctatum*.	X
2.4	**Examination**		
2.4.1	Effect investigated	Lethal accumulated dosage (LAD) expressed as g-h/m^3. Two effects were determined – LAD 88 days after treatment and LAD 228 days after treatment.	
2.4.2	Method for recording / scoring of the effect	Egg-mortality by examination (count) of larvae hatched from treated eggs 88 days after treatment and survival of these larvae 140 days later (i.e. 228 days after treatment).	
2.4.3	Intervals of examination	Larvae hatched from treated eggs 88 days after treatment and larvae survival 228 days after treatment.	
2.4.4	Statistics	Post fumigation mean total mortality was calculated by dividing the number of dead eggs by the total number of treated eggs 88 days after treatment and 228 days after treatment.	
2.4.5	Post fumigation monitoring of the test organism	See 2.4.4.	
		3 RESULTS	
3.1	**Efficacy**	The percentage mortality was calculated by dividing the total number of hatched and surviving larvae by the total number of treated eggs.	X

Percentage mortality of eggs of *Anobium punctatum* 88 days after exposure to sulfuryl fluoride.

A	Untreated Control			
No.	Eggs	Larvae hatched	Larvae penetrated	Dead larvae
1	153	150	150	0
2	97	97	97	0
3	88	88	88	0
4	127	127	127	0
5	98	96	96	0
6	87	87	87	0
7	100	100	100	0

8	88	88	88	0
9	109	107	107	0
10	123	122	122	0
total	1070	1062	1062	0

Total mortality of untreated eggs 0.75 %.

B	Treated Eggs			
No.	Eggs	Larvae hatched	Larvae penetrated	Dead larvae
21	293	1	1	0
22	268	4	4	0
23	102	0	0	0
24	169	16	16	0
25	261	9	9	0
total	1093	30	30	0

Total mortality of treated eggs: 97.26 %.

Percentage mortality of eggs of *Anobium punctatum* 228 days after exposure to sulfuryl fluoride.

A	Untreated Control			
No.	Eggs	Larvae hatched	Larvae penetrated	Larvae survived
1	153	150	150	150
2	97	97	97	97
3	88	88	88	88
4	127	127	127	127
5	98	96	96	95
6	87	87	87	87
7	100	100	100	98
8	88	88	88	85
9	109	107	107	99
10	123	122	122	109
total	1070	1062	1062	1035

Total mortality of untreated eggs: 3.27 %.

B	Treated Eggs			
No.	Eggs	Larvae hatched	Larvae penetrated	Larvae survived
21	293	1	1	0
22	268	4	4	1
23	102	0	0	0
24	169	16	16	4
25	261	9	9	1
total	1093	30	30	6

Total mortality of treated eggs: 99.45 %.

Section B5.10.2 Efficacy Data

Annex Point IIB5.10
TNsG: Pt. I-B5.10,
Pt. III-Ch. 6

B5.10.2/23 Anobium punctatum Laboratory study (ref. Z23)

3.1.1	Dose/Efficacy curve	Not available from report
3.1.2	Begin and duration of effects	A mortality of 97.26 % was achieved 88 days after treatment and of 99.45 % 228 days after treatment.
3.1.3	Observed effects in the post monitoring phase	No unusual effect observed.
3.2	**Effects against organisms or objects to be protected**	None reported.
3.3	**Other effects**	None reported.
3.4	**Efficacy of the reference substance**	No reference substance was used.
3.5	**Tabular and/or graphical presentation of the summarised results**	See 3.1.
3.6	**Efficacy limiting factors**	
3.6.1	Occurrences of resistances	None reported.
3.6.2	Other limiting factors	None reported.
		4 RELEVANCE OF THE RESULTS COMPARED TO FIELD CONDITIONS
4.1	**Reasons for laboratory testing**	1 Precise conditions could be determined. 2 Practical, accurate procedure. Data generated is considered relevant for field of use. Test insects obtained from the field.
4.2	**Intended actual scale of biocide application**	Not applicable.
4.3	**Relevance compared to field conditions**	
4.3.1	Application method	The principle of fumigation is to confine a sufficient concentration for a sufficient period of time to enable a toxic dose to be received by the target pest. There are a number of ways in laboratory and field studies to achieve this although the principle is the same.
4.3.2	Test organism	There are different life stages of *Anobium punctatum* . Eggs are considered to be the stage which would require a higher dose of sulfuryl

		fluoride compared to the other stages.
4.3.3	Observed effect	The high mortality effect, recorded in the laboratory test is considered as the desired field response for eradication of eggs of *Anobium punctatum*.
4.4	**Relevance for read-across**	Not applicable.

5 APPLICANT'S SUMMARY AND CONCLUSION

5.1	**Materials and methods**	Eggs of *Anobium punctatum* were fumigated with sulfuryl fluoride for 41 hours and 50 minutes at 20.1 °C and 82 % relative humidity in laboratory fumitoria. Bioassays from laboratory population according to EN 49.1 (1992) ("Holzschutzmittel - Bestimmung der vorbeugenden Wirkung gegenüber *Anobium punctatum* (De Geer) durch Beobachten der Eiablage und des Überlebens von Larven - Teil 1: Oberflächenbehandlung (Laboratoriumsverfahren)") were tested to determine LAD. Fumigant concentration was measured using a Fumiscope gas analyser. Mortality rate was evaluated 88 days and 228 days after treatment.
5.2	**Reliability**	Reliability indicator 2: Study conducted in accordance with generally accepted scientific principles, possibly with incomplete reporting or methodological deficiencies, which do not affect the quality of relevant results.
5.3	**Assessment of efficacy, data analysis and interpretation**	The result of this investigation was that under the described conditions a high level of control of *Anobium punctatum* eggs was achieved. Additional trials have to be performed to understand the variability of the dose rates of the fumigant to achieve the LAD for this specific life stage at different temperatures.
5.4	**Conclusion**	There are different life stages of *Anobium punctatum* present in infested wooden structures. The laboratory fumigation test undertaken was considered to be a valid and effective procedure for evaluating the efficacy of sulfuryl fluoride on the eggs of *A. punctatum*. The efficacy results showed that sulfuryl fluoride was highly effective on eggs of this pest species.
5.5	**Proposed efficacy specification**	Control of eggs is excellent 99.45 % mortality at the evaluated LAD of 974 g-h/m³ at a temperature of 20.1°C and 82 % relative humidity.

Evaluation by Competent Authorities

EVALUATION BY RAPPORTEUR MEMBER STATE

Date	October 2004.
Comments	Field 2.3.7, The following is a revised version of the present entry: The untreated controls and treated eggs were kept and stored under the same incubation conditions before and after the test fumigations. These incubation conditions were: temperature 20 C , 75% relative humidity. The conditions during fumigation is given in Table 1.4 with the untreated controls remaining under incubation conditions of 20 °C , 75% relative humidity. Field 3.1: Within the body of each table the numbers are counts and not percentages (as stated in the table legend above the tables).
Summary and conclusion	Applicant's version is adopted.

1.1 Test organisms - *Anobium punctatum*

Criteria	Details
Family	Anobiidae.
Species	*Anobium punctatum.*
Source	Laboratory population according to EN 49.1 (1992) ("Holzschutzmittel - Bestimmung der vorbeugenden Wirkung gegenüber *Anobium punctatum* (De Geer) durch Beobachten der Eiablage und des Überlebens von Larven - Teil 1: Oberflächenbehandlung (Laboratoriumsverfahren)") ("Holzschutzmittel - Bestimmung der vorbeugenden Wirkung gegenüber Anobium punctatum (De Geer) durch Beobachten der Eiablage und des Überlebens von Larven - Teil 1: Oberflächenbehandlung (Laboratoriumsverfahren)").
Life stage	Eggs.
Mixed age population	Not applicable.
Number of eggs in test	1093.

1.2 Test system

Criteria	Details
Test chamber	Fumitoria (fumigation chambers) made of acrylic glass, 40 x 25 x 14.5 cm = 14.5 litres, gas introduction via polyamide (PA) -lines 6 mm external diameter/4 mm internal diameter, gas monitoring via separate PA-lines 6 mm external diameter/4 mm internal diameter.
Test insects introduction into chamber	In total 1093 eggs on five boards of pine-wood (*Pinus silvestris* L.), ca. 100x40x10 mm according to EMPA ("Für Insektenversuche darf nur Kiefernsplintholz, gerade gewachsen, ohne Äste und arm an Harz verwendet werden. Mittleres Wachstum von 2.5-8

	Jahrringe je cm. Der Anteil des Spätholzes an der Gesamtbreite der Jahrringe soll 30% nicht überschreiten. Das Holz darf weder chemisch behandelt noch geflößt oder mit Wärme behandelt sein; es muss lufttrocken und nicht länger als 5 Jahre gelagert sein.“).
Measuring equipment	Gas concentrations were verified upon initiation, periodically during fumigation and upon termination using a Fumiscope gas analyser.

1.3 Application of test substance

Criteria	Details
Application procedure	Sulfuryl fluoride was supplied in commercial steel cylinders as a liquid under pressure. It was introduced into the fumitorium in its gaseous form.
Delivery method	Sulfuryl fluoride was made available for introduction into the fumitorium by using a heat-exchanger-system. Exact amounts of sulfuryl fluoride were transferred from the cylinder to the fumatorium using a gas syringe.
Dosage rate	<u>Eggs</u> All eggs were fumigated at a mean concentration of 23.3 g/m^3 for a total exposure period of 41 hours and 50 minutes leading to an accumulated dosage of 974 g-h/m^3.

1.4 Test conditions

Criteria	Details
Incubation temperature	Fumigation was conducted at an average temperature of 20.1 ^oC.
Moisture	Fumigation was conducted at an average 82 % relative humidity.

Section B5.10.2 Efficacy Data

Annex Point IIB5.10
TNsG: Pt. I-B5.10, Pt. III-Ch. 6

B5.10.2/24 Anobium punctatum Laboratory study (Ref. Z24)

			Official use only
		1 REFERENCE: Z24, B5.10.2/24	
1.1	**Reference**	[1]Binker, G., [1]Binker, J., [1]Fröba G., [2]Graf, E. and [2]Lanz, B (1999). [1]Binker Materialschutz GmbH, Westendstr. 3, D-91207 Lauf, Germany [2]EMPA, Swiss Federal Laboratories for Materials Testing and Research Lerchenfeldstr. 5, CH-9014 St. Gallen, Switzerland. Laboratory study on *Anobium punctatum* Number: 130377/A and 403972 (Bioassay 26 – 30).	
1.2	**Data protection**	Yes.	
1.2.1	Data owner	Dow AgroSciences LLC.	
1.2.2	Companies with letter of Access	None.	
1.2.3	Criteria for data protection	Data submitted to the MS after 13 May 2000 on existing b.p. for the purpose of its entry into Annex I	
1.3	**Guideline study**	The study was undertaken on the basis of sound principles of fumigation practice.	
1.4	**Deviations**	Not applicable as the study not conducted to an international standard method.	
		2 METHOD	
2.1	**Test Substance (Biocidal Product)**	Sulfuryl fluoride.	
2.1.1	Trade name/ proposed trade name	Vikane.	
2.1.2	Composition of Product tested	> 99% Sulfuryl fluoride.	
2.1.3	Physical state and nature	Fumigant.	
2.1.4	Monitoring of active substance concentration	Monitoring was undertaken using a Fumiscope gas analyser.	
2.1.5	Method of analysis	Not applicable.	
2.2	**Reference substance**	No reference substance was included in the study.	
2.2.1	Method of analysis for reference substance	Not applicable.	
2.3	**Testing procedure**		
2.3.1	Test population / inoculum /	See Table 1.1.	

	test organism		
2.3.2	Test system	See Table 1.2.	
2.3.3	Application of TS	See Table 1.3.	
2.3.4	Test conditions	See Table 1.4.	
2.3.5	Duration of the test / Exposure time	43 hours.	
2.3.6	Number of replicates performed	One.	
2.3.7	Controls	Untreated controls were included, these were kept and stored under the same conditions as the treated eggs of *Anobium punctatum*.	X
2.4	**Examination**		
2.4.1	Effect investigated	Lethal accumulated dosage (LAD) expressed as g-h/m^3. Two effects were determined – LAD 88 days after treatment and LAD 228 days after treatment.	
2.4.2	Method for recording / scoring of the effect	Egg-mortality by examination (count) of larvae hatched from treated eggs 88 days after treatment and survival of these larvae 140 days later (i.e. 228 days after treatment).	
2.4.3	Intervals of examination	Larvae hatched from treated eggs 88 days after treatment and larvae survival 228 days after treatment.	
2.4.4	Statistics	Post fumigation mean total mortality was calculated by dividing the number of dead eggs by the total number of treated eggs 88 days after treatment and 228 days after treatment.	
2.4.5	Post fumigation monitoring of the test organism	See 2.4.4.	
		3 RESULTS	
3.1	**Efficacy**	The percentage mortality was calculated by dividing the total number of hatched and surviving larvae by the total number of treated eggs.	X

Percentage mortality of eggs of *Anobium punctatum* 88 days after exposure to sulfuryl fluoride.

A	Untreated Control			
No.	Eggs	Larvae hatched	Larvae penetrated	Dead larvae
1	153	150	150	0
2	97	97	97	0
3	88	88	88	0
4	127	127	127	0
5	98	96	96	0
6	87	87	87	0
7	100	100	100	0

8	88	88	88	0
9	109	107	107	0
10	123	122	122	0
total	1070	1062	1062	0

Total mortality of untreated eggs 0.75 %.

B	Treated Eggs			
No.	Eggs	Larvae hatched	Larvae penetrated	Dead larvae
26	255	1	1	0
27	159	0	0	0
28	138	1	1	0
29	195	0	0	0
30	192	0	0	0
total	939	2	2	0

Total mortality of treated eggs: 99.79 %.

Percentage mortality of eggs of *Anobium punctatum* 228 days after exposure to sulfuryl fluoride.

A	Untreated Control			
No.	Eggs	Larvae hatched	Larvae penetrated	Larvae survived
1	153	150	150	150
2	97	97	97	97
3	88	88	88	88
4	127	127	127	127
5	98	96	96	95
6	87	87	87	87
7	100	100	100	98
8	88	88	88	85
9	109	107	107	99
10	123	122	122	109
total	1070	1062	1062	1035

Total mortality of untreated eggs: 3.27 %.

B	Treated Eggs			
No.	Eggs	Larvae hatched	Larvae penetrated	Larvae survived
26	255	1	1	0
27	159	0	0	0
28	138	1	1	0
29	195	0	0	0
30	192	0	0	0
total	939	2	2	0

Total mortality of treated eggs: 100 %.

Section B5.10.2 Efficacy Data

Annex Point IIB5.10
TNsG: Pt. I-B5.10,
Pt. III-Ch. 6

B5.10.2/24 Anobium punctatum Laboratory study (Ref. Z24)

3.1.1	Dose/Efficacy curve	Not available from report.
3.1.2	Begin and duration of effects	A mortality of 99.79 % was achieved 88 days after treatment and of 100 % 228 days after treatment.
3.1.3	Observed effects in the post monitoring phase	No unusual effect observed.
3.2	**Effects against organisms or objects to be protected**	None reported.
3.3	**Other effects**	None reported.
3.4	**Efficacy of the reference substance**	No reference substance was used.
3.5	**Tabular and/or graphical presentation of the summarised results**	See 3.1.
3.6	**Efficacy limiting factors**	
3.6.1	Occurrences of resistances	None reported.
3.6.2	Other limiting factors	None reported.
		4 RELEVANCE OF THE RESULTS COMPARED TO FIELD CONDITIONS
4.1	**Reasons for laboratory testing**	1 Precise conditions could be determined. 2 Practical, accurate procedure. Data generated is considered relevant for field of use. Test insects obtained from the field.
4.2	**Intended actual scale of biocide application**	Not applicable.
4.3	**Relevance compared to field conditions**	
4.3.1	Application method	The principle of fumigation is to confine a sufficient concentration for a sufficient period of time to enable a toxic dose to be received by the target pest. There are a number of ways in laboratory and field studies to achieve this although the principle is the same.
4.3.2	Test organism	There are different life stages of *Anobium punctatum.* Eggs are considered to be the stage which would require a higher dose of sulfuryl

		fluoride compared to the other stages.
4.3.3	Observed effect	The high mortality effect, recorded in the laboratory test is considered as the desired field response for eradication of eggs of *Anobium punctatum*.
4.4	**Relevance for read-across**	Not applicable.

5 APPLICANT'S SUMMARY AND CONCLUSION

5.1	**Materials and methods**	Eggs of *Anobium punctatum* were fumigated with sulfuryl fluoride for 43 hours at 20.4 °C and 87 % relative humidity in laboratory fumitoria. Bioassays from laboratory population according to EN 49.1 (1992) ("Holzschutzmittel - Bestimmung der vorbeugenden Wirkung gegenüber *Anobium punctatum* (De Geer) durch Beobachten der Eiablage und des Überlebens von Larven - Teil 1: Oberflächenbehandlung (Laboratoriumsverfahren)") ("Holzschutzmittel - Bestimmung der vorbeugenden Wirkung gegenüber Anobium punctatum (De Geer) durch Beobachten der Eiablage und des Überlebens von Larven - Teil 1: Oberflächenbehandlung (Laboratoriumsverfahren)") were tested to determine LAD. Fumigant concentration was measured using a Fumiscope gas analyser. Mortality rate was evaluated 88 days and 228 days after treatment.
5.2	**Reliability**	Reliability indicator 2: Study conducted in accordance with generally accepted scientific principles, possibly with incomplete reporting or methodological deficiencies, which do not affect the quality of relevant results.
5.3	**Assessment of efficacy, data analysis and interpretation**	The result of this investigation was that under the described conditions a high level of control of *Anobium punctatum* eggs was achieved. Additional trials have to be performed to understand the variability of the dose rates of the fumigant to achieve the LAD for this specific life stage at different temperatures.
5.4	**Conclusion**	There are different life stages of *Anobium punctatum* present in infested wooden structures. The laboratory fumigation test undertaken was considered to be a valid and effective procedure for evaluating the efficacy of sulfuryl fluoride on the eggs of *A. punctatum*. The efficacy results showed that sulfuryl fluoride was highly effective on eggs of this pest species.
5.5	**Proposed efficacy specification**	Control of eggs is excellent 100 % mortality at the evaluated LAD of 1819 g-h/m³ at a temperature of 20.4 °C and 87 % relative humidity.

Evaluation by Competent Authorities	
	EVALUATION BY RAPPORTEUR MEMBER STATE
Date	October 2004.
Comments	Field 2.3.7, The following is a revised version of the present entry: The untreated controls and treated eggs were kept and stored under the same incubation conditions before and after the test fumigations. These incubation conditions were: temperature 20 C , 75% relative humidity. The conditions during fumigation is given in Table 1.4 with the untreated controls remaining under incubation conditions of 20 °C , 75% relative humidity. Field 3.1: Within the body of each table the numbers are counts and not percentages (as stated in the table legend above the tables).
Summary and conclusion	Applicant's version is adopted.

1.1 Test organisms - *Anobium punctatum*

Criteria	Details
Family	Anobiidae.
Species	*Anobium punctatum.*
Source	Laboratory population according to EN 49.1 (1992) ("Holzschutzmittel - Bestimmung der vorbeugenden Wirkung gegenüber *Anobium punctatum* (De Geer) durch Beobachten der Eiablage und des Überlebens von Larven - Teil 1: Oberflächenbehandlung (Laboratoriumsverfahren)") ("Holzschutzmittel - Bestimmung der vorbeugenden Wirkung gegenüber Anobium punctatum (De Geer) durch Beobachten der Eiablage und des Überlebens von Larven - Teil 1: Oberflächenbehandlung (Laboratoriumsverfahren)").
Life stage	Eggs.
Mixed age population	Not applicable.
Number of eggs in test	939.

1.2 Test system

Criteria	Details
Test chamber	Fumitoria (fumigation chambers) made of acrylic glass, 40 x 25 x 14.5 cm = 14.5 litres, gas introduction via polyamide (PA) -lines 6 mm external diameter/4 mm internal diameter, gas monitoring via separate PA-lines 6 mm external diameter/4 mm internal diameter.
Test insects introduction into chamber	In total 939 eggs on five boards of pine-wood (*Pinus silvestris* L.), ca. 100x40x10 mm according to EMPA ("Für Insektenversuche darf nur Kiefernsplintholz, gerade gewachsen, ohne Äste und arm an Harz verwendet werden. Mittleres Wachstum von 2.5-8

	Jahrringe je cm. Der Anteil des Spätholzes an der Gesamtbreite der Jahrringe soll 30% nicht überschreiten. Das Holz darf weder chemisch behandelt noch geflößt oder mit Wärme behandelt sein; es muss lufttrocken und nicht länger als 5 Jahre gelagert sein.“).
Measuring equipment	Gas concentrations were verified upon initiation, periodically during fumigation and upon termination using a Fumiscope gas analyser.

1.3 Application of test substance

Criteria	Details
Application procedure	Sulfuryl fluoride was supplied in commercial steel cylinders as liquid under pressure. It was introduced into the fumitorium in its gaseous form.
Delivery method	Sulfuryl fluoride was made available for introduction into the fumitorium by using a heat-exchanger-system. Exact amounts of sulfuryl fluoride were transferred from the cylinder to the fumatorium using a gas syringe.
Dosage rate	Eggs All eggs were fumigated at a mean concentration of 42.3 g/m^3 for a total exposure period of 43 hours leading to an accumulated dosage of 1819 g-h/m^3.

1.4 Test conditions

Criteria	Details
Incubation temperature	Fumigation was conducted at an average temperature of 20.4 ^oC.
Moisture	Fumigation was conducted at an average 87 % relative humidity.

Section B5.10.2 Efficacy Data

Annex Point IIB5.10
TNsG: Pt. I-B5.10, Pt. III-Ch. 6

B5.10.2/25 Anobium punctatum Laboratory study (Ref. Z25)

			Official use only
		1 REFERENCE: Z25, B5.10.2/25	
1.1	**Reference**	[1]Binker, G., [1]Binker, J., [1]Fröba G., [2]Graf, E. and [2]Lanz, B (1999). [1]Binker Materialschutz GmbH, Westendstr. 3, D-91207 Lauf, Germany [2]EMPA, Swiss Federal Laboratories for Materials Testing and Research Lerchenfeldstr. 5, CH-9014 St. Gallen, Switzerland. Laboratory study on *Anobium punctatum* Number: 130377/A and 403972 (Bioassay 31 – 35).	
1.2	**Data protection**	Yes.	
1.2.1	Data owner	Dow AgroSciences LLC.	
1.2.2	Companies with letter of Access	None.	
1.2.3	Criteria for data protection	Data submitted to the MS after 13 May 2000 on existing b.p. for the purpose of its entry into Annex I	
1.3	**Guideline study**	The study was undertaken on the basis of sound principles of fumigation practice.	
1.4	**Deviations**	Not applicable as the study not conducted to an international standard method.	
		2 METHOD	
2.1	**Test Substance (Biocidal Product)**	Sulfuryl fluoride.	
2.1.1	Trade name/ proposed trade name	Vikane.	
2.1.2	Composition of Product tested	> 99% Sulfuryl fluoride.	
2.1.3	Physical state and nature	Fumigant.	
2.1.4	Monitoring of active substance concentration	Monitoring was undertaken using a Fumiscope gas analyser.	
2.1.5	Method of analysis	Not applicable.	
2.2	**Reference substance**	No reference substance was included in the study.	
2.2.1	Method of analysis for reference substance	Not applicable.	
2.3	**Testing procedure**		
2.3.1	Test population / inoculum /	See Table 1.1.	

	test organism		
2.3.2	Test system	See Table 1.2.	
2.3.3	Application of TS	See Table 1.3.	
2.3.4	Test conditions	See Table 1.4.	
2.3.5	Duration of the test / Exposure time	42 hours and 40 minutes.	
2.3.6	Number of replicates performed	One.	
2.3.7	Controls	Untreated controls were included; these were kept and stored under the same conditions as the treated eggs of *Anobium punctatum*.	X
2.4	**Examination**		
2.4.1	Effect investigated	Lethal accumulated dosage (LAD) expressed as g-h/m^3. Two effects were determined – LAD 88 days after treatment and LAD 228 days after treatment.	
2.4.2	Method for recording / scoring of the effect	Egg-mortality by examination (count) of larvae hatched from treated eggs 88 days after treatment and survival of these larvae 140 days later (i.e. 228 days after treatment).	
2.4.3	Intervals of examination	Larvae hatched from treated eggs 88 days after treatment and larvae survival 228 days after treatment.	
2.4.4	Statistics	Post fumigation mean total mortality was calculated by dividing the number of dead eggs by the total number of treated eggs 88 days after treatment and 228 days after treatment.	
2.4.5	Post fumigation monitoring of the test organism	See 2.4.4.	
		3 RESULTS	
3.1	**Efficacy**	The percentage mortality was calculated by dividing the total number of hatched and surviving larvae by the total number of treated eggs.	X

Percentage mortality of eggs of *Anobium punctatum* 88 days after exposure to sulfuryl fluoride.

A	Untreated Control			
No.	Eggs	Larvae hatched	Larvae penetrated	Dead larvae
1	153	150	150	0
2	97	97	97	0
3	88	88	88	0
4	127	127	127	0
5	98	96	96	0
6	87	87	87	0
7	100	100	100	0

8	88	88	88	0
9	109	107	107	0
10	123	122	122	0
total	1070	1062	1062	0

Total mortality of untreated eggs 0.75 %.

B	Treated Eggs			
No.	Eggs	Larvae hatched	Larvae penetrated	Dead larvae
31	279	3	3	0
32	119	0	0	0
33	184	0	0	0
34	215	0	0	0
35	122	0	0	0
total	919	3	3	0

Total mortality of treated eggs: 99.67 %.

Percentage mortality of eggs of *Anobium punctatum* 228 days after exposure to sulfuryl fluoride.

A	Untreated Control			
No.	Eggs	Larvae hatched	Larvae penetrated	Larvae survived
1	153	150	150	150
2	97	97	97	97
3	88	88	88	88
4	127	127	127	127
5	98	96	96	95
6	87	87	87	87
7	100	100	100	98
8	88	88	88	85
9	109	107	107	99
10	123	122	122	109
total	1070	1062	1062	1035

Total mortality of untreated eggs: 3.27 %.

B	Treated Eggs			
No.	Eggs	Larvae hatched	Larvae penetrated	Larvae survived
31	279	3	3	0
32	119	0	0	0
33	184	0	0	0
34	215	0	0	0
35	122	0	0	0
total	919	3	3	0

Total mortality of treated eggs: 100 %.

Section B5.10.2 **Efficacy Data**

Annex Point IIB5.10
TNsG: Pt. I-B5.10,
Pt. III-Ch. 6

B5.10.2/25 Anobium punctatum Laboratory study (Ref. Z25)

3.1.1	Dose/Efficacy curve	Not available from report.
3.1.2	Begin and duration of effects	A mortality of 99.67 % was achieved 88 days after treatment and of 100 % 228 days after treatment.
3.1.3	Observed effects in the post monitoring phase	No unusual effect observed.
3.2	**Effects against organisms or objects to be protected**	None reported.
3.3	**Other effects**	None reported.
3.4	**Efficacy of the reference substance**	No reference substance was used.
3.5	**Tabular and/or graphical presentation of the summarised results**	See 3.1.
3.6	**Efficacy limiting factors**	
3.6.1	Occurrences of resistances	None reported.
3.6.2	Other limiting factors	None reported.
		4 RELEVANCE OF THE RESULTS COMPARED TO FIELD CONDITIONS
4.1	**Reasons for laboratory testing**	1 Precise conditions could be determined. 2 Practical, accurate procedure. Data generated is considered relevant for field of use. Test insects obtained from the field.
4.2	**Intended actual scale of biocide application**	Not applicable.
4.3	**Relevance compared to field conditions**	Not applicable.
4.3.1	Application method	The principle of fumigation is to confine a sufficient concentration for a sufficient period of time to enable a toxic dose to be received by the target pest. There are a number of ways in laboratory and field studies to achieve this although the principle is the same.
4.3.2	Test organism	There are different life stages of *Anobium punctatum.* Eggs are

		considered to be the stage which would require a higher dose of sulfuryl fluoride compared to the other stages.
4.3.3	Observed effect	The high mortality effect, recorded in the laboratory test is considered as the desired field response for eradication of eggs of *Anobium punctatum*.
4.4	**Relevance for read-across**	Not applicable.

5 APPLICANT'S SUMMARY AND CONCLUSION

5.1	**Materials and methods**	Eggs of *Anobium punctatum* were fumigated with sulfuryl fluoride for 42 hours and 40 minutes at 20.2 °C and 87 % relative humidity in laboratory fumitoria. Bioassays from laboratory population according to EN 49.1 (1992) ("Holzschutzmittel - Bestimmung der vorbeugenden Wirkung gegenüber *Anobium punctatum* (De Geer) durch Beobachten der Eiablage und des Überlebens von Larven - Teil 1: Oberflächenbehandlung (Laboratoriumsverfahren)") ("Holzschutzmittel - Bestimmung der vorbeugenden Wirkung gegenüber Anobium punctatum (De Geer) durch Beobachten der Eiablage und des Überlebens von Larven - Teil 1: Oberflächenbehandlung (Laboratoriumsverfahren)") were tested to determine LAD. Fumigant concentration was measured using a Fumiscope gas analyser. Mortality rate was evaluated 88 days and 228 days after treatment.
5.2	**Reliability**	Reliability indicator 2: Study conducted in accordance with generally accepted scientific principles, possibly with incomplete reporting or methodological deficiencies, which do not affect the quality of relevant results.
5.3	**Assessment of efficacy, data analysis and interpretation**	The result of this investigation was that under the described conditions a high level of control of *Anobium punctatum* eggs was achieved. Additional trials have to be performed to understand the variability of the dose rates of the fumigant to achieve the LAD for this specific life stage at different temperatures.
5.4	**Conclusion**	There are different life stages of *Anobium punctatum* present in infested wooden structures. The laboratory fumigation test undertaken was considered to be a valid and effective procedure for evaluating the efficacy of sulfuryl fluoride on the eggs of *A. punctatum*. The efficacy results showed that sulfuryl fluoride was highly effective on eggs of this pest species.
5.5	**Proposed efficacy specification**	Control of eggs is excellent 100 % mortality at the evaluated LAD of 1600 g-h/m³ at a temperature of 20.2 °C 87 % relative humidity.

Evaluation by Competent Authorities	
	EVALUATION BY RAPPORTEUR MEMBER STATE
Date	October 2004.
Comments	Field 2.3.7, The following is a revised version of the present entry: The untreated controls and treated eggs were kept and stored under the same incubation conditions before and after the test fumigations. These incubation conditions were: temperature 20 C , 75% relative humidity. The conditions during fumigation is given in Table 1.4 with the untreated controls remaining under incubation conditions of 20 °C , 75% relative humidity. Field 3.1: Within the body of each table the numbers are counts and not percentages (as stated in the table legend above the tables).
Summary and conclusion	Applicant's version is adopted.

1.1 Test organisms - *Anobium punctatum*

Criteria	Details
Family	Anobiidae.
Species	*Anobium punctatum.*
Source	Laboratory population according to EN 49.1 (1992) ("Holzschutzmittel - Bestimmung der vorbeugenden Wirkung gegenüber *Anobium punctatum* (De Geer) durch Beobachten der Eiablage und des Überlebens von Larven - Teil 1: Oberflächenbehandlung (Laboratoriumsverfahren)") ("Holzschutzmittel - Bestimmung der vorbeugenden Wirkung gegenüber Anobium punctatum (De Geer) durch Beobachten der Eiablage und des Überlebens von Larven - Teil 1: Oberflächenbehandlung (Laboratoriumsverfahren)").
Life stage	Eggs.
Mixed age population	Not applicable.
Number of eggs in test	919.

1.2 Test system

Criteria	Details
Test chamber	Fumitoria (fumigation chambers) made of acrylic glass, 40 x 25 x 14.5 cm = 14.5 litres, gas introduction via polyamide (PA) -lines 6 mm external diameter/4 mm internal diameter, gas monitoring via separate PA-lines 6 mm external diameter/4 mm internal diameter.
Test insects introduction into chamber	In total 919 eggs on five boards of pine-wood (*Pinus silvestris* L.), ca. 100x40x10 mm according to EMPA ("Für Insektenversuche darf nur Kiefernsplintholz, gerade gewachsen, ohne Äste und arm an Harz verwendet werden. Mittleres Wachstum von 2.5-8

	Jahrringe je cm. Der Anteil des Spätholzes an der Gesamtbreite der Jahrringe soll 30% nicht überschreiten. Das Holz darf weder chemisch behandelt noch geflößt oder mit Wärme behandelt sein; es muss lufttrocken und nicht länger als 5 Jahre gelagert sein.“).
Measuring equipment	Gas concentrations were verified upon initiation, periodically during fumigation and upon termination using a Fumiscope gas analyser.

1.3 Application of test substance

Criteria	Details
Application procedure	Sulfuryl fluoride was supplied in commercial steel cylinders as a liquid under pressure. It was introduced into the fumitorium in its gaseous form.
Delivery method	Sulfuryl fluoride was made available for introduction into the fumitorium by using a heat-exchanger-system. Exact amounts of sulfuryl fluoride were transferred from the cylinder to the fumatorium using a gas syringe.
Dosage rate	<u>Eggs</u> All eggs were fumigated at a mean concentration of 37.5 g/m^3 for a total exposure period of 42 hours and 40 minutes leading to an accumulated dosage of 1600 g-h/m^3.

1.4 Test conditions

Criteria	Details
Incubation temperature	Fumigation was conducted at an average temperature of 20.2 ^oC.
Moisture	Fumigation was conducted at an average 87 % relative humidity.

Section B5.10.2 Efficacy Data

Annex Point IIB5.10
TNsG: Pt. I-B5.10, Pt. III-Ch. 6

B5.10.2/26 Anobium punctatum Laboratory study (Ref. Z26)

			Official use only
		1 REFERENCE: Z26, B5.10.2/26	
1.1	**Reference**	[1]Binker, G., [1]Binker, J., [1]Fröba G., [2]Graf, E. and [2]Lanz, B (1999). [1]Binker Materialschutz GmbH, Westendstr. 3, D-91207 Lauf, Germany [2]EMPA, Swiss Federal Laboratories for Materials Testing and Research Lerchenfeldstr. 5, CH-9014 St. Gallen, Switzerland. Laboratory study on *Anobium punctatum* Number: 130377/A and 403972 (Bioassay 36 – 40).	
1.2	**Data protection**	Yes.	
1.2.1	Data owner	Dow AgroSciences LLC.	
1.2.2	Companies with letter of Access	None.	
1.2.3	Criteria for data protection	Data submitted to the MS after 13 May 2000 on existing b.p. for the purpose of its entry into Annex I	
1.3	**Guideline study**	The study was undertaken on the basis of sound principles of fumigation practice.	
1.4	**Deviations**	Not applicable as the study not conducted to an international standard method.	
		2 METHOD	
2.1	**Test Substance (Biocidal Product)**	Sulfuryl fluoride.	
2.1.1	Trade name/ proposed trade name	Vikane.	
2.1.2	Composition of Product tested	> 99% Sulfuryl fluoride.	
2.1.3	Physical state and nature	Fumigant.	
2.1.4	Monitoring of active substance concentration	Monitoring was undertaken using a Fumiscope gas analyser.	
2.1.5	Method of analysis	Not applicable.	
2.2	**Reference substance**	No reference substance was included in the study.	
2.2.1	Method of analysis for reference substance	Not applicable.	
2.3	**Testing procedure**		

Section B5.10.2 Efficacy Data

Annex Point IIB5.10
TNsG: Pt. I-B5.10, Pt. III-Ch. 6

B5.10.2/26 Anobium punctatum Laboratory study (Ref. Z26)

2.3.1	Test population / inoculum / test organism	See Table 1.1.	
2.3.2	Test system	See Table 1.2.	
2.3.3	Application of TS	See Table 1.3.	
2.3.4	Test conditions	See Table 1.4.	
2.3.5	Duration of the test / Exposure time	72 hours and 5 minutes.	
2.3.6	Number of replicates performed	One.	
2.3.7	Controls	Untreated controls were included; these were kept and stored under the same conditions as the treated eggs of *Anobium punctatum*.	X
2.4	**Examination**		
2.4.1	Effect investigated	Lethal accumulated dosage (LAD) expressed as g-h/m^3. Two effects were determined – LAD 85 days after treatment and LAD 225 days after treatment.	
2.4.2	Method for recording / scoring of the effect	Egg-mortality by examination (count) of larvae hatched from treated eggs 85 days after treatment and survival of these larvae 140 days later (i.e. 225 days after treatment).	
2.4.3	Intervals of examination	Larvae hatched from treated eggs 85 days after treatment and larvae survival 225 days after treatment.	
2.4.4	Statistics	Post fumigation mean total mortality was calculated by dividing the number of dead eggs by the total number of treated eggs 85 days after treatment and 225 days after treatment.	
2.4.5	Post fumigation monitoring of the test organism	See 2.4.4.	
		3 RESULTS	
3.1	**Efficacy**	The percentage mortality was calculated by dividing the total number of hatched and surviving larvae by the total number of treated eggs.	X

Percentage mortality of eggs of *Anobium punctatum* 85 days after exposure to sulfuryl fluoride.

A	Untreated Control			
No.	Eggs	Larvae hatched	Larvae penetrated	Dead larvae
1	153	150	150	0
2	97	97	97	0
3	88	88	88	0
4	127	127	127	0

5	98	96	96	0
6	87	87	87	0
7	100	100	100	0
8	88	88	88	0
9	109	107	107	0
10	123	122	122	0
total	1070	1062	1062	0

Total mortality of untreated eggs 0.75 %.

B	Treated Eggs			
No.	Eggs	Larvae hatched	Larvae penetrated	Dead larvae
36	174	0	0	0
37	327	0	0	0
38	133	0	0	0
39	277	0	0	0
40	271	0	0	0
total	1182	0	0	0

Total mortality of treated eggs: 100 %.

Percentage mortality of eggs of *Anobium punctatum* 225 days after exposure to sulfuryl fluoride.

A	Untreated Control			
No.	Eggs	Larvae hatched	Larvae penetrated	Larvae survived
1	153	150	150	150
2	97	97	97	97
3	88	88	88	88
4	127	127	127	127
5	98	96	96	95
6	87	87	87	87
7	100	100	100	98
8	88	88	88	85
9	109	107	107	99
10	123	122	122	109
total	1070	1062	1062	1035

Total mortality of untreated eggs: 3.27 %.

Section B5.10.2 **Efficacy Data**

Annex Point IIB5.10
TNsG: Pt. I-B5.10,
Pt. III-Ch. 6

B5.10.2/26 Anobium punctatum
Laboratory study (Ref. Z26)

3.1.1	Dose/Efficacy curve	Not available from report.
3.1.2	Begin and duration of effects	A mortality of 100 % was achieved 85 days after treatment.
3.1.3	Observed effects in the post monitoring phase	No unusual effect observed.
3.2	**Effects against organisms or objects to be protected**	None reported.
3.3	**Other effects**	None reported.
3.4	**Efficacy of the reference substance**	No reference substance was used.
3.5	**Tabular and/or graphical presentation of the summarised results**	See 3.1.
3.6	**Efficacy limiting factors**	
3.6.1	Occurrences of resistances	None reported.
3.6.2	Other limiting factors	None reported.
		4 RELEVANCE OF THE RESULTS COMPARED TO FIELD CONDITIONS
4.1	**Reasons for laboratory testing**	1 Precise conditions could be determined. 2 Practical, accurate procedure. Data generated is considered relevant for field of use. Test insects obtained from the field.
4.2	**Intended actual scale of biocide application**	Not applicable.
4.3	**Relevance compared to field conditions**	
4.3.1	Application method	The principle of fumigation is to confine a sufficient concentration for a sufficient period of time to enable a toxic dose to be received by the target pest. There are a number of ways in laboratory and field studies to achieve this although the principle is the same.
4.3.2	Test organism	There are different life stages of *Anobium punctatum.* Eggs are considered to be the stage which would require a higher dose of sulfuryl

		fluoride compared to the other stages.
4.3.3	Observed effect	The high mortality effect, recorded in the laboratory test is considered as the desired field response for eradication of eggs of *Anobium punctatum*.
4.4	**Relevance for read-across**	Not applicable.

5 APPLICANT'S SUMMARY AND CONCLUSION

5.1	**Materials and methods**	Eggs of *Anobium punctatum* were fumigated with sulfuryl fluoride for 72 hours and 5 minutes at 17.2 °C and 89 % relative humidity in laboratory fumitoria. Bioassays from laboratory population according to EN 49.1 (1992) ("Holzschutzmittel - Bestimmung der vorbeugenden Wirkung gegenüber *Anobium punctatum* (De Geer) durch Beobachten der Eiablage und des Überlebens von Larven - Teil 1: Oberflächenbehandlung (Laboratoriumsverfahren)") ("Holzschutzmittel - Bestimmung der vorbeugenden Wirkung gegenüber Anobium punctatum (De Geer) durch Beobachten der Eiablage und des Überlebens von Larven - Teil 1: Oberflächenbehandlung (Laboratoriumsverfahren)") were tested to determine LAD. Fumigant concentration was measured using a Fumiscope gas analyser. Mortality rate was evaluated 85 days and 225 days after treatment.
5.2	**Reliability**	Reliability indicator 2: Study conducted in accordance with generally accepted scientific principles, possibly with incomplete reporting or methodological deficiencies, which do not affect the quality of relevant results.
5.3	**Assessment of efficacy, data analysis and interpretation**	The result of this investigation was that under the described conditions a high level of control of *Anobium punctatum* eggs was achieved. Additional trials have to be performed to understand the variability of the dose rates of the fumigant to achieve the LAD for this specific life stage at different temperatures.
5.4	**Conclusion**	There are different life stages of *Anobium punctatum* present in infested wooden structures. The laboratory fumigation test undertaken was considered to be a valid and effective procedure for evaluating the efficacy of sulfuryl fluoride on the eggs of *A. punctatum*. The efficacy results showed that sulfuryl fluoride was highly effective on eggs of this pest species.
5.5	**Proposed efficacy specification**	Control of eggs is excellent 100 % mortality at the evaluated LAD of 2586 g-h/m³ at a temperature of 17.2 °C and 89 % relative humidity.

Evaluation by Competent Authorities

EVALUATION BY RAPPORTEUR MEMBER STATE

Date	October 2004.
Comments	Field 2.3.7, The following is a revised version of the present entry: The untreated controls and treated eggs were kept and stored under the same incubation conditions before and after the test fumigations. These incubation conditions were: temperature 20 C , 75% relative humidity. The conditions during fumigation is given in Table 1.4 with the untreated controls remaining under incubation conditions of 20 °C , 75% relative humidity. Field 3.1: Within the body of each table the numbers are counts and not percentages (as stated in the table legend above the tables).
Summary and conclusion	Applicant's version is adopted.

1.1 Test organisms - *Anobium punctatum*

Criteria	Details
Family	Anobiidae.
Species	*Anobium punctatum.*
Source	Laboratory population according to EN 49.1 (1992) ("Holzschutzmittel - Bestimmung der vorbeugenden Wirkung gegenüber *Anobium punctatum* (De Geer) durch Beobachten der Eiablage und des Überlebens von Larven - Teil 1: Oberflächenbehandlung (Laboratoriumsverfahren)") ("Holzschutzmittel - Bestimmung der vorbeugenden Wirkung gegenüber Anobium punctatum (De Geer) durch Beobachten der Eiablage und des Überlebens von Larven - Teil 1: Oberflächenbehandlung (Laboratoriumsverfahren)").
Life stage	Eggs.
Mixed age population	Not applicable.
Number of eggs in test	1182.

1.2 Test system

Criteria	Details
Test chamber	Fumitoria (fumigation chambers) made of acrylic glass, 40 x 25 x 14.5 cm = 14.5 litres, gas introduction via polyamide (PA) -lines 6 mm external diameter/4 mm internal diameter, gas monitoring via separate PA-lines 6 mm external diameter/4 mm internal diameter.
Test insects introduction into chamber	In total 1182 eggs on five boards of pine-wood (*Pinus silvestris* L.), ca. 100x40x10 mm according to EMPA ("Für Insektenversuche darf nur Kiefernsplintholz, gerade gewachsen, ohne Äste und arm an Harz verwendet werden. Mittleres Wachstum von 2.5-8

	Jahrringe je cm. Der Anteil des Spätholzes an der Gesamtbreite der Jahrringe soll 30% nicht überschreiten. Das Holz darf weder chemisch behandelt noch geflößt oder mit Wärme behandelt sein; es muss lufttrocken und nicht länger als 5 Jahre gelagert sein.“).
Measuring equipment	Gas concentrations were verified upon initiation, periodically during fumigation and upon termination using a Fumiscope gas analyser.

1.3 Application of test substance

Criteria	Details
Application procedure	Sulfuryl fluoride was supplied in commercial steel cylinders as a liquid under pressure. It was introduced into the fumitorium in its gaseous form.
Delivery method	Sulfuryl fluoride was made available for introduction into the fumitorium by using a heat-exchanger-system. Exact amounts of sulfuryl fluoride were transferred from the cylinder to the fumatorium using a gas syringe.
Dosage rate	<u>Eggs</u> All eggs were fumigated at a mean concentration of 35.9 g/m^3 for a total exposure period of 72 hours and 5 minutes leading to an accumulated dosage of 2586 $g\text{-}h/m^3$.

1.4 Test conditions

Criteria	Details
Incubation temperature	Fumigation was conducted at an average temperature of 17.2 ^oC.
Moisture	Fumigation was conducted at an average 89 % relative humidity.

Section B5.10.2 Efficacy Data

Annex Point IIB5.10
TNsG: Pt. I-B5.10, Pt. III-Ch. 6

B5.10.2/27 Anobium punctatum Laboratory study (Ref. Z27)

			Official use only
		1 REFERENCE: Z27, B5.10.2/27	
1.1	**Reference**	[1]Binker, G., [1]Binker, J., [1]Fröba G., [2]Graf, E. and [2]Lanz, B (1999). [1]Binker Materialschutz GmbH, Westendstr. 3, D-91207 Lauf, Germany [2]EMPA, Swiss Federal Laboratories for Materials Testing and Research Lerchenfeldstr. 5, CH-9014 St. Gallen, Switzerland. Laboratory study on *Anobium punctatum* Number: 130377/A and 403972 (Bioassay 41 – 45).	
1.2	**Data protection**	Yes.	
1.2.1	Data owner	Dow AgroSciences LLC.	
1.2.2	Companies with letter of Access	None.	
1.2.3	Criteria for data protection	Data submitted to the MS after 13 May 2000 on existing b.p. for the purpose of its entry into Annex I	
1.3	**Guideline study**	The study was undertaken on the basis of sound principles of fumigation practice.	
1.4	**Deviations**	Not applicable as the study not conducted to an international standard method.	
		2 METHOD	
2.1	**Test Substance (Biocidal Product)**	Sulfuryl fluoride.	
2.1.1	Trade name/ proposed trade name	Vikane.	
2.1.2	Composition of Product tested	> 99% Sulfuryl fluoride.	
2.1.3	Physical state and nature	Fumigant.	
2.1.4	Monitoring of active substance concentration	Monitoring was undertaken using a Fumiscope gas analyser.	
2.1.5	Method of analysis	Not applicable.	
2.2	**Reference substance**	No reference substance was included in the study.	
2.2.1	Method of analysis for reference substance	Not applicable.	
2.3	**Testing procedure**		
2.3.1	Test population / inoculum /	See Table 1.1.	

	test organism		
2.3.2	Test system	See Table 1.2.	
2.3.3	Application of TS	See Table 1.3.	
2.3.4	Test conditions	See Table 1.4.	
2.3.5	Duration of the test / Exposure time	69 hours and 55 minutes.	
2.3.6	Number of replicates performed	One.	
2.3.7	Controls	Untreated controls were included, these were kept and stored under the same conditions as the treated eggs of *Anobium punctatum*.	X
2.4	**Examination**		
2.4.1	Effect investigated	Lethal accumulated dosage (LAD) expressed as g-h/m^3. Two effects were determined – LAD 85 days after treatment and LAD 225 days after treatment.	
2.4.2	Method for recording / scoring of the effect	Egg-mortality by examination (count) of larvae hatched from treated eggs 85 days after treatment and survival of these larvae 140 days later (i.e. 225 days after treatment).	
2.4.3	Intervals of examination	Larvae hatched from treated eggs 85 days after treatment and larvae survival 225 days after treatment.	
2.4.4	Statistics	Post fumigation mean total mortality was calculated by dividing the number of dead eggs by the total number of treated eggs 85 days after treatment and 225 days after treatment.	
2.4.5	Post fumigation monitoring of the test organism	See 2.4.4.	
		3 RESULTS	
3.1	**Efficacy**	The percentage mortality was calculated by dividing the total number of hatched and surviving larvae by the total number of treated eggs.	X

Percentage mortality of eggs of *Anobium punctatum* 85 days after exposure to sulfuryl fluoride.

A	Untreated Control			
No.	Eggs	Larvae hatched	Larvae penetrated	Dead larvae
1	153	150	150	0
2	97	97	97	0
3	88	88	88	0
4	127	127	127	0
5	98	96	96	0
6	87	87	87	0

7	100	100	100	0
8	88	88	88	0
9	109	107	107	0
10	123	122	122	0
total	1070	1062	1062	0

Total mortality of untreated eggs 0.75 %.

B	Treated Eggs			
No.	Eggs	Larvae hatched	Larvae penetrated	Dead larvae
41	117	0	0	0
42	165	0	0	0
43	194	0	0	0
44	183	0	0	0
45	218	0	0	0
total	877	0	0	0

Total mortality of treated eggs: 100 %.

Percentage mortality of eggs of *Anobium punctatum* 225 days after exposure to sulfuryl fluoride.

A	Untreated Control			
No.	Eggs	Larvae hatched	Larvae penetrated	Larvae survived
1	153	150	150	150
2	97	97	97	97
3	88	88	88	88
4	127	127	127	127
5	98	96	96	95
6	87	87	87	87
7	100	100	100	98
8	88	88	88	85
9	109	107	107	99
10	123	122	122	109
total	1070	1062	1062	1035

Total mortality of untreated eggs: 3.27 %.

Section B5.10.2 Efficacy Data

Annex Point IIB5.10
TNsG: Pt. I-B5.10,
Pt. III-Ch. 6

B5.10.2.27 Anobium punctatum Laboratory study (Ref. Z27)

3.1.1	Dose/Efficacy curve	Not available from report.
3.1.2	Begin and duration of effects	A mortality of 100 % was achieved 85 days after treatment.
3.1.3	Observed effects in the post monitoring phase	No unusual effect observed.
3.2	**Effects against organisms or objects to be protected**	None reported.
3.3	**Other effects**	None reported.
3.4	**Efficacy of the reference substance**	No reference substance was used.
3.5	**Tabular and/or graphical presentation of the summarised results**	See 3.1.
3.6	**Efficacy limiting factors**	
3.6.1	Occurrences of resistances	None reported.
3.6.2	Other limiting factors	None reported.
		4 RELEVANCE OF THE RESULTS COMPARED TO FIELD CONDITIONS
4.1	**Reasons for laboratory testing**	1 Precise conditions could be determined. 2 Practical, accurate procedure. Data generated is considered relevant for field of use. Test insects obtained from the field.
4.2	**Intended actual scale of biocide application**	Not applicable.
4.3	**Relevance compared to field conditions**	
4.3.1	Application method	The principle of fumigation is to confine a sufficient concentration for a sufficient period of time to enable a toxic dose to be received by the target pest. There are a number of ways in laboratory and field studies to achieve this although the principle is the same.
4.3.2	Test organism	There are different life stages of *Anobium punctatum.* Eggs are considered to be the stage which would require a higher dose of sulfuryl

		fluoride compared to the other stages.
4.3.3	Observed effect	The high mortality effect, recorded in the laboratory test is considered as the desired field response for eradication of eggs of *Anobium punctatum*.
4.4	**Relevance for read-across**	Not applicable.

5 APPLICANT'S SUMMARY AND CONCLUSION

5.1	**Materials and methods**	Eggs of *Anobium punctatum* were fumigated with sulfuryl fluoride for 69 hours and 55 minutes at 17 °C and 87 % relative humidity in laboratory fumitoria. Bioassays from laboratory population according to EN 49.1 (1992) ("Holzschutzmittel - Bestimmung der vorbeugenden Wirkung gegenüber *Anobium punctatum* (De Geer) durch Beobachten der Eiablage und des Überlebens von Larven - Teil 1: Oberflächenbehandlung (Laboratoriumsverfahren)") ("Holzschutzmittel - Bestimmung der vorbeugenden Wirkung gegenüber Anobium punctatum (De Geer) durch Beobachten der Eiablage und des Überlebens von Larven - Teil 1: Oberflächenbehandlung (Laboratoriumsverfahren)") were tested to determine LAD. Fumigant concentration was measured using a Fumiscope gas analyser. Mortality rate was evaluated 85 days and 225 days after treatment.
5.2	**Reliability**	Reliability indicator 2: Study conducted in accordance with generally accepted scientific principles, possibly with incomplete reporting or methodological deficiencies, which do not affect the quality of relevant results.
5.3	**Assessment of efficacy, data analysis and interpretation**	The result of this investigation was that under the described conditions a high level of control of *Anobium punctatum* eggs was achieved. Additional trials have to be performed to understand the variability of the dose rates of the fumigant to achieve the LAD for this specific life stage at different temperatures.
5.4	**Conclusion**	There are different life stages of *Anobium punctatum* present in infested wooden structures. The field fumigation test undertaken was considered to be a valid and effective procedure for evaluating the efficacy of sulfuryl fluoride on the eggs of *A. punctatum*. The efficacy results showed that sulfuryl fluoride was highly effective on eggs of this pest species.
5.5	**Proposed efficacy specification**	Control of eggs is excellent 100 % mortality at the evaluated LAD of 2421 g-h/m³ at a temperature of 17 °C and a moisture of 87 % relative humidity.

Evaluation by Competent Authorities	
	EVALUATION BY RAPPORTEUR MEMBER STATE
Date	October 2004.
Comments	Field 2.3.7, The following is a revised version of the present entry: The untreated controls and treated eggs were kept and stored under the same incubation conditions before and after the test fumigations. These incubation conditions were: temperature 20 C , 75% relative humidity. The conditions during fumigation is given in Table 1.4 with the untreated controls remaining under incubation conditions of 20 °C , 75% relative humidity. Field 3.1: Within the body of each table the numbers are counts and not percentages (as stated in the table legend above the tables).
Summary and conclusion	Applicant's version is adopted.

1.1 Test organisms - *Anobium punctatum*

Criteria	Details
Family	Anobiidae.
Species	*Anobium punctatum.*
Source	Laboratory population according to EN 49.1 (1992) ("Holzschutzmittel - Bestimmung der vorbeugenden Wirkung gegenüber *Anobium punctatum* (De Geer) durch Beobachten der Eiablage und des Überlebens von Larven - Teil 1: Oberflächenbehandlung (Laboratoriumsverfahren)") ("Holzschutzmittel - Bestimmung der vorbeugenden Wirkung gegenüber Anobium punctatum (De Geer) durch Beobachten der Eiablage und des Überlebens von Larven - Teil 1: Oberflächenbehandlung (Laboratoriumsverfahren)").
Life stage	Eggs.
Mixed age population	Not applicable.
Number of eggs in test	877.

1.2 Test system

Criteria	Details
Test chamber	Fumitoria (fumigation chambers) made of acrylic glass, 40 x 25 x 14.5 cm = 14.5 litres, gas introduction via polyamide (PA) -lines 6 mm external diameter/4 mm internal diameter, gas monitoring via separate PA-lines 6 mm external diameter/4 mm internal diameter.
Test insects introduction into chamber	In total 877 eggs on five boards of pine-wood (*Pinus silvestris* L.), ca. 100x40x10 mm according to EMPA ("Für Insektenversuche darf nur Kiefernsplintholz, gerade gewachsen, ohne Äste und arm an Harz verwendet werden. Mittleres Wachstum von 2.5-8

	Jahrringe je cm. Der Anteil des Spätholzes an der Gesamtbreite der Jahrringe soll 30% nicht überschreiten. Das Holz darf weder chemisch behandelt noch geflößt oder mit Wärme behandelt sein; es muss lufttrocken und nicht länger als 5 Jahre gelagert sein.“).
Measuring equipment	Gas concentrations were verified upon initiation, periodically during fumigation and upon termination using a Fumiscope gas analyser.

1.3 Application of test substance

Criteria	Details
Application procedure	Sulfuryl fluoride was supplied in commercial steel cylinders as a liquid under pressure. It was introduced into the fumitorium in its gaseous form.
Delivery method	Sulfuryl fluoride was made available for introduction into the fumitorium by using a heat-exchanger-system. Exact amounts of sulfuryl fluoride were transferred from the cylinder to the fumatorium using a gas syringe.
Dosage rate	<u>Eggs</u> All eggs were fumigated at a mean concentration of 34.6 g/m^3 for a total exposure period of 69 hours and 55 minutes leading to an accumulated dosage of 2421 $g\text{-}h/m^3$.

1.4 Test conditions

Criteria	Details
Incubation temperature	Fumigation was conducted at an average temperature of 17 ^oC.
Moisture	Fumigation was conducted at an average 87 % relative humidity.

Section B5.10.2 Efficacy Data

Annex Point IIB5.10
TNsG: Pt. I-B5.10, Pt. III-Ch. 6

B5.10.2/28 Anobium punctatum Laboratory study (Ref. Z28)

			Official use only
		1 REFERENCE: Z28, B5.10.2/28	
1.1	**Reference**	[1]Binker, G., [1]Binker, J., [1]Fröba G., [2]Graf, E. and [2]Lanz, B (1999). [1]Binker Materialschutz GmbH, Westendstr. 3, D-91207 Lauf, Germany [2]EMPA, Swiss Federal Laboratories for Materials Testing and Research Lerchenfeldstr. 5, CH-9014 St. Gallen, Switzerland. Laboratory study on *Anobium punctatum* Number: 130377/A and 403972 (Bioassay 46 – 50).	
1.2	**Data protection**	Yes.	
1.2.1	Data owner	Dow AgroSciences LLC.	
1.2.2	Companies with letter of Access	None.	
1.2.3	Criteria for data protection	Data submitted to the MS after 13 May 2000 on existing b.p. for the purpose of its entry into Annex I	
1.3	**Guideline study**	The study was undertaken on the basis of sound principles of fumigation practice.	
1.4	**Deviations**	Not applicable as the study not conducted to an international standard method.	
		2 METHOD	
2.1	**Test Substance (Biocidal Product)**	Sulfuryl fluoride.	
2.1.1	Trade name/ proposed trade name	Vikane.	
2.1.2	Composition of Product tested	> 99% Sulfuryl fluoride.	
2.1.3	Physical state and nature	Fumigant.	
2.1.4	Monitoring of active substance concentration	Monitoring was undertaken using a Fumiscope gas analyser.	
2.1.5	Method of analysis	Not applicable.	
2.2	**Reference substance**	No reference substance was included in the study.	
2.2.1	Method of analysis for reference substance	Not applicable.	
2.3	**Testing procedure**		
2.3.1	Test population / inoculum /	See Table 1.1.	

	test organism		
2.3.2	Test system	See Table 1.2.	
2.3.3	Application of TS	See Table 1.3.	
2.3.4	Test conditions	See Table 1.4.	
2.3.5	Duration of the test / Exposure time	71 hours and 10 minutes.	
2.3.6	Number of replicates performed	One.	
2.3.7	Controls	Untreated controls were included; these were kept and stored under the same conditions as the treated eggs of *Anobium punctatum*.	X
2.4	**Examination**		
2.4.1	Effect investigated	Lethal accumulated dosage (LAD) expressed as g-h/m^3. Two effects were determined – LAD 85 days after treatment and LAD 225 days after treatment.	
2.4.2	Method for recording / scoring of the effect	Egg-mortality by examination (count) of larvae hatched from treated eggs 85 days after treatment and survival of these larvae 140 days later (i.e. 225 days after treatment).	
2.4.3	Intervals of examination	Larvae hatched from treated eggs 85 days after treatment and larvae survival 225 days after treatment.	
2.4.4	Statistics	Post fumigation mean total mortality was calculated by dividing the number of dead eggs by the total number of treated eggs 85 days after treatment and 225 days after treatment.	
2.4.5	Post fumigation monitoring of the test organism	See 2.4.4.	
		3 RESULTS	
3.1	**Efficacy**	The percentage mortality was calculated by dividing the total number of hatched and surviving larvae by the total number of treated eggs.	X

Percentage mortality of eggs of *Anobium punctatum* 85 days after exposure to sulfuryl fluoride.

A	Untreated Control			
No.	Eggs	Larvae hatched	Larvae penetrated	Dead larvae
1	153	150	150	0
2	97	97	97	0
3	88	88	88	0
4	127	127	127	0
5	98	96	96	0
6	87	87	87	0

7	100	100	100	0
8	88	88	88	0
9	109	107	107	0
10	123	122	122	0
total	1070	1062	1062	0

Total mortality of untreated eggs 0.75 %.

B	Treated Eggs			
No.	Eggs	Larvae hatched	Larvae penetrated	Dead larvae
46	169	0	0	0
47	242	1	1	0
48	143	1	1	0
49	168	3	3	0
50	267	0	0	0
total	989	5	5	0

Total mortality of treated eggs: 99.49 %.

Percentage mortality of eggs of *Anobium punctatum* 225 days after exposure to sulfuryl fluoride.

A	Untreated Control			
No.	Eggs	Larvae hatched	Larvae penetrated	Larvae survived
1	153	150	150	150
2	97	97	97	97
3	88	88	88	88
4	127	127	127	127
5	98	96	96	95
6	87	87	87	87
7	100	100	100	98
8	88	88	88	85
9	109	107	107	99
10	123	122	122	109
total	1070	1062	1062	1035

Total mortality of untreated eggs: 3.27 %.

B	Treated Eggs			
No.	Eggs	Larvae hatched	Larvae penetrated	Larvae survived
46	169	0	0	0
47	242	1	1	0
48	143	1	1	0
49	168	3	3	0
50	267	0	0	0
total	989	5	5	0

Total mortality of treated eggs: 100 %.

Section B5.10.2 Efficacy Data

Annex Point IIB5.10
TNsG: Pt. I-B5.10,
Pt. III-Ch. 6

B5.10.2/28 Anobium punctatum Laboratory study (Ref. Z28)

3.1.1	Dose/Efficacy curve	Not available from report
3.1.2	Begin and duration of effects	A mortality of 99.49 % was achieved 85 days after treatment and of 100 % 225 days after treatment.
3.1.3	Observed effects in the post monitoring phase	No unusual effect observed.
3.2	**Effects against organisms or objects to be protected**	None reported.
3.3	**Other effects**	None reported.
3.4	**Efficacy of the reference substance**	No reference substance was used.
3.5	**Tabular and/or graphical presentation of the summarised results**	See 3.1.
3.6	**Efficacy limiting factors**	
3.6.1	Occurrences of resistances	None reported.
3.6.2	Other limiting factors	None reported.

4 RELEVANCE OF THE RESULTS COMPARED TO FIELD CONDITIONS

4.1	**Reasons for laboratory testing**	1 Precise conditions could be determined. 2 Practical, accurate procedure. Data generated is considered relevant for field of use. Test insects obtained from the field.
4.2	**Intended actual scale of biocide application**	Not applicable.
4.3	**Relevance compared to field conditions**	
4.3.1	Application method	The principle of fumigation is to confine a sufficient concentration for a sufficient period of time to enable a toxic dose to be received by the target pest. There are a number of ways in laboratory and field studies to achieve this although the principle is the same.
4.3.2	Test organism	There are different life stages of *Anobium punctatum.* Eggs are considered to be the stage which would require a higher dose of sulfuryl

		fluoride compared to the other stages.
4.3.3	Observed effect	The high mortality effect, recorded in the laboratory test is considered as the desired field response for eradication of eggs of *Anobium punctatum*.
4.4	**Relevance for read-across**	Not applicable.

5 APPLICANT'S SUMMARY AND CONCLUSION

5.1	**Materials and methods**	Eggs of *Anobium punctatum* were fumigated with sulfuryl fluoride for 71 hours and 10 minutes at 16.9 °C and 86 % relative humidity in laboratory fumitoria. Bioassays from laboratory population according to EN 49.1 (1992) ("Holzschutzmittel - Bestimmung der vorbeugenden Wirkung gegenüber *Anobium punctatum* (De Geer) durch Beobachten der Eiablage und des Überlebens von Larven - Teil 1: Oberflächenbehandlung (Laboratoriumsverfahren)") were tested to determine LAD. Fumigant concentration was measured using a Fumiscope gas analyser. Mortality rate was evaluated 85 days and 225 days after treatment.
5.2	**Reliability**	Reliability indicator 2: Study conducted in accordance with generally accepted scientific principles, possibly with incomplete reporting or methodological deficiencies, which do not affect the quality of relevant results.
5.3	**Assessment of efficacy, data analysis and interpretation**	The result of this investigation was that under the described conditions a high level of control of *Anobium punctatum* eggs was achieved. Additional trials have to be performed to understand the variability of the dose rates of the fumigant to achieve the LAD for this specific life stage at different temperatures.
5.4	**Conclusion**	There are different life stages of *Anobium punctatum* present in infested wooden structures. The laboratory fumigation test undertaken was considered to be a valid and effective procedure for evaluating the efficacy of sulfuryl fluoride on the eggs of *A. punctatum*. The efficacy results showed that sulfuryl fluoride was highly effective on eggs of this pest species.
5.5	**Proposed efficacy specification**	Control of eggs is excellent 100 % mortality at the evaluated LAD of 1642 g-h/m³ at a temperature of 16.9 °C and 86 % relative humidity.

Evaluation by Competent Authorities

EVALUATION BY RAPPORTEUR MEMBER STATE

Date	October 2004.
Comments	Field 2.3.7, The following is a revised version of the present entry: The untreated controls and treated eggs were kept and stored under the same incubation conditions before and after the test fumigations. These incubation conditions were: temperature 20 C , 75% relative humidity. The conditions during fumigation is given in Table 1.4 with the untreated controls remaining under incubation conditions of 20 °C , 75% relative humidity. Field 3.1: Within the body of each table the numbers are counts and not percentages (as stated in the table legend above the tables).
Summary and conclusion	Applicant's version is adopted.

1.1 Test organisms - *Anobium punctatum*

Criteria	Details
Family	Anobiidae.
Species	*Anobium punctatum.*
Source	Laboratory population according to EN 49.1 (1992) ("Holzschutzmittel - Bestimmung der vorbeugenden Wirkung gegenüber *Anobium punctatum* (De Geer) durch Beobachten der Eiablage und des Überlebens von Larven - Teil 1: Oberflächenbehandlung (Laboratoriumsverfahren)") ("Holzschutzmittel - Bestimmung der vorbeugenden Wirkung gegenüber Anobium punctatum (De Geer) durch Beobachten der Eiablage und des Überlebens von Larven - Teil 1: Oberflächenbehandlung (Laboratoriumsverfahren)").
Life stage	Eggs.
Mixed age population	Not applicable.
Number of eggs in test	989.

1.2 Test system

Criteria	Details
Test chamber	Fumitoria (fumigation chambers) made of acrylic glass, 40 x 25 x 14.5 cm = 14.5 litres, gas introduction via polyamide (PA) -lines 6 mm external diameter/4 mm internal diameter, gas monitoring via separate PA-lines 6 mm external diameter/4 mm internal diameter.
Test insects introduction into chamber	In total 989 eggs on five boards of pine-wood (*Pinus silvestris* L.), ca. 100x40x10 mm according to EMPA ("Für Insektenversuche darf nur Kiefernsplintholz, gerade gewachsen, ohne Äste und arm an Harz verwendet werden. Mittleres Wachstum von 2.5-8

	Jahrringe je cm. Der Anteil des Spätholzes an der Gesamtbreite der Jahrringe soll 30% nicht überschreiten. Das Holz darf weder chemisch behandelt noch geflößt oder mit Wärme behandelt sein; es muss lufttrocken und nicht länger als 5 Jahre gelagert sein.“).
Measuring equipment	Gas concentrations were verified upon initiation, periodically during fumigation and upon termination using a Fumiscope gas analyser.

1.3 Application of test substance

Criteria	Details
Application procedure	Sulfuryl fluoride was supplied in commercial steel cylinders as a liquid under pressure. It was introduced into the fumitorium in its gaseous form.
Delivery method	Sulfuryl fluoride was made available for introduction into the fumitorium by using a heat-exchanger-system. Exact amounts of sulfuryl fluoride were transferred from the cylinder to the fumatorium using a gas syringe.
Dosage rate	<u>Eggs</u> All eggs were fumigated at a mean concentration of 23.1 g/m^3 for a total exposure period of 71 hours and 10 minutes leading to an accumulated dosage of 1642 $g\text{-}h/m^3$.

1.4 Test conditions

Criteria	Details
Incubation temperature	Fumigation was conducted at an average temperature of 16.9 ^oC.
Moisture	Fumigation was conducted at an average 86 % relative humidity.

Section B5.10.2 Efficacy Data

Annex Point IIB5.10
TNsG: Pt. I-B5.10, Pt. III-Ch. 6

B5.10.2/29 Anobium punctatum Laboratory study (Ref. Z29)

			Official use only
		1 REFERENCE: Z29, B5.10.2/29	
1.1	**Reference**	[1]Binker, G., [1]Binker, J., [1]Fröba G., [2]Graf, E. and [2]Lanz, B (1999). [1]Binker Materialschutz GmbH, Westendstr. 3, D-91207 Lauf, Germany [2]EMPA, Swiss Federal Laboratories Materials Testing and Research Lerchenfeldstr. 5, CH-9014 St. Gallen, Switzerland. Laboratory study on *Anobium punctatum* Number: 130377/A and 403972 (Bioassay 51 – 55).	
1.2	**Data protection**	Yes.	
1.2.1	Data owner	Dow AgroSciences LLC.	
1.2.2	Companies with letter of Access	None.	
1.2.3	Criteria for data protection	Data submitted to the MS after 13 May 2000 on existing b.p. for the purpose of its entry into Annex I	
1.3	**Guideline study**	The study was undertaken on the basis of sound principles of fumigation practice.	
1.4	**Deviations**	Not applicable as the study not conducted to an international standard method.	
		2 METHOD	
2.1	**Test Substance (Biocidal Product)**	Sulfuryl fluoride.	
2.1.1	Trade name/ proposed trade name	Vikane.	
2.1.2	Composition of Product tested	> 99% Sulfuryl fluoride.	
2.1.3	Physical state and nature	Fumigant.	
2.1.4	Monitoring of active substance concentration	Monitoring was undertaken using a Fumiscope gas analyser.	
2.1.5	Method of analysis	Not applicable.	
2.2	**Reference substance**	No reference substance was included in the study.	
2.2.1	Method of analysis for reference substance	Not applicable.	
2.3	**Testing procedure**		
2.3.1	Test population / inoculum /	See Table 1.1.	

	test organism		
2.3.2	Test system	See Table 1.2.	
2.3.3	Application of TS	See Table 1.3.	
2.3.4	Test conditions	See Table 1.4.	
2.3.5	Duration of the test / Exposure time	71 hours and 23 minutes.	
2.3.6	Number of replicates performed	One.	
2.3.7	Controls	Untreated controls were included; these were kept and stored under the same conditions as the treated eggs of *Anobium punctatum*.	X
2.4	**Examination**		
2.4.1	Effect investigated	Lethal accumulated dosage (LAD) expressed as g-h/m^3. Two effects were determined – LAD 85 days after treatment and LAD 225 days after treatment.	
2.4.2	Method for recording / scoring of the effect	Egg-mortality by examination (count) of larvae hatched from treated eggs 85 days after treatment and survival of these larvae 140 days later (i.e. 225 days after treatment).	
2.4.3	Intervals of examination	Larvae hatched from treated eggs 85 days after treatment and larvae survival 225 days after treatment.	
2.4.4	Statistics	Post fumigation mean total mortality was calculated by dividing the number of dead eggs by the total number of treated eggs 85 days after treatment and 225 days after treatment.	
2.4.5	Post fumigation monitoring of the test organism	See 2.4.4.	
		3 RESULTS	
3.1	**Efficacy**	The percentage mortality was calculated by dividing the total number of hatched and surviving larvae by the total number of treated eggs.	X

Percentage mortality of eggs of *Anobium punctatum* 85 days after exposure to sulfuryl fluoride.

A	Untreated Control			
No.	Eggs	Larvae hatched	Larvae penetrated	Dead larvae
1	153	150	150	0
2	97	97	97	0
3	88	88	88	0
4	127	127	127	0
5	98	96	96	0
6	87	87	87	0

7	100	100	100	0
8	88	88	88	0
9	109	107	107	0
10	123	122	122	0
total	1070	1062	1062	0

Total mortality of untreated eggs 0.75 %.

B	Treated Eggs			
No.	Eggs	Larvae hatched	Larvae penetrated	Dead larvae
51	101	0	0	0
52	162	0	0	0
53	143	0	0	0
54	128	0	0	0
55	127	0	0	0
total	661	0	0	0

Total mortality of treated eggs: 100 %.

Percentage mortality of eggs of *Anobium punctatum* 225 days after exposure to sulfuryl fluoride.

A	Untreated Control			
No.	Eggs	Larvae hatched	Larvae penetrated	Larvae survived
1	153	150	150	150
2	97	97	97	97
3	88	88	88	88
4	127	127	127	127
5	98	96	96	95
6	87	87	87	87
7	100	100	100	98
8	88	88	88	85
9	109	107	107	99
10	123	122	122	109
total	1070	1062	1062	1035

Total mortality of untreated eggs: 3.27 %.

Section B5.10.2 **Efficacy Data**

Annex Point IIB5.10
TNsG: Pt. I-B5.10,
Pt. III-Ch. 6

B5.10.2/29 Anobium punctatum Laboratory study (Ref. Z29)

3.1.1	Dose/Efficacy curve	Not available from report.
3.1.2	Begin and duration of effects	A mortality of 100 % was achieved 85 days after treatment.
3.1.3	Observed effects in the post monitoring phase	No unusual effect observed.
3.2	**Effects against organisms or objects to be protected**	None reported.
3.3	**Other effects**	None reported.
3.4	**Efficacy of the reference substance**	No reference substance was used.
3.5	**Tabular and/or graphical presentation of the summarised results**	See 3.1.
3.6	**Efficacy limiting factors**	
3.6.1	Occurrences of resistances	None reported.
3.6.2	Other limiting factors	None reported.
		4 RELEVANCE OF THE RESULTS COMPARED TO FIELD CONDITIONS
4.1	**Reasons for laboratory testing**	1 Precise conditions could be determined. 2 Practical, accurate procedure. Data generated is considered relevant for field of use. Test insects obtained from the field.
4.2	**Intended actual scale of biocide application**	Not applicable.
4.3	**Relevance compared to field conditions**	
4.3.1	Application method	The principle of fumigation is to confine a sufficient concentration for a sufficient period of time to enable a toxic dose to be received by the target pest. There are a number of ways in laboratory and field studies to achieve this although the principle is the same.
4.3.2	Test organism	There are different life stages of *Anobium punctatum.* Eggs are considered to be the stage which would require a higher dose of sulfuryl

		fluoride compared to the other stages.
4.3.3	Observed effect	The high mortality effect, recorded in the laboratory test is considered as the desired field response for eradication of eggs of *Anobium punctatum*.
4.4	**Relevance for read-across**	Not applicable.

5 APPLICANT'S SUMMARY AND CONCLUSION

5.1	**Materials and methods**	Eggs of *Anobium punctatum* were fumigated with sulfuryl fluoride for 71 hours and 23 minutes at 16.9 °C and 82 % relative humidity in laboratory fumitoria. Bioassays from laboratory population according to EN 49.1 (1992) ("Holzschutzmittel - Bestimmung der vorbeugenden Wirkung gegenüber *Anobium punctatum* (De Geer) durch Beobachten der Eiablage und des Überlebens von Larven - Teil 1: Oberflächenbehandlung (Laboratoriumsverfahren)") were tested to determine LAD. Fumigant concentration was measured using a Fumiscope gas analyser. Mortality rate was evaluated 85 days and 225 days after treatment.
5.2	**Reliability**	Reliability indicator 2: Study conducted in accordance with generally accepted scientific principles, possibly with incomplete reporting or methodological deficiencies, which do not affect the quality of relevant results.
5.3	**Assessment of efficacy, data analysis and interpretation**	The result of this investigation that under the described conditions a high level of control of *Anobium punctatum* eggs was achieved. Additional trials have to be performed to understand the variability of the dose rates of the fumigant to achieve the LAD for this specific life stage at different temperatures.
5.4	**Conclusion**	There are different life stages of *Anobium punctatum* present in infested wooden structures. The laboratory fumigation test undertaken was considered to be a valid and effective procedure for evaluating the efficacy of sulfuryl fluoride on the eggs of *A. punctatum*. The efficacy results showed that sulfuryl fluoride was highly effective on eggs of this pest species.
5.5	**Proposed efficacy specification**	Control of eggs is excellent 100 % mortality at the evaluated LAD of 2677 g-h/m³ at a temperature of 16.9 °C and 82 % relative humidity.

Evaluation by Competent Authorities	
	EVALUATION BY RAPPORTEUR MEMBER STATE
Date	October 2004.
Comments	Field 2.3.7, The following is a revised version of the present entry: The untreated controls and treated eggs were kept and stored under the same incubation conditions before and after the test fumigations. These incubation conditions were: temperature 20 C , 75% relative humidity. The conditions during fumigation is given in Table 1.4 with the untreated controls remaining under incubation conditions of 20 °C , 75% relative humidity. Field 3.1: Within the body of each table the numbers are counts and not percentages (as stated in the table legend above the tables).
Summary and conclusion	Applicant's version is adopted.

1.1 Test organisms - *Anobium punctatum*

Criteria	Details
Family	Anobiidae.
Species	*Anobium punctatum.*
Source	Laboratory population according to EN 49.1 (1992) ("Holzschutzmittel - Bestimmung der vorbeugenden Wirkung gegenüber *Anobium punctatum* (De Geer) durch Beobachten der Eiablage und des Überlebens von Larven - Teil 1: Oberflächenbehandlung (Laboratoriumsverfahren)") .
Life stage	Eggs.
Mixed age population	Not applicable.
Number of eggs in test	661.

1.2 Test system

Criteria	Details
Test chamber	Fumitoria (fumigation chambers) made of acrylic glass, 40 x 25 x 14.5 cm = 14.5 litres, gas introduction via polyamide (PA) -lines 6 mm external diameter/4 mm internal diameter, gas monitoring via separate PA-lines 6 mm external diameter/4 mm internal diameter.
Test insects introduction into chamber	In total 661 eggs on five boards of pine-wood (*Pinus silvestris* L.), ca. 100x40x10 mm according to EMPA ("Für Insektenversuche darf nur Kiefernsplintholz, gerade gewachsen, ohne Äste und arm an Harz verwendet werden. Mittleres Wachstum von 2.5-8 Jahrringe je cm. Der Anteil des Spätholzes an der Gesamtbreite der Jahrringe soll 30% nicht überschreiten. Das Holz darf weder chemisch behandelt noch geflößt oder mit Wärme behandelt

	sein; es muss lufttrocken und nicht länger als 5 Jahre gelagert sein.“).
Measuring equipment	Gas concentrations were verified upon initiation, periodically during fumigation and upon termination using a Fumiscope gas analyser.

1.3 Application of test substance

Criteria	Details
Application procedure	Sulfuryl fluoride was supplied in commercial steel cylinders as a liquid under pressure. It was introduced into the fumitorium in its gaseous form.
Delivery method	Sulfuryl fluoride was made available for introduction into the fumitorium by using a heat-exchanger-system. Exact amounts of sulfuryl fluoride were transferred from the cylinder to the fumatorium using a gas syringe.
Dosage rate	<u>Eggs</u> All eggs were fumigated at a mean concentration of 37.5 g/m^3 for a total exposure period of 71 hours and 23 minutes leading to an accumulated dosage of 2677 g-h/m^3.

1.4 Test conditions

Criteria	Details
Incubation temperature	Fumigation was conducted at an average temperature of 16.9 ^oC.
Moisture	Fumigation was conducted at an average 82 % relative humidity.

Section B5.10.2 Efficacy Data

Annex Point IIB5.10
TNsG: Pt. I-B5.10, Pt. III-Ch. 6

B5.10.2/30 Anobium punctatum Laboratory study (Ref. Z30)

			Official use only
		1 REFERENCE: Z30, B5.10.2/30	
1.1	**Reference**	[1]Binker, G., [1]Binker, J., [1]Fröba G., [2]Graf, E. and [2]Lanz, B (1999). [1]Binker Materialschutz GmbH, Westendstr. 3, D-91207 Lauf, Germany [2]EMPA, Swiss Federal Laboratories for Materials Testing and Research Lerchenfeldstr. 5, CH-9014 St. Gallen, Switzerland. Laboratory study on *Anobium punctatum* Number: 130377/A and 403972 (Bioassay 56 – 60).	
1.2	**Data protection**	Yes.	
1.2.1	Data owner	Dow AgroSciences LLC.	
1.2.2	Companies with letter of Access	None.	
1.2.3	Criteria for data protection	Data submitted to the MS after 13 May 2000 on existing b.p. for the purpose of its entry into Annex I	
1.3	**Guideline study**	The study was undertaken on the basis of sound principles of fumigation practice.	
1.4	**Deviations**	Not applicable as the study not conducted to an international standard method.	
		2 METHOD	
2.1	**Test Substance (Biocidal Product)**	Sulfuryl fluoride.	
2.1.1	Trade name/ proposed trade name	Vikane.	
2.1.2	Composition of Product tested	> 99% Sulfuryl fluoride.	
2.1.3	Physical state and nature	Fumigant.	
2.1.4	Monitoring of active substance concentration	Monitoring was undertaken using a Fumiscope gas analyser.	
2.1.5	Method of analysis	Not applicable.	
2.2	**Reference substance**	No reference substance was included in the study.	
2.2.1	Method of analysis for reference substance	Not applicable.	
2.3	**Testing procedure**		
2.3.1	Test population / inoculum /	See Table 1.1.	

	test organism		
2.3.2	Test system	See Table 1.2.	
2.3.3	Application of TS	See Table 1.3.	
2.3.4	Test conditions	See Table 1.4.	
2.3.5	Duration of the test / Exposure time	71 hours and 40 minutes.	
2.3.6	Number of replicates performed	One.	
2.3.7	Controls	Untreated controls were included; these were kept and stored under the same conditions as the treated eggs of *Anobium punctatum*.	X
2.4	**Examination**		
2.4.1	Effect investigated	Lethal accumulated dosage (LAD) expressed as g-h/m^3. Two effects were determined – LAD 85 days after treatment and LAD 225 days after treatment.	
2.4.2	Method for recording / scoring of the effect	Egg-mortality by examination (count) of larvae hatched from treated eggs 85 days after treatment and survival of these larvae 140 days later (i.e. 225 days after treatment).	
2.4.3	Intervals of examination	Larvae hatched from treated eggs 85 days after treatment and larvae survival 225 days after treatment.	
2.4.4	Statistics	Post fumigation mean total mortality was calculated by dividing the number of dead eggs by the total number of treated eggs 85 days after treatment and 225 days after treatment.	
2.4.5	Post fumigation monitoring of the test organism	See 2.4.4.	
		3 RESULTS	
3.1	**Efficacy**	The percentage mortality was calculated by dividing the total number of hatched and surviving larvae by the total number of treated eggs.	X

Percentage mortality of eggs of *Anobium punctatum* 85 days after exposure to sulfuryl fluoride.

A	Untreated Control			
No.	Eggs	Larvae hatched	Larvae penetrated	Dead larvae
1	153	150	150	0
2	97	97	97	0
3	88	88	88	0
4	127	127	127	0
5	98	96	96	0
6	87	87	87	0

7	100	100	100	0
8	88	88	88	0
9	109	107	107	0
10	123	122	122	0
total	1070	1062	1062	0

Total mortality of untreated eggs 0.75 %.

B	Treated Eggs			
No.	Eggs	Larvae hatched	Larvae penetrated	Dead larvae
56	274	1	1	0
57	149	1	1	0
58	141	0	0	0
59	98	0	0	0
60	212	0	0	0
total	874	2	2	0

Total mortality of treated eggs: 99.77 %.

Percentage mortality of eggs of *Anobium punctatum* 225 days after exposure to sulfuryl fluoride.

A	Untreated Control			
No.	Eggs	Larvae hatched	Larvae penetrated	Larvae survived
1	153	150	150	150
2	97	97	97	97
3	88	88	88	88
4	127	127	127	127
5	98	96	96	95
6	87	87	87	87
7	100	100	100	98
8	88	88	88	85
9	109	107	107	99
10	123	122	122	109
total	1070	1062	1062	1035

Total mortality of untreated eggs: 3.27 %.

B	Treated Eggs			
No.	Eggs	Larvae hatched	Larvae penetrated	Larvae survived
56	274	1	1	0
57	149	1	1	0
58	141	0	0	0
59	98	0	0	0
60	212	0	0	0
total	874	2	2	0

Total mortality of treated eggs: 100 %.

Section B5.10.2 **Efficacy Data**

Annex Point IIB5.10
TNsG: Pt. I-B5.10,
Pt. III-Ch. 6

B5.10.2/30 Anobium punctatum
Laboratory study (Ref. Z30)

3.1.1	Dose/Efficacy curve	Not available from report.
3.1.2	Begin and duration of effects	A mortality of 99.77 % was achieved 85 days after treatment and of 100 % 225 days after treatment.
3.1.3	Observed effects in the post monitoring phase	No unusual effect observed.
3.2	**Effects against organisms or objects to be protected**	None reported.
3.3	**Other effects**	None reported.
3.4	**Efficacy of the reference substance**	No reference substance was used.
3.5	**Tabular and/or graphical presentation of the summarised results**	See 3.1.
3.6	**Efficacy limiting factors**	
3.6.1	Occurrences of resistances	None reported.
3.6.2	Other limiting factors	None reported.

4 RELEVANCE OF THE RESULTS COMPARED TO FIELD CONDITIONS

4.1	**Reasons for laboratory testing**	1 Precise conditions could be determined. 2 Practical, accurate procedure. Data generated is considered relevant for field of use. Test insects obtained from the field.
4.2	**Intended actual scale of biocide application**	Not applicable.
4.3	**Relevance compared to field conditions**	
4.3.1	Application method	The principle of fumigation is to confine a sufficient concentration for a sufficient period of time to enable a toxic dose to be received by the target pest. There are a number of ways in laboratory and field studies to achieve this although the principle is the same.
4.3.2	Test organism	There are different life stages of *Anobium punctatum.* Eggs are considered to be the stage which would require a higher dose of sulfuryl

		fluoride compared to the other stages.
4.3.3	Observed effect	The high mortality effect, recorded in the laboratory test is considered as the desired field response for eradication of eggs of *Anobium punctatum*.
4.4	**Relevance for read-across**	Not applicable.

5 APPLICANT'S SUMMARY AND CONCLUSION

5.1	**Materials and methods**	Eggs of *Anobium punctatum* were fumigated with sulfuryl fluoride for 71 hours and 40 minutes at 16.8 °C and 85 % relative humidity in laboratory fumitoria. Bioassays from laboratory population according to EN 49.1 (1992) ("Holzschutzmittel - Bestimmung der vorbeugenden Wirkung gegenüber *Anobium punctatum* (De Geer) durch Beobachten der Eiablage und des Überlebens von Larven - Teil 1: Oberflächenbehandlung (Laboratoriumsverfahren)") were tested to determine LAD. Fumigant concentration was measured using a Fumiscope gas analyser. Mortality rate was evaluated 85 days and 225 days after treatment.
5.2	**Reliability**	Reliability indicator 2: Study conducted in accordance with generally accepted scientific principles, possibly with incomplete reporting or methodological deficiencies, which do not affect the quality of relevant results
5.3	**Assessment of efficacy, data analysis and interpretation**	The result of this investigation was that under the described conditions a high level of control of *Anobium punctatum* eggs was achieved. Additional trials have to be performed to understand the variability of the dose rates of the fumigant to achieve the LAD for this specific life stage at different temperatures.
5.4	**Conclusion**	There are different life stages of *Anobium punctatum* present in infested wooden structures. The laboratory fumigation test undertaken was considered to be a valid and effective procedure for evaluating the efficacy of sulfuryl fluoride on the eggs of *A. punctatum*. The efficacy results showed that sulfuryl fluoride was highly effective on eggs of this pest species.
5.5	**Proposed efficacy specification**	Control of eggs is excellent 100 % mortality at the evaluated LAD of 1788 g-h/m³ at a temperature of 16.8 °C and 85 % relative humidity.

Evaluation by Competent Authorities	
	EVALUATION BY RAPPORTEUR MEMBER STATE
Date	October 2004.
Comments	Field 2.3.7, The following is a revised version of the present entry: The untreated controls and treated eggs were kept and stored under the same incubation conditions before and after the test fumigations. These incubation conditions were: temperature 20 C , 75% relative humidity. The conditions during fumigation is given in Table 1.4 with the untreated controls remaining under incubation conditions of 20 °C , 75% relative humidity. Field 3.1: Within the body of each table the numbers are counts and not percentages (as stated in the table legend above the tables).
Summary and conclusion	Applicant's version is adopted.

1.1 Test organisms - *Anobium punctatum*

Criteria	Details
Family	Anobiidae.
Species	*Anobium punctatum.*
Source	Laboratory population according to EN 49.1 (1992) ("Holzschutzmittel - Bestimmung der vorbeugenden Wirkung gegenüber Anobium punctatum (De Geer) durch Beobachten der Eiablage und des Überlebens von Larven - Teil 1: Oberflächenbehandlung (Laboratoriumsverfahren)").
Life stage	Eggs.
Mixed age population	Not applicable.
Number of eggs in test	874.

1.2 Test system

Criteria	Details
Test chamber	Fumitoria (fumigation chambers) made of acrylic glass, 40 x 25 x 14.5 cm = 14.5 litres, gas introduction via polyamide (PA) -lines 6 mm external diameter/4 mm internal diameter, gas monitoring via separate PA-lines 6 mm external diameter/4 mm internal diameter.
Test insects introduction into chamber	In total 874 eggs on five boards of pine-wood (*Pinus silvestris* L.), ca. 100x40x10 mm according to EMPA ("Für Insektenversuche darf nur Kiefernsplintholz, gerade gewachsen, ohne Äste und arm an Harz verwendet werden. Mittleres Wachstum von 2.5-8 Jahrringe je cm. Der Anteil des Spätholzes an der Gesamtbreite der Jahrringe soll 30% nicht überschreiten. Das Holz darf weder chemisch behandelt noch geflößt oder mit Wärme behandelt

	sein; es muss lufttrocken und nicht länger als 5 Jahre gelagert sein.“).
Measuring equipment	Gas concentrations were verified upon initiation, periodically during fumigation and upon termination using a Fumiscope gas analyser.

1.3 Application of test substance

Criteria	Details
Application procedure	Sulfuryl fluoride was supplied in commercial steel cylinders as a liquid under pressure. It was introduced into the fumitorium in its gaseous form.
Delivery method	Sulfuryl fluoride was made available for introduction into the fumitorium by using a heat-exchanger-system. Exact amounts of sulfuryl fluoride were transferred from the cylinder to the fumatorium using a gas syringe.
Dosage rate	<u>Eggs</u> All eggs were fumigated at a mean concentration of 25 g/m^3 for a total exposure period of 71 hours and 40 minutes leading to an accumulated dosage of 1788 g-h/m^3.

1.4 Test conditions

Criteria	Details
Incubation temperature	Fumigation was conducted at an average temperature of 16.8 ^oC.
Moisture	Fumigation was conducted at an average 85 % relative humidity.

Section B5.10.2 Efficacy Data

Annex Point IIB5.10
TNsG: Pt. I-B5.10, Pt. III-Ch. 6

B5.10.2/31 Anobium punctatum Field study (Ref. Z31)

			Official use only
		1 REFERENCE: Z31, B5.10.2/31	
1.1	**Reference**	[1]Binker, G., [1]Binker, J., [1]Fröba G., [2]Franke, P. and [2]Ultsch, R (2001). [1]Binker Materialschutz GmbH, Westendstr. 3, D-91207 Lauf, Germany [2]LGA, Landesgewerbeanstalt Bayern, Tillystr. 2, D-90431 Nürnberg, Germany Field study on *Anobium punctatum* Number: LBM 541 1320/113.	
1.2	**Data protection**	Yes.	
1.2.1	Data owner	Dow AgroSciences LLC.	
1.2.2	Companies with letter of Access	None.	
1.2.3	Criteria for data protection	Data submitted to the MS after 13 May 2000 on existing b.p. for the purpose of its entry into Annex I	
1.3	**Guideline study**	The study was undertaken on the basis of sound principles of fumigation practice.	
1.4	**Deviations**	Not applicable as the study not conducted to an international standard method.	
		2 METHOD	
2.1	**Test Substance (Biocidal Product)**	Sulfuryl fluoride.	
2.1.1	Trade name/ proposed trade name	Vikane.	
2.1.2	Composition of Product tested	> 99% Sulfuryl fluoride.	
2.1.3	Physical state and nature	Fumigant.	
2.1.4	Monitoring of active substance concentration	Monitoring was undertaken using a Fumiscope gas analyser.	
2.1.5	Method of analysis	Not applicable.	
2.2	**Reference substance**	No reference substance was included in the study.	
2.2.1	Method of analysis for reference substance	Not applicable.	
2.3	**Testing procedure**		
2.3.1	Test population / inoculum / test organism	See Table 1.1.	

2.3.2	Test system	See Table 1.2.	
2.3.3	Application of TS	See Table 1.3.	
2.3.4	Test conditions	See Table 1.4.	
2.3.5	Duration of the test / Exposure time	63 hours and 30 minutes.	
2.3.6	Number of replicates performed	One.	
2.3.7	Controls	Untreated controls were included, these were kept and stored under the same conditions as the treated larvae of *Anobium punctatum*.	
2.4	**Examination**		
2.4.1	Effect investigated	Lethal accumulated dosage (LAD) expressed as g-h/m^3. LAD was determined 11 days after treatment.	
2.4.2	Method for recording / scoring of the effect	Larvae-mortality by examination (count) of dead larvae 11 days after treatment.	
2.4.3	Intervals of examination	11 days after treatment.	
2.4.4	Statistics	Post fumigation mean total mortality was calculated by dividing the number of dead larvae by the total number of treated larvae 11 days after treatment.	
2.4.5	Post fumigation monitoring of the test organism	See 2.4.4.	
		3 RESULTS	
3.1	**Efficacy**	The percentage mortality was calculated by dividing the total number of dead larvae by the total number of treated larvae.	X

Percentage mortality of larvae of *Anobium punctatum* after exposure to sulfuryl fluoride.

	Control	
No.	Larvae	Dead larvae
2	10	0

Total mortality of untreated larvae: 0 %.

	Treated larvae	
No.	Larvae	Dead larvae
1	10	10

Total mortality of treated larvae: 100 %.

3.1.1	Dose/Efficacy curve	Not available from report.
3.1.2	Begin and duration of effects	A mortality of 100 % was achieved 11 days after treatment.
3.1.3	Observed effects in the post monitoring phase	No unusual effect observed.
3.2	**Effects against organisms or objects to be protected**	None reported.
3.3	**Other effects**	None reported.
3.4	**Efficacy of the reference substance**	No reference substance was used.
3.5	**Tabular and/or graphical presentation of the summarised results**	See 3.1.
3.6	**Efficacy limiting factors**	
3.6.1	Occurrences of resistances	None reported.
3.6.2	Other limiting factors	None reported.

4 RELEVANCE OF THE RESULTS COMPARED TO FIELD CONDITIONS

4.1	**Reasons for laboratory testing**	Not applicable.
4.2	**Intended actual scale of biocide application**	Not applicable.
4.3	**Relevance compared to field conditions**	Not applicable.
4.3.1	Application method	Not applicable.
4.3.2	Test organism	Not applicable.
4.3.3	Observed effect	Not applicable.
4.4	**Relevance for read-across**	Not applicable.

5 APPLICANT'S SUMMARY AND CONCLUSION

Section B5.10.2 Efficacy Data

Annex Point IIB5.10
TNsG: Pt. I-B5.10, Pt. III-Ch. 6

B5.10.2/31 Anobium punctatum Field study (Ref. Z31)

5.1	**Materials and methods**	Larvae of *Anobium punctatum* were fumigated with sulfuryl fluoride for 63 hours and 30 minutes at a temperature of 12.6 °C and a moisture of 83.1 % relative humidity in a practical fumigation under field condition (church of a volume of 2400 m³). Bioassays from laboratory population were tested to determine LAD. Fumigant concentration was measured using a Fumiscope gas analyser. Mortality rate was evaluated 11 days after treatment.
5.2	**Reliability**	Reliability indicator 2: Study conducted in accordance with generally accepted scientific principles, possibly with incomplete reporting or methodological deficiencies, which do not affect the quality of relevant results.
5.3	**Assessment of efficacy, data analysis and interpretation**	The result of this investigation was that under the described conditions complete control of *Anobium punctatum* larvae was achieved. Additional trials have to be performed to understand the variability of the dose rates of the fumigant to achieve the LAD for this specific life stage at different temperatures.
5.4	**Conclusion**	There are different life stages of *Anobium punctatum* present in infested wooden structures. The field fumigation test undertaken was considered to be a valid and effective procedure for evaluating the efficacy of sulfuryl fluoride on the larvae of *A. punctatum*. The efficacy results showed that sulfuryl fluoride was highly effective on larvae of this pest species.
5.5	**Proposed efficacy specification**	Total control of larvae of *Anobium punctatum.*

Evaluation by Competent Authorities

EVALUATION BY RAPPORTEUR MEMBER STATE

Date	October 2004.
Comments	Field 3.1: Within the body of each table the numbers are counts and not percentages (as stated in the table legend above the tables).
Summary and conclusion	Applicant's version is adopted.

1.1 Test organisms - *Anobium punctatum*

Criteria	Details
Family	Anobiidae.
Species	*Anobium punctatum.*
Source	Laboratory population.
Life stage	Larvae.
Mixed age population	Not applicable.
Number of larvae in test	10.

1.2 Test system

Criteria	Details
Test chamber	Fumigation was carried out under field conditions in a typical Bavarian church in Germany (volume: 2400 m³). Gas introduction via polyamide (PA) lines 6 mm external diameter 4 mm internal diameter, gas monitoring via separate PA-lines 6 mm external diameter/4 mm internal diameter.
Test insects introduction into chamber	In totally 10 larvae in one block of pine-wood (*Picea abies*) according to LGA ("Ein Fichtenholz-Spaltblock wurde mit 10 parasitenfreien, lebendigen Larven/Entwicklungsstadien des Gewöhnlichen Nagekäfers (*Anobium punctatum*) in den vorgebohrten Probetrögen versehen. Nach Zusammenfügen der Spaltblockhälften verklebte man die Trennfugen mit Klebeband.").
Measuring equipment	Gas concentrations were verified upon initiation, periodically during fumigation and upon termination using a Fumiscope gas analyser.

1.3 Application of test substance

Criteria	Details
Application procedure	Sulfuryl fluoride was supplied in commercial steel cylinders as liquid under pressure. It was introduced into the structure in its gaseous form.
Delivery method	Sulfuryl fluoride was made available for introduction into the structure by using a heat-exchanger-system. Exact amounts of sulfuryl fluoride were transferred from the cylinder to the structure using a digital scale. Gas was mixed as it was injected using a fan inside the structure.
Dosage rate	<u>Larvae</u> All larvae were fumigated at a mean concentration of 9.0 g/m^3 for a total exposure period of 63 hours and 30 minutes leading to an accumulated dosage of 570 g-h/m^3.

1.4 Test conditions

Criteria	Details
Incubation temperature	Fumigation was conducted at an average temperature of 12.6 ^{o}C.
Moisture	Fumigation was conducted at an average of 83.1 % relative humidity.

Section B5.10.2 Efficacy Data

Annex Point IIB5.10
TNsG: Pt. I-B5.10, Pt. III-Ch. 6

B5.10.2/32 Anobium punctatum Field study (Ref. Z32)

			Official use only
		1 REFERENCE: Z32, B5.10.2/32	
1.1	**Reference**	[1]Binker, G., [1]Binker, J., [1]Fröba G., [2]Franke, P. and [2]Ultsch, R. (2001). [1]Binker Materialschutz GmbH, Westendstr. 3, D-91207 Lauf, Germany [2]LGA, Landesgewerbeanstalt Bayern, Tillystr. 2, D-90431 Nürnberg, Germany Field study on *Anobium punctatum* Number: LBM 541 1320/116.	
1.2	**Data protection**	Yes.	
1.2.1	Data owner	Dow AgroSciences LLC.	
1.2.2	Companies with letter of Access	None.	
1.2.3	Criteria for data protection	Data submitted to the MS after 13 May 2000 on existing b.p. for the purpose of its entry into Annex I	
1.3	**Guideline study**	The study was undertaken on the basis of sound principles of fumigation practice.	
1.4	**Deviations**	Not applicable as the study not conducted to an international standard method.	
		2 METHOD	
2.1	**Test Substance (Biocidal Product)**	Sulfuryl fluoride.	
2.1.1	Trade name/ proposed trade name	Vikane.	
2.1.2	Composition of Product tested	> 99% Sulfuryl fluoride.	
2.1.3	Physical state and nature	Fumigant.	
2.1.4	Monitoring of active substance concentration	Monitoring was undertaken using a Fumiscope gas analyser.	
2.1.5	Method of analysis	Not applicable.	
2.2	**Reference substance**	No reference substance was included in the study.	
2.2.1	Method of analysis for reference substance	Not applicable.	
2.3	**Testing procedure**		
2.3.1	Test population / inoculum / test organism	See Table 1.1.	

2.3.2	Test system	See Table 1.2.	
2.3.3	Application of TS	See Table 1.3.	
2.3.4	Test conditions	See Table 1.4.	
2.3.5	Duration of the test / Exposure time	66 hours.	
2.3.6	Number of replicates performed	One.	
2.3.7	Controls	Untreated controls were included, these were kept and stored under the same conditions as the treated larvae of *Anobium punctatum*.	
2.4	**Examination**		
2.4.1	Effect investigated	Lethal accumulated dosage (LAD) expressed as g-h/m^3. LAD was determined after treatment.	
2.4.2	Method for recording / scoring of the effect	Larvae-mortality by examination (count) of dead larvae 11 days after treatment.	
2.4.3	Intervals of examination	11 days after treatment.	
2.4.4	Statistics	Post fumigation mean total mortality was calculated by dividing the number of dead larvae by the total number of treated larvae 11 days after treatment.	
2.4.5	Post fumigation monitoring of the test organism	See 2.4.4.	
		3 RESULTS	
3.1	**Efficacy**	The percentage mortality was calculated by dividing the total number of dead larvae by the total number of treated larvae	X

Percentage mortality of larvae of *Anobium punctatum* after exposure to sulfuryl fluoride.

	Control	
No.	Larvae	Dead larvae
2	10	0

Total mortality of untreated larvae: 0 %.

	Treated larvae	
No.	Larvae	Dead larvae
1	10	10

Total mortality of treated larvae: 100 %.

3.1.1	Dose/Efficacy curve	Not available from report.
3.1.2	Begin and duration of effects	A mortality of 100 % was achieved 11 days after treatment.
3.1.3	Observed effects in the post monitoring phase	No unusual effect observed.
3.2	**Effects against organisms or objects to be protected**	None reported.
3.3	**Other effects**	None reported.
3.4	**Efficacy of the reference substance**	No reference substance was used.
3.5	**Tabular and/or graphical presentation of the summarised results**	See 3.1.
3.6	**Efficacy limiting factors**	
3.6.1	Occurrences of resistances	None reported.
3.6.2	Other limiting factors	None reported.

4 RELEVANCE OF THE RESULTS COMPARED TO FIELD CONDITIONS

4.1	**Reasons for laboratory testing**	Not applicable.
4.2	**Intended actual scale of biocide application**	Not applicable.
4.3	**Relevance compared to field conditions**	Not applicable.
4.3.1	Application method	Not applicable.
4.3.2	Test organism	Not applicable.
4.3.3	Observed effect	Not applicable.
4.4	**Relevance for read-across**	Not applicable.

5 APPLICANT'S SUMMARY AND CONCLUSION

Section B5.10.2 Efficacy Data

Annex Point IIB5.10
TNsG: Pt. I-B5.10, Pt. III-Ch. 6

B5.10.2/32 Anobium punctatum Field study (Ref. Z32)

5.1	**Materials and methods**	Larvae of *Anobium punctatum* were fumigated with sulfuryl fluoride for 66 hours at a temperature of 12.1 ^{o}C and a moisture of 82.2 % relative humidity in a practical fumigation under field condition (church of a volume of 3750 m^3). Bioassays from laboratory population were tested to determine LAD. Fumigant concentration was measured using a Fumiscope gas analyser. Mortality rate was evaluated 11 days after treatment.
5.2	**Reliability**	Reliability indicator 2: Study conducted in accordance with generally accepted scientific principles, possibly with incomplete reporting or methodological deficiencies, which do not affect the quality of relevant results.
5.3	**Assessment of efficacy, data analysis and interpretation**	The result of this investigation was that under the described conditions complete control of *Anobium punctatum* larvae was achieved. Additional trials have to be performed to understand the variability of the dose rates of the fumigant to achieve the LAD for this specific life stage at different temperatures.
5.4	**Conclusion**	There are different life stages of *Anobium punctatum* present in infested wooden structures. The field fumigation test undertaken was considered to be a valid and effective procedure for evaluating the efficacy of sulfuryl fluoride on the larvae of *A. punctatum*. The efficacy results showed that sulfuryl fluoride was highly effective on larvae of this pest species.
5.5	**Proposed efficacy specification**	Total control of larvae of *Anobium punctatum.*

Evaluation by Competent Authorities

EVALUATION BY RAPPORTEUR MEMBER STATE

Date	October 2004.
Comments	Field 3.1: Within the body of each table the numbers are counts and not percentages (as stated in the table legend above the tables).
Summary and conclusion	Applicant's version is adopted.

1.1 Test organisms - *Anobium punctatum*

Criteria	Details
Family	Anobiidae.
Species	*Anobium punctatum.*
Source	Laboratory population.
Life stage	Larvae.
Mixed age population	Not applicable.
Number of larvae in test	10.

1.2 Test system

Criteria	Details
Test chamber	Fumigation was carried out under field conditions in a typical Bavarian church in Germany (volume: 3750 m^3). Gas introduction via polyamide (PA) lines 6 mm external diameter 4 mm internal diameter, gas monitoring via separate PA-lines 6 mm external diameter/4 mm internal diameter.
Test insects introduction into chamber	In total 10 larvae in one block of pine-wood (*Picea abies*) according to LGA ("Ein Fichtenholz-Spaltblock wurde mit 10 parasitenfreien, lebendigen Larven/Entwicklungsstadien des Gewöhnlichen Nagekäfers (Anobium punctatum) in den vorgebohrten Probetrögen versehen. Nach Zusammenfügen der Spaltblockhälften verklebte man die Trennfugen mit Klebeband.").
Measuring equipment	Gas concentrations were verified upon initiation, periodically during fumigation and upon termination using a Fumiscope gas analyser.

1.3 Application of test substance

Criteria	Details
Application procedure	Sulfuryl fluoride was supplied in commercial steel cylinders as a liquid under pressure. It was introduced into the structure in its gaseous form.
Delivery method	Sulfuryl fluoride was made available for introduction into the structure by using a heat-exchanger-system. Exact amounts of sulfuryl fluoride were transferred from the cylinder to the structure using a digital scale. Gas was mixed as it was injected using a fan inside the structure.
Dosage rate	<u>Larvae</u> All larvae were fumigated at a mean concentration of 9.1 g/m^3 for a total exposure period of 66 hours leading to an accumulated dosage of 599 $g\text{-}h/m^3$.

1.4 Test conditions

Criteria	Details
Incubation temperature	Fumigation was conducted at an average temperature of 12.1 ^{o}C.
Moisture	Fumigation was conducted at an average of 82.2 % relative humidity.

Section B5.10.2 Efficacy Data

Annex Point IIB5.10
TNsG: Pt. I-B5.10, Pt. III-Ch. 6

B5.10.2/33 Anobium punctatum Field study (Ref. Z33)

			Official use only
		1 REFERENCE: Z33, B5.10.2/33	
1.1	**Reference**	[1]Binker, G., [1]Binker, J., [1]Fröba G., [2]Franke, P. and [2]Ultsch, R (1998). [1]Binker Materialschutz GmbH, Westendstr. 3, D-91207 Lauf, Germany [2]LGA, Landesgewerbeanstalt Bayern, Tillystr. 2, D-90431 Nürnberg, Germany Field study on *Anobium punctatum* Number: MBP 548 1317/20.	
1.2	**Data protection**	Yes.	
1.2.1	Data owner	Dow AgroSciences LLC.	
1.2.2	Companies with letter of Access	None.	
1.2.3	Criteria for data protection	Data submitted to the MS after 13 May 2000 on existing b.p. for the purpose of its entry into Annex I	
1.3	**Guideline study**	The study was undertaken on the basis of sound principles of fumigation practice.	
1.4	**Deviations**	Not applicable as the study not conducted to an international standard method.	
		2 METHOD	
2.1	**Test Substance (Biocidal Product)**	Sulfuryl fluoride.	
2.1.1	Trade name/ proposed trade name	Vikane.	
2.1.2	Composition of Product tested	> 99% Sulfuryl fluoride.	
2.1.3	Physical state and nature	Fumigant.	
2.1.4	Monitoring of active substance concentration	Monitoring was undertaken using a Fumiscope gas analyser.	
2.1.5	Method of analysis	Not applicable.	
2.2	**Reference substance**	No reference substance was included in the study.	
2.2.1	Method of analysis for reference substance	Not applicable.	
2.3	**Testing procedure**		
2.3.1	Test population / inoculum / test organism	See Table 1.1.	

Section B5.10.2 **Efficacy Data**

Annex Point IIB5.10
TNsG: Pt. I-B5.10,
Pt. III-Ch. 6

B5.10.2/33 Anobium punctatum
Field study (Ref. Z33)

2.3.2	Test system	See Table 1.2.	
2.3.3	Application of TS	See Table 1.3.	X
2.3.4	Test conditions	See Table 1.4.	
2.3.5	Duration of the test / Exposure time	89 hours and 45 minutes.	
2.3.6	Number of replicates performed	One.	
2.3.7	Controls	Untreated controls were included, these were kept and stored under the same conditions as the treated larvae of *Anobium punctatum*.	
2.4	**Examination**		
2.4.1	Effect investigated	Lethal accumulated dosage (LAD) expressed as g-h/m^3. LAD was determined 32 days after treatment.	
2.4.2	Method for recording / scoring of the effect	Larvae-mortality by examination (count) of dead larvae 32 days after treatment.	
2.4.3	Intervals of examination	32 days after treatment.	
2.4.4	Statistics	Post fumigation mean total mortality was calculated by dividing the number of dead larvae by the total number of treated larvae 32 days after treatment.	
2.4.5	Post fumigation monitoring of the test organism	See 2.4.4.	
		3 RESULTS	
3.1	**Efficacy**	The percentage mortality was calculated by dividing the total number of dead larvae by the total number of treated larvae.	X

Percentage mortality of larvae of *Anobium punctatum* after exposure to sulfuryl fluoride.

	Control	
No.	Larvae	Dead larvae
2	10	3

Total mortality of untreated larvae: 30 %.

	Treated larvae	
No.	Larvae	Dead larvae
1	10	10

Total mortality of treated larvae: 100 %.

Section B5.10.2 **Efficacy Data**

Annex Point IIB5.10
TNsG: Pt. I-B5.10,
Pt. III-Ch. 6

B5.10.2/33 Anobium punctatum
Field study (Ref. Z33)

3.1.1	Dose/Efficacy curve	Not available from report.
3.1.2	Begin and duration of effects	A mortality of 100 % was achieved 32 days after treatment.
3.1.3	Observed effects in the post monitoring phase	No unusual effect observed.
3.2	**Effects against organisms or objects to be protected**	None reported.
3.3	**Other effects**	None reported.
3.4	**Efficacy of the reference substance**	No reference substance was used.
3.5	**Tabular and/or graphical presentation of the summarised results**	See 3.1.
3.6	**Efficacy limiting factors**	
3.6.1	Occurrences of resistances	None reported.
3.6.2	Other limiting factors	None reported.

4 RELEVANCE OF THE RESULTS COMPARED TO FIELD CONDITIONS

4.1	**Reasons for laboratory testing**	Not applicable.
4.2	**Intended actual scale of biocide application**	Not applicable.
4.3	**Relevance compared to field conditions**	Not applicable.
4.3.1	Application method	Not applicable.
4.3.2	Test organism	Not applicable.
4.3.3	Observed effect	Not applicable.
4.4	**Relevance for read-across**	Not applicable.

5 APPLICANT'S SUMMARY AND CONCLUSION

Section B5.10.2 Efficacy Data

Annex Point IIB5.10
TNsG: Pt. I-B5.10, Pt. III-Ch. 6

B5.10.2/33 Anobium punctatum Field study (Ref. Z33)

5.1	**Materials and methods**	Larvae of *Anobium punctatum* were fumigated with sulfuryl fluoride for 89 hours and 45 minutes at a temperature of 16.0 °C and a moisture of 73.0 % relative humidity in a practical fumigation under field condition (church of a volume of 4200 m³). Bioassays from laboratory population were tested to determine LAD. Fumigant concentration was measured using a Fumiscope gas analyser. Mortality rate was evaluated 32 days after treatment.
5.2	**Reliability**	Reliability indicator 2: Study conducted in accordance with generally accepted scientific principles, possibly with incomplete reporting or methodological deficiencies, which do not affect the quality of relevant results.
5.3	**Assessment of efficacy, data analysis and interpretation**	The result of this investigation was that under the described conditions complete control of *Anobium punctatum* larvae was achieved. Additional trials have to be performed to understand the variability of the dose rates of the fumigant to achieve the LAD for this specific life stage at different temperatures.
5.4	**Conclusion**	There are different life stages of *Anobium punctatum* present in infested wooden structures. The field fumigation test undertaken was considered to be a valid and effective procedure for evaluating the efficacy of sulfuryl fluoride on the larvae of *A. punctatum*. The efficacy results showed that sulfuryl fluoride was highly effective on larvae of this pest species.
5.5	**Proposed efficacy specification**	Total control of larvae of *Anobium punctatum.*

Evaluation by Competent Authorities

EVALUATION BY RAPPORTEUR MEMBER STATE

Date	October 2004.
Comments	Field 2.3.3. Table 1.3, dosage rate: All larvae were fumigated at a mean concentration of 4.9 g/m^3 ….. leading to an accumulated dosage of 440 g-h/m^3. Field 3.1: Within the body of each table the numbers are counts and not percentages (as stated in the table legend above the tables).
Summary and conclusion	Applicant's version is adopted.

1.1 Test organisms - *Anobium punctatum*

Criteria	Details
Family	Anobiidae.
Species	*Anobium punctatum.*
Source	Laboratory population.
Life stage	Larvae.
Mixed age population	Not applicable.
Number of larvae in test	10.

1.2 Test system

Criteria	Details
Test chamber	Fumigation was carried out under field conditions in a typical Bavarian church in Germany (volume: 4200 m³). Gas introduction via polyamide (PA) lines 6 mm external diameter 4 mm internal diameter, gas monitoring via separate PA-lines 6 mm external diameter/4 mm internal diameter.
Test insects introduction into chamber	In total 10 larvae in one block of pine-wood (*Picea abies*) according to LGA ("Ein Fichtenholz-Spaltblock wurde mit 10 parasitenfreien, lebendigen Larven/Entwicklungsstadien des Gewöhnlichen Nagekäfers (*Anobium punctatum*) in den vorgebohrten Probetrögen versehen. Nach Zusammenfügen der Spaltblockhälften verklebte man die Trennfugen mit Klebeband.").
Measuring equipment	Gas concentrations were verified upon initiation, periodically during fumigation and upon termination using a Fumiscope gas analyser.

1.3 Application of test substance

Criteria	Details
Application procedure	Sulfuryl fluoride was supplied in commercial steel cylinders as a liquid under pressure. It was introduced into the structure in its gaseous form.
Delivery method	Sulfuryl fluoride was made available for introduction into the structure by using a heat-exchanger-system. Exact amounts of sulfuryl fluoride were transferred from the cylinder to the structure using a digital scale. Gas was mixed as it was injected using a fan inside the structure.
Dosage rate	<u>Larvae</u> All larvae were fumigated at a mean concentration of 5.1 g/m^3 for a total exposure period of 89 hours and 45 minutes leading to an accumulated dosage of 454 g-h/m^3.

1.4 Test conditions

Criteria	Details
Incubation temperature	Fumigation was conducted at an average temperature of 16.0 ^{o}C.
Moisture	Fumigation was conducted at an average of 73.0 % relative humidity.

Section B5.10.2 Efficacy Data

Annex Point IIB5.10
TNsG: Pt. I-B5.10, Pt. III-Ch. 6

B5.10.2/34 Anobium punctatum Field study (Ref. Z34)

			Official use only
		1 REFERENCE: Z34, B5.10.2/34	
1.1	**Reference**	[1]Binker, G., [1]Binker, J., [1]Fröba G., [2]Franke, P. and [2]Ultsch, R. (1998). [1]Binker Materialschutz GmbH, Westendstr. 3, D-91207 Lauf, Germany [2]LGA, Landesgewerbeanstalt Bayern, Tillystr. 2, D-90431 Nürnberg, Germany Field study on *Anobium punctatum* Number: MBP 548 1317/32.	
1.2	**Data protection**	Yes.	
1.2.1	Data owner	Dow AgroSciences LLC.	
1.2.2	Companies with letter of Access	None.	
1.2.3	Criteria for data protection	Data submitted to the MS after 13 May 2000 on existing b.p. for the purpose of its entry into Annex I	
1.3	**Guideline study**	The study was undertaken on the basis of sound principles of fumigation practice.	
1.4	**Deviations**	Not applicable as the study not conducted to an international standard method.	
		2 METHOD	
2.1	**Test Substance (Biocidal Product)**	Sulfuryl fluoride.	
2.1.1	Trade name/ proposed trade name	Vikane.	
2.1.2	Composition of Product tested	> 99% Sulfuryl fluoride.	
2.1.3	Physical state and nature	Fumigant.	
2.1.4	Monitoring of active substance concentration	Monitoring was undertaken using a Fumiscope gas analyser.	
2.1.5	Method of analysis	Not applicable.	
2.2	**Reference substance**	No reference substance was included in the study.	
2.2.1	Method of analysis for reference substance	Not applicable.	
2.3	**Testing procedure**		
2.3.1	Test population / inoculum /	See Table 1.1.	

	test organism	
2.3.2	Test system	See Table 1.2.
2.3.3	Application of TS	See Table 1.3.
2.3.4	Test conditions	See Table 1.4.
2.3.5	Duration of the test / Exposure time	66 hours and 49 minutes.
2.3.6	Number of replicates performed	One.
2.3.7	Controls	Untreated controls were included, these were kept and stored under the same conditions as the treated larvae of *Anobium punctatum*.
2.4	**Examination**	
2.4.1	Effect investigated	Lethal accumulated dosage (LAD) expressed as g-h/m^3. LAD was determined 17 days after treatment.
2.4.2	Method for recording / scoring of the effect	Larvae-mortality by examination (count) of dead larvae 17 days after treatment.
2.4.3	Intervals of examination	17 days after treatment.
2.4.4	Statistics	Post fumigation mean total mortality was calculated by dividing the number of dead larvae by the total number of treated larvae 17 days after treatment.
2.4.5	Post fumigation monitoring of the test organism	See 2.4.4.
	3 RESULTS	
3.1	**Efficacy**	The percentage mortality was calculated by dividing the total number of dead larvae by the total number of treated larvae. X

Percentage mortality of larvae of *Anobium punctatum* after exposure to sulfuryl fluoride.

	Control	
No.	Larvae	Dead larvae
2	10	4

Total mortality of untreated larvae: 40 %.

	Treated larvae	
No.	Larvae	Dead larvae
1	10	10

Total mortality of treated larvae: 100 %.

Section B5.10.2 Efficacy Data

Annex Point IIB5.10
TNsG: Pt. I-B5.10, Pt. III-Ch. 6

B5.10.2/34 Anobium punctatum Field study (Ref. Z34)

3.1.1	Dose/Efficacy curve	Not available from report.
3.1.2	Begin and duration of effects	A mortality of 100 % was achieved 17 days after treatment.
3.1.3	Observed effects in the post monitoring phase	No unusual effect observed.
3.2	**Effects against organisms or objects to be protected**	None reported.
3.3	**Other effects**	None reported.
3.4	**Efficacy of the reference substance**	No reference substance was used.
3.5	**Tabular and/or graphical presentation of the summarised results**	See 3.1.
3.6	**Efficacy limiting factors**	
3.6.1	Occurrences of resistances	None reported.
3.6.2	Other limiting factors	None reported.
	4 RELEVANCE OF THE RESULTS COMPARED TO FIELD CONDITIONS	
4.1	**Reasons for laboratory testing**	Not applicable.
4.2	**Intended actual scale of biocide application**	Not applicable.
4.3	**Relevance compared to field conditions**	Not applicable.
4.3.1	Application method	Not applicable.
4.3.2	Test organism	Not applicable.
4.3.3	Observed effect	Not applicable.
4.4	**Relevance for read-across**	Not applicable.

Section B5.10.2 Efficacy Data

Annex Point IIB5.10
TNsG: Pt. I-B5.10, Pt. III-Ch. 6

B5.10.2/34 Anobium punctatum Field study (Ref. Z34)

5 APPLICANT'S SUMMARY AND CONCLUSION

5.1	**Materials and methods**	Larvae of *Anobium punctatum* were fumigated with sulfuryl fluoride for 66 hours and 49 minutes at a temperature of 16.0°C and a 71.2 % relative humidity in a practical fumigation under field condition (church of a volume of 1450 m³). Bioassays from laboratory population were tested to determine LAD. Fumigant concentration was measured using a Fumiscope gas analyser. Mortality rate was evaluated 17 days after treatment.
5.2	**Reliability**	Reliability indicator 2: Study conducted in accordance with generally accepted scientific principles, possibly with incomplete reporting or methodological deficiencies, which do not affect the quality of relevant results.
5.3	**Assessment of efficacy, data analysis and interpretation**	The result of this investigation was that under the described conditions complete control of *Anobium punctatum* larvae was achieved. Additional trials have to be performed to understand the variability of the dose rates of the fumigant to achieve the LAD for this specific life stage at different temperatures.
5.4	**Conclusion**	There are different life stages of *Anobium punctatum* present in infested wooden structures. The field fumigation test undertaken was considered to be a valid and effective procedure for evaluating the efficacy of sulfuryl fluoride on the larvae of *A. punctatum*. The efficacy results showed that sulfuryl fluoride was highly effective on larvae of this pest species.
5.5	**Proposed efficacy specification**	Total control of larvae of *Anobium punctatum.*

Evaluation by Competent Authorities

EVALUATION BY RAPPORTEUR MEMBER STATE

Date	October 2004.
Comments	Field 3.1: Within the body of each table the numbers are counts and not percentages (as stated in the table legend above the tables).
Summary and conclusion	Applicant's version is adopted.

1.1 Test organisms - *Anobium punctatum*

Criteria	Details
Family	Anobiidae.
Species	*Anobium punctatum.*
Source	Laboratory population.
Life stage	Larvae.
Mixed age population	Not applicable.
Number of larvae in test	10.

1.2 Test system

Criteria	Details
Test chamber	Fumigation was carried out under field conditions in a typical Bavarian church in Germany (volume: 1450 m³). Gas introduction via polyamide (PA) lines 6 mm external diameter 4 mm internal diameter, gas monitoring via separate PA-lines 6 mm external diameter/4 mm internal diameter.
Test insects introduction into chamber	In total 10 larvae in one block of pine-wood (*Picea abies*) according to LGA ("Ein Fichtenholz-Spaltblock wurde mit 10 parasitenfreien, lebendigen Larven/Entwicklungsstadien des Gewöhnlichen Nagekäfers (*Anobium punctatum*) in den vorgebohrten Probetrögen versehen. Nach Zusammenfügen der Spaltblockhälften verklebte man die Trennfugen mit Klebeband.").
Measuring equipment	Gas concentrations were verified upon initiation, periodically during fumigation and upon termination using a Fumiscope gas analyser.

1.3 Application of test substance

Criteria	Details
Application procedure	Sulfuryl fluoride was supplied in commercial steel cylinders as a liquid under pressure. It was introduced into the structure in its gaseous form.
Delivery method	Sulfuryl fluoride was made available for introduction into the structure by using a heat-exchanger-system. Exact amounts of sulfuryl fluoride were transferred from the cylinder to the structure using a digital scale. Gas was mixed as it was injected using a fan inside the structure.
Dosage rate	<u>Larvae</u> All larvae were fumigated at a mean concentration of 6.5 g/m^3 for a total exposure period of 66 hours and 49 minutes leading to an accumulated dosage of 434 g-h/m^3.

1.4 Test conditions

Criteria	Details
Incubation temperature	Fumigation was conducted at an average temperature of 16.0 ^{o}C.
Moisture	Fumigation was conducted at an average of 71.2 % relative humidity.

Section B5.10.2 Efficacy Data

Annex Point IIB5.10
TNsG: Pt. I-B5.10, Pt. III-Ch. 6

B.10.2/35 Anobium punctatum Field study (Ref. Z35)

			Official use only
		1 REFERENCE: Z35, B.10.2/35	
1.1	**Reference**	[1]Binker, G., [1]Binker, J., [1]Fröba G., [2]Franke, P. and [2]Ultsch, R. (2000). [1]Binker Materialschutz GmbH, Westendstr. 3, D-91207 Lauf, Germany [2]LGA, Landesgewerbeanstalt Bayern, Tillystr. 2, D-90431 Nürnberg, Germany Field study on *Anobium punctatum* Number: LBM 540 1336/30.	
1.2	**Data protection**	Yes.	
1.2.1	Data owner	Dow AgroSciences LLC.	
1.2.2	Companies with letter of Access	None.	
1.2.3	Criteria for data protection	Data submitted to the MS after 13 May 2000 on existing b.p. for the purpose of its entry into Annex I	
1.3	**Guideline study**	The study was undertaken on the basis of sound principles of fumigation practice.	
1.4	**Deviations**	Not applicable as the study not conducted to an international standard method.	
		2 METHOD	
2.1	**Test Substance (Biocidal Product)**	Sulfuryl fluoride.	
2.1.1	Trade name/ proposed trade name	Vikane.	
2.1.2	Composition of Product tested	> 99% Sulfuryl fluoride.	
2.1.3	Physical state and nature	Fumigant.	
2.1.4	Monitoring of active substance concentration	Monitoring was undertaken using a Fumiscope gas analyser.	
2.1.5	Method of analysis	Not applicable.	
2.2	**Reference substance**	No reference substance was included in the study.	
2.2.1	Method of analysis for reference substance	Not applicable.	
2.3	**Testing procedure**		
2.3.1	Test population / inoculum / test organism	See Table 1.1.	

Section B5.10.2 **Efficacy Data**

Annex Point IIB5.10
TNsG: Pt. I-B5.10,
Pt. III-Ch. 6

B.10.2/35 Anobium punctatum
Field study (Ref. Z35)

2.3.2	Test system	See Table 1.2.	
2.3.3	Application of TS	See Table 1.3.	X
2.3.4	Test conditions	See Table 1.4.	
2.3.5	Duration of the test / Exposure time	65 hours.	
2.3.6	Number of replicates performed	One.	
2.3.7	Controls	Untreated controls were included, these were kept and stored under the same conditions as the treated larvae of *Anobium punctatum*.	
2.4	**Examination**		
2.4.1	Effect investigated	Lethal accumulated dosage (LAD) expressed as g-h/m^3. LAD was determined 13 days after treatment.	
2.4.2	Method for recording / scoring of the effect	Larvae-mortality by examination (count) of dead larvae 13 days after treatment.	
2.4.3	Intervals of examination	13 days after treatment.	
2.4.4	Statistics	Post fumigation mean total mortality was calculated by dividing the number of dead larvae by the total number of treated larvae 13 days after treatment.	
2.4.5	Post fumigation monitoring of the test organism	See 2.4.4.	
		3 RESULTS	
3.1	**Efficacy**	The percentage mortality was calculated by dividing the total number of dead larvae by the total number of treated larvae.	X

Percentage mortality of larvae of *Anobium punctatum* after exposure to sulfuryl fluoride.

	Control	
No.	Larvae	Dead larvae
2	10	0

Total mortality of untreated larvae: 0 %.

	Treated larvae	
No.	Larvae	Dead larvae
1	10	10

Total mortality of treated larvae: 100 %.

Section B5.10.2 **Efficacy Data**

Annex Point IIB5.10
TNsG: Pt. I-B5.10,
Pt. III-Ch. 6

B.10.2/35 Anobium punctatum
Field study (Ref. Z35)

3.1.1	Dose/Efficacy curve	Not available from report.
3.1.2	Begin and duration of effects	A mortality of 100 % was achieved 13 days after treatment.
3.1.3	Observed effects in the post monitoring phase	No unusual effect observed.
3.2	**Effects against organisms or objects to be protected**	None reported.
3.3	**Other effects**	None reported.
3.4	**Efficacy of the reference substance**	No reference substance was used.
3.5	**Tabular and/or graphical presentation of the summarised results**	See 3.1.
3.6	**Efficacy limiting factors**	
3.6.1	Occurrences of resistances	None reported.
3.6.2	Other limiting factors	None reported.

4 RELEVANCE OF THE RESULTS COMPARED TO FIELD CONDITIONS

4.1	**Reasons for laboratory testing**	Not applicable.
4.2	**Intended actual scale of biocide application**	Not applicable.
4.3	**Relevance compared to field conditions**	Not applicable.
4.3.1	Application method	Not applicable.
4.3.2	Test organism	Not applicable.
4.3.3	Observed effect	Not applicable.
4.4	**Relevance for read-across**	Not applicable.

5 APPLICANT'S SUMMARY AND CONCLUSION

Section B5.10.2 Efficacy Data

Annex Point IIB5.10
TNsG: Pt. I-B5.10, Pt. III-Ch. 6

B.10.2/35 Anobium punctatum Field study (Ref. Z35)

5.1	**Materials and methods**	Larvae of *Anobium punctatum* were fumigated with sulfuryl fluoride for 65 hours at a temperature of 20.3°C and a 54.0 % relative humidity in a practical fumigation under field condition (church of a volume of 4350 m³). Bioassays from laboratory population were tested to determine LAD. Fumigant concentration was measured using a Fumiscope gas analyser. Mortality rate was evaluated 13 days after treatment.
5.2	**Reliability**	Reliability indicator 2: Study conducted in accordance with generally accepted scientific principles, possibly with incomplete reporting or methodological deficiencies, which do not affect the quality of relevant results.
5.3	**Assessment of efficacy, data analysis and interpretation**	The result of this investigation was that under the described conditions a complete control of *Anobium punctatum* larvae was achieved. Additional trials have to be performed to understand the variability of the dose rates of the fumigant to achieve the LAD for this specific life stage at different temperatures.
5.4	**Conclusion**	There are different life stages of *Anobium punctatum* present in infested wooden structures. The field fumigation test undertaken was considered to be a valid and effective procedure for evaluating the efficacy of sulfuryl fluoride on the larvae of *A. punctatum*. The efficacy results showed that sulfuryl fluoride was highly effective on larvae of this pest species.
5.5	**Proposed efficacy specification**	Total control of larvae of *Anobium punctatum.*

Evaluation by Competent Authorities

EVALUATION BY RAPPORTEUR MEMBER STATE

Date	October 2004.
Comments	2.3.3. Table 1.3, dosage rate All larvae were fumigated at a mean concentration of 5.5 g/m³ ….. leading to an accumulated dosage of 358 g-h/m³. Field 3.1: Within the body of each table the numbers are counts and not percentages (as stated in the table legend above the tables).
Summary and conclusion	Applicant's version is adopted.

1.1 Test organisms - *Anobium punctatum*

Criteria	Details
Family	Anobiidae.
Species	*Anobium punctatum.*
Source	Laboratory population.
Life stage	Larvae.
Mixed age population	Not applicable.
Number of larvae in test	10.

1.2 Test system

Criteria	Details
Test chamber	Fumigation was carried out under field conditions in a typical Bavarian church in Germany (volume: 4350 m³). Gas introduction via polyamide (PA) lines 6 mm external diameter 4 mm internal diameter, gas monitoring via separate PA-lines 6 mm external diameter/4 mm internal diameter.
Test insects introduction into chamber	In total 10 larvae in one block of pine-wood (*Picea abies*) according to LGA ("Ein Fichtenholz-Spaltblock wurde mit 10 parasitenfreien, lebendigen Larven/Entwicklungsstadien des Gewöhnlichen Nagekäfers (*Anobium punctatum*) in den vorgebohrten Probetrögen versehen. Nach Zusammenfügen der Spaltblockhälften verklebte man die Trennfugen mit Klebeband.").
Measuring equipment	Gas concentrations were verified upon initiation, periodically during fumigation and upon termination using a Fumiscope gas analyser.

1.3 Application of test substance

Criteria	Details
Application procedure	Sulfuryl fluoride was supplied in commercial steel cylinders as a liquid under pressure. It was introduced into the structure in its gaseous form.
Delivery method	Sulfuryl fluoride was made available for introduction into the structure by using a heat-exchanger-system. Exact amounts of sulfuryl fluoride were transferred from the cylinder to the structure using a digital scale. Gas was mixed as it was injected using a fan inside the structure.
Dosage rate	Larvae All larvae were fumigated at a mean concentration of 5.8 g/m^3 for a total exposure period of 65 hours leading to an accumulated dosage of 376 g-h/m^3.

1.4 Test conditions

Criteria	Details
Incubation temperature	Fumigation was conducted at an average temperature of 20.3 ^{o}C.
Moisture	Fumigation was conducted at an average of 54.0% relative humidity.

Section B5.10.2 Efficacy Data

Annex Point IIB5.10
TNsG: Pt. I-B5.10, Pt. III-Ch. 6

B5.10.2/36 Anobium punctatum Field study (Ref. Z36)

			Official use only
		1 REFERENCE: Z36, B.10.2/36	
1.1	**Reference**	[1]Binker, G., [1]Binker, J., [1]Fröba G., [2]Franke, P. and [2]Ultsch, R. (2000). [1]Binker Materialschutz GmbH, Westendstr. 3, D-91207 Lauf, Germany [2]LGA, Landesgewerbeanstalt Bayern, Tillystr. 2, D-90431 Nürnberg, Germany Field study on *Anobium punctatum* Number: LBM 540 1336/37.	
1.2	**Data protection**	Yes.	
1.2.1	Data owner	Dow AgroSciences LLC.	
1.2.2	Companies with letter of Access	None.	
1.2.3	Criteria for data protection	Data submitted to the MS after 13 May 2000 on existing b.p. for the purpose of its entry into Annex I	
1.3	**Guideline study**	The study was undertaken on the basis of sound principles of fumigation practice.	
1.4	**Deviations**	Not applicable as the study not conducted to an international standard method.	
		2 METHOD	
2.1	**Test Substance (Biocidal Product)**	Sulfuryl fluoride.	
2.1.1	Trade name/ proposed trade name	Vikane.	
2.1.2	Composition of Product tested	> 99% Sulfuryl fluoride.	
2.1.3	Physical state and nature	Fumigant.	
2.1.4	Monitoring of active substance concentration	Monitoring was undertaken using a Fumiscope gas analyser.	
2.1.5	Method of analysis	Not applicable.	
2.2	**Reference substance**	No reference substance was included in the study.	
2.2.1	Method of analysis for reference substance	Not applicable.	
2.3	**Testing procedure**		
2.3.1	Test population / inoculum / test organism	See Table 1.1.	

Section B5.10.2 **Efficacy Data**

Annex Point IIB5.10
TNsG: Pt. I-B5.10,
Pt. III-Ch. 6

B5.10.2/36 Anobium punctatum
Field study (Ref. Z36)

2.3.2	Test system	See Table 1.2.	
2.3.3	Application of TS	See Table 1.3.	
2.3.4	Test conditions	See Table 1.4.	
2.3.5	Duration of the test / Exposure time	62 hours.	
2.3.6	Number of replicates performed	One.	
2.3.7	Controls	Untreated controls were included; these were kept and stored under the same conditions as the treated larvae of *Anobium punctatum*.	
2.4	**Examination**		
2.4.1	Effect investigated	Lethal accumulated dosage (LAD) expressed as g-h/m^3. LAD was determined 12 days after treatment.	
2.4.2	Method for recording / scoring of the effect	Larvae-mortality by examination (count) of dead larvae 12 days after treatment.	
2.4.3	Intervals of examination	12 days after treatment.	
2.4.4	Statistics	Post fumigation mean total mortality was calculated by dividing the number of dead larvae by the total number of treated larvae 12 days after treatment.	
2.4.5	Post fumigation monitoring of the test organism	See 2.4.4.	
		3 RESULTS	
3.1	**Efficacy**	The percentage mortality was calculated by dividing the total number of dead larvae by the total number of treated larvae.	X

Percentage mortality of larvae of *Anobium punctatum* after exposure to sulfuryl fluoride.

	Control	
No.	Larvae	Dead larvae
2	10	0

Total mortality of untreated larvae: 0 %.

	Treated larvae	
No.	Larvae	Dead larvae
1	10	10

Total mortality of treated larvae: 100 %.

Section B5.10.2 **Efficacy Data**

Annex Point IIB5.10
TNsG: Pt. I-B5.10,
Pt. III-Ch. 6

B5.10.2/36 Anobium punctatum
Field study (Ref. Z36)

3.1.1	Dose/Efficacy curve	Not available from report.
3.1.2	Begin and duration of effects	A mortality of 100 % was achieved 12 days after treatment.
3.1.3	Observed effects in the post monitoring phase	No unusual effect observed.
3.2	**Effects against organisms or objects to be protected**	None reported.
3.3	**Other effects**	None reported.
3.4	**Efficacy of the reference substance**	No reference substance was used.
3.5	**Tabular and/or graphical presentation of the summarised results**	See 3.1.
3.6	**Efficacy limiting factors**	
3.6.1	Occurrences of resistances	None reported.
3.6.2	Other limiting factors	None reported.

4 RELEVANCE OF THE RESULTS COMPARED TO FIELD CONDITIONS

4.1	**Reasons for laboratory testing**	Not applicable.
4.2	**Intended actual scale of biocide application**	Not applicable.
4.3	**Relevance compared to field conditions**	Not applicable.
4.3.1	Application method	Not applicable.
4.3.2	Test organism	Not applicable.
4.3.3	Observed effect	Not applicable.
4.4	**Relevance for read-across**	Not applicable.

Section B5.10.2 Efficacy Data

Annex Point IIB5.10
TNsG: Pt. I-B5.10, Pt. III-Ch. 6

B5.10.2/36 Anobium punctatum Field study (Ref. Z36)

5 APPLICANT'S SUMMARY AND CONCLUSION

5.1	**Materials and methods**	Larvae of *Anobium punctatum* were fumigated with sulfuryl fluoride for 62 hours at a temperature of 18.6 °C and a 75.7 % relative humidity in a practical fumigation under field condition (church of a volume of 3000 m³). Bioassays from laboratory population were tested to determine LAD. Fumigant concentration was measured using a Fumiscope gas analyser. Mortality rate was evaluated 12 days after treatment.
5.2	**Reliability**	Reliability indicator 2: Study conducted in accordance with generally accepted scientific principles, possibly with incomplete reporting or methodological deficiencies, which do not affect the quality of relevant results.
5.3	**Assessment of efficacy, data analysis and interpretation**	The result of this investigation is that under the described conditions complete control of *Anobium punctatum* larvae was achieved. Additional trials have to be performed to understand the variability of the dose rates of the fumigant to achieve the LAD for this specific life stage at different temperatures.
5.4	**Conclusion**	There are different life stages of *Anobium punctatum* present in infested wooden structures. The field fumigation test undertaken was considered to be a valid and effective procedure for evaluating the efficacy of sulfuryl fluoride on the larvae of *A. punctatum*. The efficacy results showed that sulfuryl fluoride was highly effective on larvae of this pest species.
5.5	**Proposed efficacy specification**	Total control of larvae of *Anobium punctatum.*

Evaluation by Competent Authorities

EVALUATION BY RAPPORTEUR MEMBER STATE

Date	October 2004.
Comments	Field 3.1: Within the body of each table the numbers are counts and not percentages (as stated in the table legend above the tables).
Summary and conclusion	Applicant's version is adopted.

1.1 Test organisms - *Anobium punctatum*

Criteria	Details
Family	Anobiidae.
Species	*Anobium punctatum.*
Source	Laboratory population.
Life stage	Larvae.
Mixed age population	Not applicable.
Number of larvae in test	10.

1.2 Test system

Criteria	Details
Test chamber	Fumigation was carried out under field conditions in a typical Bavarian church in Germany (volume: 3000 m^3). Gas introduction via polyamide (PA) lines 6 mm external diameter 4 mm internal diameter, gas monitoring via separate PA-lines 6 mm external diameter/4 mm internal diameter.
Test insects introduction into chamber	In total 10 larvae in one block of pine-wood (*Picea abies*) according to LGA ("Ein Fichtenholz-Spaltblock wurde mit 10 parasitenfreien, lebendigen Larven/Entwicklungsstadien des Gewöhnlichen Nagekäfers (*Anobium punctatum*) in den vorgebohrten Probetrögen versehen. Nach Zusammenfügen der Spaltblockhälften verklebte man die Trennfugen mit Klebeband.").
Measuring equipment	Gas concentrations were verified upon initiation, periodically during fumigation and upon termination using a Fumiscope gas analyser.

1.3 Application of test substance

Criteria	Details
Application procedure	Sulfuryl fluoride was supplied in commercial steel cylinders as a liquid under pressure. It was introduced into the structure in its gaseous form.
Delivery method	Sulfuryl fluoride was made available for introduction into the structure by using a heat-exchanger-system. Exact amounts of sulfuryl fluoride were transferred from the cylinder to the structure using a digital scale. Gas was mixed as it was injected using a fan inside the structure.
Dosage rate	<u>Larvae</u> All larvae were fumigated at a mean concentration of 7.2 g/m^3 for a total exposure period of 62 hours leading to an accumulated dosage of 446 $g\text{-}h/m^3$.

1.4 Test conditions

Criteria	Details
Incubation temperature	Fumigation was conducted at an average temperature of 18.6 ^oC.
Moisture	Fumigation was conducted at an average of 75.7 % relative humidity.

Section B5.10.2 Efficacy Data

Annex Point IIB5.10
TNsG: Pt. I-B5.10, Pt. III-Ch. 6

B5.10.2/37 Anobium punctatum Laboratory study (Ref. Z37)

			Official use only
		1 REFERENCE: Z37, B5.10.2/37	
1.1	**Reference**	[1]Binker, G., [1]Binker, J., [1]Fröba G. and [2]Franke P. (1998). [1]Binker Materialschutz GmbH, Westendstr. 3, D-91207 Lauf, Germany [2]Von der IHK Nürnberg öffentlich bestellte und vereidigte Sachverständige für Vorratsschädlinge und biologische Schäden am Holz, Hohe Linde 2, D-90607 Rückersdorf, Germany Laboratory study on *Anobium punctatum* Number: 121.08.1998 No. 1.	
1.2	**Data protection**	Yes.	
1.2.1	Data owner	Dow AgroSciences LLC.	
1.2.2	Companies with letter of Access	None.	
1.2.3	Criteria for data protection	Data submitted to the MS after 13 May 2000 on existing b.p. for the purpose of its entry into Annex I	
1.3	**Guideline study**	The study was undertaken on the basis of sound principles of fumigation practice.	
1.4	**Deviations**	Not applicable as the study not conducted to an international standard method.	
		2 METHOD	
2.1	**Test Substance (Biocidal Product)**	Sulfuryl fluoride.	
2.1.1	Trade name/ proposed trade name	Vikane.	
2.1.2	Composition of Product tested	> 99% Sulfuryl fluoride.	
2.1.3	Physical state and nature	Fumigant.	
2.1.4	Monitoring of active substance concentration	Monitoring was undertaken using a Fumiscope gas analyser.	
2.1.5	Method of analysis	Not applicable.	
2.2	**Reference substance**	No reference substance was included in the study.	
2.2.1	Method of analysis for reference substance	Not applicable.	
2.3	**Testing procedure**		
2.3.1	Test population / inoculum /	See Table 1.1.	

	test organism		
2.3.2	Test system	See Table 1.2.	
2.3.3	Application of TS	See Table 1.3.	
2.3.4	Test conditions	See Table 1.4.	
2.3.5	Duration of the test / Exposure time	31 hours and 35 minutes.	
2.3.6	Number of replicates performed	One.	
2.3.7	Controls	Untreated controls were included; these were kept and stored under the same conditions as the treated pupae of *A. punctatum*.	
2.4	**Examination**		
2.4.1	Effect investigated	Lethal accumulated dosage (LAD) expressed as g-h/m^3. The LAD was determined 3 days after treatment and finally 28 days after treatment.	
2.4.2	Method for recording / scoring of the effect	Pupae mortality by examination (count) of beetles hatched from treated pupae 3 days after treatment and finally 28 days after treatment.	
2.4.3	Intervals of examination	3 days after treatment and finally 28 days after treatment.	
2.4.4	Statistics	Post fumigation mean total mortality was calculated by dividing the number of dead pupae by the total number of treated pupae 3 days after treatment and finally 28 days after treatment.	
2.4.5	Post fumigation monitoring of the test organism	The total mortality-effect of sufuryl fluoride on pupae was determined 3 days after treatment and finally 28 days after treatment.	
		3 RESULTS	
3.1	**Efficacy**	The percentage mortality was calculated by dividing the total number of dead pupae by the total number of treated pupae.	X

Percentage mortality of pupae of *Anobium punctatum* 3 days after exposure to sulfuryl fluoride

A	Untreated Control			
No.	Pupae	beetles hatched	Living pupae	Dead pupae
K	10	2	8	0

Total mortality of untreated pupae: 0 %

B	Treated pupae			
No.	Pupae	beetles hatched	Living pupae	Dead pupae
1	10	0	0	10

Total mortality of treated pupae: 100 %

Percentage mortality of pupae of *Anobium punctatum* 28 days after exposure to sulfuryl fluoride

A	Untreated Control			
No.	Pupae	beetles hatched	Living pupae	Dead pupae
K	10	8	0	2

Total mortality of untreated pupae: 20 %

B	Treated pupae			
No.	Pupae	beetles hatched	Living pupae	Dead pupae
1	10	0	0	10

Total mortality of treated pupae: 100 %

Section B5.10.2 **Efficacy Data**

Annex Point IIB5.10
TNsG: Pt. I-B5.10,
Pt. III-Ch. 6

B5.10.2/37 Anobium punctatum Laboratory study (Ref. Z37)

3.1.1	Dose/Efficacy curve	Not available from report.
3.1.2	Begin and duration of effects	A mortality of 100 % was achieved 28 days after treatment.
3.1.3	Observed effects in the post monitoring phase	No unusual effect observed.
3.2	**Effects against organisms or objects to be protected**	None reported.
3.3	**Other effects**	None reported.
3.4	**Efficacy of the reference substance**	No reference substance was used.
3.5	**Tabular and/or graphical presentation of the summarised results**	See 3.1.
3.6	**Efficacy limiting factors**	
3.6.1	Occurrences of resistances	None reported.
3.6.2	Other limiting factors	None reported.
		4 RELEVANCE OF THE RESULTS COMPARED TO FIELD CONDITIONS
4.1	**Reasons for laboratory testing**	1 Precise conditions could be determined. 2 Practical, accurate procedure. Data generated is considered relevant for field of use. Test insects obtained from the field.
4.2	**Intended actual scale of biocide application**	Not applicable.
4.3	**Relevance compared to field conditions**	
4.3.1	Application method	The principle of fumigation is to confine a sufficient concentration for a sufficient period of time to enable a toxic dose to be received by the target pest. There are a number of ways in laboratory and field studies to achieve this although the principle is the same.
4.3.2	Test organism	There are different life stages of *Anobium punctatum.* Pupae are considered to be a stage which would require a higher dose of sulfuryl

		fluoride compared to larvae.
4.3.3	Observed effect	The complete mortality effect, recorded in the laboratory test is considered as the desired field response for eradication of pupae of *Anobium punctatum*.
4.4	**Relevance for read-across**	Not applicable.

5 APPLICANT'S SUMMARY AND CONCLUSION

5.1	**Materials and methods**	Pupae of *Anobium punctatum* were fumigated with sulfuryl fluoride for 31 hours and 35 minutes at a temperature of 11.5 ^{o}C and 58 % relative humidity in laboratory fumitoria. Bioassays from laboratory population were tested to determine LAD. Fumigant concentration was measured using a Fumiscope gas analyser. Mortality rate was evaluated 3 days after treatment and 28 days after treatment.
5.2	**Reliability**	Reliability indicator 2: Study conducted in accordance with generally accepted scientific principles, possibly with incomplete reporting or methodological deficiencies, which do not affect the quality of relevant results.
5.3	**Assessment of efficacy, data analysis and interpretation**	The result of this investigation was that under the described conditions complete control of *Anobium punctatum* pupae was achieved. Additional trials have to be performed to understand the variability of the dose rates of the fumigant to achieve the LAD for this specific life stage at different temperatures.
5.4	**Conclusion**	There are different life stages of *Anobium punctatum* present in infested wooden structures. The laboratory fumigation test undertaken was considered to be a valid and effective procedure for evaluating the efficacy of sulfuryl fluoride on the pupae of *A. punctatum*. The efficacy results showed that sulfuryl fluoride was highly effective on pupae of this pest species.
5.5	**Proposed efficacy specification**	Total control of pupae of *Anobium punctatum.*

Evaluation by Competent Authorities

EVALUATION BY RAPPORTEUR MEMBER STATE

Date	October 2004.
Comments	Field 3.1: Within the body of each table the numbers are counts and not percentages (as stated in the table legend above the tables).
Summary and conclusion	Applicant's version is adopted.

1.1 Test organism - *Anobium puntatum*

Criteria	Details
Family	Anobiidae.
Species	*Anobium punctatum.*
Source	10 pupae in one block of pine-wood (*Picea abies*) according to LGA ("Ein Fichtenholz-Spaltblock wurde mit 10 parasitenfreien, lebendigen Puppen des Gewöhnlichen Nagekäfers (*Anobium punctatum*) in den vorgebohrten Probetrögen versehen. Nach Zusammenfügen der Spaltblockhälften verklebte man die Trennfugen mit Klebeband.").
Life stage	Pupae.
Mixed age population	Not applicable.
Number of pupae in test	10.

1.2 Test system

Criteria	Details
Test chamber	Fumitoria (fumigation chambers) made of acrylic glass, 40 x 25 x 14.5 cm = 14.5 litres, gas introduction via polyamide (PA) -lines 6 mm external diameter/4 mm internal diameter, gas monitoring via separate PA-lines 6 mm external diameter/4 mm internal diameter.
Test insects introduction into chamber	10 pupae in one block of pine-wood (*Picea abies*) according to LGA ("Ein Fichtenholz-Spaltblock wurde mit 10 parasitenfreien, lebendigen Puppen des Gewöhnlichen Nagekäfers (*Anobium punctatum*) in den vorgebohrten Probetrögen versehen. Nach Zusammenfügen der Spaltblockhälften verklebte man die Trennfugen mit Klebeband.").
Measuring equipment	Gas concentrations were verified upon initiation, periodically during fumigation and upon termination using a Fumiscope gas-analyser.

1.3 Application of test substance

Criteria	Details
Application procedure	Sulfuryl fluoride was supplied in commercial steel cylinders as a liquid under pressure. It was introduced into the fumitoria in its gaseous form.
Delivery method	Sulfuryl fluoride was made available for introduction into the fumitorium by using a heat-exchanger-system. Exact amounts of sulfuryl fluoride were transferred from the cylinder to the fumatorium using a gas syringe.
Dosage rate	Pupae All pupae were fumigated at 26.6 g/m^3 for a total exposure period of 31 hours and 35 minutes leading to an accumulated dosage of 839 g-h/m^3.

1.4 Test conditions

Criteria	Details
Incubation temperature	Fumigation was conducted at an average temperature of 11.5^{o}C.
Moisture	Fumigation was conducted at an average 58 % relative humidity.

Section B5.10.2 Efficacy Data

Annex Point IIB5.10
TNsG: Pt. I-B5.10, Pt. III-Ch. 6

B5.10.2/38 Anobium punctatum Laboratory study (Ref. Z38)

			Official use only
		1 REFERENCE: Z38, B5.10.2/38	
1.1	**Reference**	[1]Binker, G., [1]Binker, J., [1]Fröba G. and [2]Franke P. (1998). [1]Binker Materialschutz GmbH, Westendstr. 3, D-91207 Lauf, Germany [2]Von der IHK Nürnberg öffentlich bestellte und vereidigte Sachverständige für Vorratsschädlinge und biologische Schäden am Holz, Hohe Linde 2, D-90607 Rückersdorf, Germany Laboratory study on *Anobium punctatum* Number: 121.08.1998 No. 2.	
1.2	**Data protection**	Yes.	
1.2.1	Data owner	Dow AgroSciences LLC.	
1.2.2	Companies with letter of Access	None.	
1.2.3	Criteria for data protection	Data submitted to the MS after 13 May 2000 on existing b.p. for the purpose of its entry into Annex I	
1.3	**Guideline study**	The study was undertaken on the basis of sound principles of fumigation practice.	
1.4	**Deviations**	Not applicable as the study not conducted to an international standard method.	
		2 METHOD	
2.1	**Test Substance (Biocidal Product)**	Sulfuryl fluoride.	
2.1.1	Trade name/ proposed trade name	Vikane.	
2.1.2	Composition of Product tested	> 99% Sulfuryl fluoride.	
2.1.3	Physical state and nature	Fumigant.	
2.1.4	Monitoring of active substance concentration	Monitoring was undertaken using a Fumiscope gas analyser.	
2.1.5	Method of analysis	Not applicable.	
2.2	**Reference substance**	No reference substance was included in the study.	
2.2.1	Method of analysis for reference substance	Not applicable.	
2.3	**Testing procedure**		
2.3.1	Test population / inoculum /	See Table 1.1.	

	test organism		
2.3.2	Test system	See Table 1.2.	
2.3.3	Application of TS	See Table 1.3.	
2.3.4	Test conditions	See Table 1.4.	
2.3.5	Duration of the test / Exposure time	31 hours and 10 minutes.	
2.3.6	Number of replicates performed	One.	
2.3.7	Controls	Untreated controls were included, these were kept and stored under the same conditions as the treated pupae of *A. punctatum*.	
2.4	**Examination**		
2.4.1	Effect investigated	Lethal accumulated dosage (LAD) expressed as g-h/m^3. The LAD was determined 3 days after treatment and finally 28 days after treatment.	
2.4.2	Method for recording / scoring of the effect	Pupae mortality by examination (count) of beetles hatched from treated pupae 3 days after treatment and finally 28 days after treatment.	
2.4.3	Intervals of examination	3 days after treatment and finally 28 days after treatment.	
2.4.4	Statistics	Post fumigation mean total mortality was calculated by dividing the number of dead pupae by the total number of treated pupae 3 days after treatment and finally 28 days after treatment.	
2.4.5	Post fumigation monitoring of the test organism	The total mortality-effect of sufuryl fluoride on pupae was determined 3 days after treatment and finally 28 days after treatment.	
		3 RESULTS	
3.1	**Efficacy**	The percentage mortality was calculated by dividing the total number of dead pupae by the total number of treated pupae.	X

Percentage mortality of pupae of *Anobium punctatum* 3 days after exposure to sulfuryl fluoride

A	Untreated Control			
No.	Pupae	beetles hatched	Living pupae	Dead pupae
K	10	2	8	0

Total mortality of untreated pupae: 0 %

B	Treated pupae			
No.	Pupae	beetles hatched	Living pupae	Dead pupae
2	10	0	1	9

Total mortality of treated pupae: 90 %

Percentage mortality of pupae of *Anobium punctatum* 28 days after exposure to sulfuryl fluoride

A	Untreated Control			
No.	Pupae	beetles hatched	Living pupae	Dead pupae
K	10	8	0	2

Total mortality of untreated pupae: 20 %

B	Treated pupae			
No.	Pupae	beetles hatched	Living pupae	Dead pupae
1	10	0	0	10

Total mortality of treated pupae: 100 %

Section B5.10.2 **Efficacy Data**

Annex Point IIB5.10
TNsG: Pt. I-B5.10,
Pt. III-Ch. 6

B5.10.2/38 Anobium punctatum
Laboratory study (Ref. Z38)

3.1.1	Dose/Efficacy curve	Not available from report.
3.1.2	Begin and duration of effects	A mortality of 100 % was achieved 28 days after treatment.
3.1.3	Observed effects in the post monitoring phase	No unusual effect observed.
3.2	**Effects against organisms or objects to be protected**	None reported.
3.3	**Other effects**	None reported.
3.4	**Efficacy of the reference substance**	No reference substance was used.
3.5	**Tabular and/or graphical presentation of the summarised results**	See 3.1.
3.6	**Efficacy limiting factors**	
3.6.1	Occurrences of resistances	None reported.
3.6.2	Other limiting factors	None reported.
		4 RELEVANCE OF THE RESULTS COMPARED TO FIELD CONDITIONS
4.1	**Reasons for laboratory testing**	1 Precise conditions could be determined. 2 Practical, accurate procedure. Data generated is considered relevant for field of use. Test insects obtained from the field.
4.2	**Intended actual scale of biocide application**	Not applicable.
4.3	**Relevance compared to field conditions**	
4.3.1	Application method	The principle of fumigation is to confine a sufficient concentration for a sufficient period of time to enable a toxic dose to be received by the target pest. There are a number of ways in laboratory and field studies to achieve this although the principle is the same.
4.3.2	Test organism	There are different life stages of *Anobium punctatum.* Pupae are considered to be a stage which would require a higher dose of sulfuryl

		fluoride compared to larvae.
4.3.3	Observed effect	The complete mortality effect, recorded in the laboratory test is considered as the desired field response for eradication of pupae of *Anobium punctatum*.
4.4	**Relevance for read-across**	Not applicable.

5 APPLICANT'S SUMMARY AND CONCLUSION

5.1	**Materials and methods**	Pupae of *Anobium punctatum* were fumigated with sulfuryl fluoride for 31 hours and 10 minutes at a temperature of 11.5°C and 58 % relative humidity in laboratory fumitoria. Bioassays from laboratory population were tested to determine LAD. Fumigant concentration was measured using a Fumiscope gas analyser. Mortality rate was evaluated 3 days after treatment and 28 days after treatment.
5.2	**Reliability**	Reliability indicator 2: Study conducted in accordance with generally accepted scientific principles, possibly with incomplete reporting or methodological deficiencies, which do not affect the quality of relevant results.
5.3	**Assessment of efficacy, data analysis and interpretation**	The result of this investigation was that under the described conditions complete control of *Anobium punctatum* pupae was achieved. Additional trials have to be performed to understand the variability of the dose rates of the fumigant to achieve the LAD for this specific life stage at different temperatures.
5.4	**Conclusion**	There are different life stages of *Anobium punctatum* present in infested wooden structures. The laboratory fumigation test undertaken was considered to be a valid and effective procedure for evaluating the efficacy of sulfuryl fluoride on the pupae of *A. punctatum*. The efficacy results showed that sulfuryl fluoride was highly effective on pupae of this pest species.
5.5	**Proposed efficacy specification**	Total control of pupae of *Anobium punctatum.*

Evaluation by Competent Authorities

EVALUATION BY RAPPORTEUR MEMBER STATE

Date	October 2004.
Comments	Field 3.1: Within the body of each table the numbers are counts and not percentages (as stated in the table legend above the tables).
Summary and conclusion	Applicant's version is adopted.

1.1 Test organism - *Anobium puntatum*

Criteria	Details
Family	Anobiidae.
Species	*Anobium punctatum.*
Source	10 pupae in one block of pine-wood (*Picea abies*) according to LGA ("Ein Fichtenholz-Spaltblock wurde mit 10 parasitenfreien, lebendigen Puppen des Gewöhnlichen Nagekäfers (*Anobium punctatum*) in den vorgebohrten Probetrögen versehen. Nach Zusammenfügen der Spaltblockhälften verklebte man die Trennfugen mit Klebeband.").
Life stage	Pupae.
Mixed age population	Not applicable.
Number of pupae in test	10.

1.2 Test system

Criteria	Details
Test chamber	Fumitoria (fumigation chambers) made of acrylic glass, 40 x 25 x 14.5 cm = 14.5 litres, gas introduction via polyamide (PA) -lines 6 mm external diameter/4 mm internal diameter, gas monitoring via separate PA-lines 6 mm external diameter/4 mm internal diameter.
Test insects introduction into chamber	10 pupae in one block of pine-wood (*Picea abies*) according to LGA ("Ein Fichtenholz-Spaltblock wurde mit 10 parasitenfreien, lebendigen Puppen des Gewöhnlichen Nagekäfers (*Anobium punctatum*) in den vorgebohrten Probetrögen versehen. Nach Zusammenfügen der Spaltblockhälften verklebte man die Trennfugen mit Klebeband.").
Measuring equipment	Gas concentrations were verified upon initiation, periodically during fumigation and upon termination using a Fumiscope gas-analyser.

1.3 Application of test substance

Criteria	Details
Application procedure	Sulfuryl fluoride was supplied in commercial steel cylinders as a liquid under pressure. It was introduced into the fumitoria in its gaseous form.
Delivery method	Sulfuryl fluoride was made available for introduction into the fumitorium by using a heat-exchanger-system. Exact amounts of sulfuryl fluoride were transferred from the cylinder to the fumatorium using a gas syringe.
Dosage rate	Pupae All pupae were fumigated at 15.0 g/m^3 for a total exposure period of 31 hours and 10 minutes leading to an accumulated dosage of 466 g-h/m^3.

1.4 Test conditions

Criteria	Details
Incubation temperature	Fumigation was conducted at an average temperature of 11.5 ^oC.
Moisture	Fumigation was conducted at an average 58 % relative humidity.

Section B5.10.2 Efficacy Data

Annex Point IIB5.10
TNsG: Pt. I-B5.10, Pt. III-Ch. 6

B5.10.2/39 Anobium punctatum Laboratory study (Ref. Z39)

			Official use only
		1 REFERENCE: Z39, B5.10.2/39	
1.1	**Reference**	[1]Binker, G., [1]Binker, J., [1]Fröba G. and [2]Franke P. (1998). [1]Binker Materialschutz GmbH, Westendstr. 3, D-91207 Lauf, Germany [2]Von der IHK Nürnberg öffentlich bestellte und vereidigte Sachverständige für Vorratsschädlinge und biologische Schäden am Holz, Hohe Linde 2, D-90607 Rückersdorf, Germany Laboratory study on *Anobium punctatum* Number: 121.08.1998 No. 3.	
1.2	**Data protection**	Yes.	
1.2.1	Data owner	Dow AgroSciences LLC.	
1.2.2	Companies with letter of Access	None.	
1.2.3	Criteria for data protection	Data submitted to the MS after 13 May 2000 on existing b.p. for the purpose of its entry into Annex I	
1.3	**Guideline study**	The study was undertaken on the basis of sound principles of fumigation practice.	
1.4	**Deviations**	Not applicable as the study not conducted to an international standard method.	
		2 METHOD	
2.1	**Test Substance (Biocidal Product)**	Sulfuryl fluoride.	
2.1.1	Trade name/ proposed trade name	Vikane.	
2.1.2	Composition of Product tested	> 99% Sulfuryl fluoride.	
2.1.3	Physical state and nature	Fumigant.	
2.1.4	Monitoring of active substance concentration	Monitoring was undertaken using a Fumiscope gas analyser.	
2.1.5	Method of analysis	Not applicable.	
2.2	**Reference substance**	No reference substance was included in the study.	
2.2.1	Method of analysis for reference substance	Not applicable.	
2.3	**Testing procedure**		
2.3.1	Test population / inoculum /	See Table 1.1.	

	test organism		
2.3.2	Test system	See Table 1.2.	
2.3.3	Application of TS	See Table 1.3.	
2.3.4	Test conditions	See Table 1.4.	
2.3.5	Duration of the test / Exposure time	30 hours and 47 minutes.	
2.3.6	Number of replicates performed	One.	
2.3.7	Controls	Untreated controls were included, these were kept and stored under the same conditions as the treated pupae of *A. punctatum*.	
2.4	**Examination**		
2.4.1	Effect investigated	Lethal accumulated dosage (LAD) expressed as g-h/m^3. The LAD was determined 3 days after treatment and finally 28 days after treatment.	
2.4.2	Method for recording / scoring of the effect	Pupae mortality by examination (count) of beetles hatched from treated pupae 3 days after treatment and finally 28 days after treatment.	
2.4.3	Intervals of examination	3 days after treatment and finally 28 days after treatment.	
2.4.4	Statistics	Post fumigation mean total mortality was calculated by dividing the number of dead pupae by the total number of treated pupae 3 days after treatment and finally 28 days after treatment.	
2.4.5	Post fumigation monitoring of the test organism	The total mortality-effect of sufuryl fluoride on pupae was determined 3 days after treatment and finally 28 days after treatment.	
		3 RESULTS	
3.1	**Efficacy**	The percentage mortality was calculated by dividing the total number of dead pupae by the total number of treated pupae.	X

Percentage mortality of pupae of *Anobium punctatum* 3 days after exposure to sulfuryl fluoride

A	Untreated Control			
No.	Pupae	beetles hatched	Living pupae	Dead pupae
K	10	2	8	0

Total mortality of untreated pupae: 0 %

B	Treated pupae			
No.	Pupae	beetles hatched	Living pupae	Dead pupae
1	10	0	2	8

Total mortality of treated pupae: 80 %

Percentage mortality of pupae of *Anobium punctatum* 28 days after exposure to sulfuryl fluoride

A	Untreated Control			
No.	Pupae	beetles hatched	Living pupae	Dead pupae
K	10	8	0	2

Total mortality of untreated pupae: 20 %

B	Treated pupae			
No.	Pupae	beetles hatched	Living pupae	Dead pupae
1	10	0	0	10

Total mortality of treated pupae: 100 %

Section B5.10.2 **Efficacy Data**

Annex Point IIB5.10
TNsG: Pt. I-B5.10,
Pt. III-Ch. 6

B5.10.2/39 Anobium punctatum
Laboratory study (Ref. Z39)

3.1.1	Dose/Efficacy curve	Not available from report.
3.1.2	Begin and duration of effects	A mortality of 100 % was achieved 28 days after treatment.
3.1.3	Observed effects in the post monitoring phase	No unusual effect observed.
3.2	**Effects against organisms or objects to be protected**	None reported.
3.3	**Other effects**	None reported.
3.4	**Efficacy of the reference substance**	No reference substance was used.
3.5	**Tabular and/or graphical presentation of the summarised results**	See 3.1.
3.6	**Efficacy limiting factors**	
3.6.1	Occurrences of resistances	None reported.
3.6.2	Other limiting factors	None reported.
		4 RELEVANCE OF THE RESULTS COMPARED TO FIELD CONDITIONS
4.1	**Reasons for laboratory testing**	1 Precise conditions could be determined. 2 Practical, accurate procedure. Data generated is considered relevant for field of use. Test insects obtained from the field.
4.2	**Intended actual scale of biocide application**	Not applicable.
4.3	**Relevance compared to field conditions**	
4.3.1	Application method	The principle of fumigation is to confine a sufficient concentration for a sufficient period of time to enable a toxic dose to be received by the target pest. There are a number of ways in laboratory and field studies to achieve this although the principle is the same.
4.3.2	Test organism	There are different life stages of *Anobium punctatum.* Pupae are considered to be a stage which would require a higher dose of sulfuryl

		fluoride compared to larvae.
4.3.3	Observed effect	The complete mortality effect, recorded in the laboratory test was considered as the desired field response for eradication of pupae of *Anobium punctatum*.
4.4	**Relevance for read-across**	Not applicable.

5 APPLICANT'S SUMMARY AND CONCLUSION

5.1	**Materials and methods**	Pupae of *Anobium punctatum* were fumigated with sulfuryl fluoride for 30 hours and 47 minutes at a temperature of 11.5 ^{o}C and 58 % relative humidity in laboratory fumitoria. Bioassays from laboratory population were tested to determine LAD. Fumigant concentration was measured using a Fumiscope gas analyser. Mortality rate was evaluated 3 days after treatment and 28 days after treatment.
5.2	**Reliability**	Reliability indicator 2: Study conducted in accordance with generally accepted scientific principles, possibly with incomplete reporting or methodological deficiencies, which do not affect the quality of relevant results.
5.3	**Assessment of efficacy, data analysis and interpretation**	The result of this investigation was that under the described conditions complete control of *Anobium punctatum* pupae was achieved. Additional trials have to be performed to understand the variability of the dose rates of the fumigant to achieve the LAD for this specific life stage at different temperatures.
5.4	**Conclusion**	There are different life stages of *Anobium punctatum* present in infested wooden structures. The laboratory fumigation test undertaken was considered to be a valid and effective procedure for evaluating the efficacy of sulfuryl fluoride on the pupae of *A. punctatum*. The efficacy results showed that sulfuryl fluoride was highly effective on pupae of this pest species.
5.5	**Proposed efficacy specification**	Total control of pupae of *Anobium punctatum.*

Evaluation by Competent Authorities

EVALUATION BY RAPPORTEUR MEMBER STATE

Date	October 2004.
Comments	Field 3.1: Within the body of each table the numbers are counts and not percentages (as stated in the table legend above the tables).
Summary and conclusion	Applicant's version is adopted.

1.1 Test organism - *Anobium puntatum*

Criteria	Details
Family	Anobiidae.
Species	*Anobium punctatum.*
Source	10 pupae in one block of pine-wood (*Picea abies*) according to LGA ("Ein Fichtenholz-Spaltblock wurde mit 10 parasitenfreien, lebendigen Puppen des Gewöhnlichen Nagekäfers (*Anobium punctatum*) in den vorgebohrten Probetrögen versehen. Nach Zusammenfügen der Spaltblockhälften verklebte man die Trennfugen mit Klebeband.").
Life stage	Pupae.
Mixed age population	Not applicable.
Number of pupae in test	10.

1.2 Test system

Criteria	Details
Test chamber	Fumitoria (fumigation chambers) made of acrylic glass, 40 x 25 x 14.5 cm = 14.5 litres, gas introduction via polyamide (PA) -lines 6 mm external diameter/4 mm internal diameter, gas monitoring via separate PA-lines 6 mm external diameter/4 mm internal diameter.
Test insects introduction into chamber	10 pupae in one block of pine-wood (*Picea abies*) according to LGA ("Ein Fichtenholz-Spaltblock wurde mit 10 parasitenfreien, lebendigen Puppen des Gewöhnlichen Nagekäfers (*Anobium punctatum*) in den vorgebohrten Probetrögen versehen. Nach Zusammenfügen der Spaltblockhälften verklebte man die Trennfugen mit Klebeband.").
Measuring equipment	Gas concentrations were verified upon initiation, periodically during fumigation and upon termination using a Fumiscope gas-analyser.

1.3 Application of test substance

Criteria	Details
Application procedure	Sulfuryl fluoride was supplied in commercial steel cylinders as a liquid under pressure. It was introduced into the fumitoria in its gaseous form.
Delivery method	Sulfuryl fluoride was made available for introduction into the fumitorium by using a heat-exchanger-system. Exact amounts of sulfuryl fluoride were transferred from the cylinder to the fumatorium using a gas syringe.
Dosage rate	Pupae All pupae were fumigated at 17.3 g/m^3 for a total exposure period of 30 hours and 47 minutes leading to an accumulated dosage of 532 g-h/m^3.

1.4 Test conditions

Criteria	Details
Incubation temperature	Fumigation was conducted at an average temperature of 11.5 ^oC.
Moisture	Fumigation was conducted at an average 58 % relative humidity.

Section B5.10.2 Efficacy Data

Annex Point IIB5.10
TNsG: Pt. I-B5.10, Pt. III-Ch. 6

B5.10.2/40 Anobium punctatum Laboratory study (Ref. Z40)

			Official use only
		1 REFERENCE: Z40, B5.10.2/40	
1.1	**Reference**	[1]Binker, G., [1]Binker, J., [1]Fröba G. and [2]Franke P. (1998). [1]Binker Materialschutz GmbH, Westendstr. 3, D-91207 Lauf, Germany [2]Von der IHK Nürnberg öffentlich bestellte und vereidigte Sachverständige für Vorratsschädlinge und biologische Schäden am Holz, Hohe Linde 2, D-90607 Rückersdorf, Germany Laboratory study on *Anobium punctatum* Number: 121.08.1998 No. 4.	
1.2	**Data protection**	Yes.	
1.2.1	Data owner	Dow AgroSciences LLC.	
1.2.2	Companies with letter of Access	None.	
1.2.3	Criteria for data protection	Data submitted to the MS after 13 May 2000 on existing b.p. for the purpose of its entry into Annex I	
1.3	**Guideline study**	The study was undertaken on the basis of sound principles of fumigation practice.	
1.4	**Deviations**	Not applicable as the study not conducted to an international standard method.	
		2 METHOD	
2.1	**Test Substance (Biocidal Product)**	Sulfuryl fluoride.	
2.1.1	Trade name/ proposed trade name	Vikane.	
2.1.2	Composition of Product tested	99% Sulfuryl fluoride.	
2.1.3	Physical state and nature	Fumigant.	
2.1.4	Monitoring of active substance concentration	Monitoring was undertaken using a Fumiscope gas analyser.	
2.1.5	Method of analysis	Not applicable.	
2.2	**Reference substance**	No reference substance was included in the study.	
2.2.1	Method of analysis for reference substance	Not applicable.	
2.3	**Testing procedure**		
2.3.1	Test population / inoculum /	See Table 1.1.	

	test organism		
2.3.2	Test system	See Table 1.2.	
2.3.3	Application of TS	See Table 1.3.	X
2.3.4	Test conditions	See Table 1.4.	
2.3.5	Duration of the test / Exposure time	30 hours and 45 minutes.	
2.3.6	Number of replicates performed	One.	
2.3.7	Controls	Untreated controls were included, these were kept and stored under the same conditions as the treated pupae of *A. punctatum*.	
2.4	**Examination**		
2.4.1	Effect investigated	Lethal accumulated dosage (LAD) expressed as g-h/m^3. The LAD was determined 3 days after treatment and finally 28 days after treatment.	
2.4.2	Method for recording / scoring of the effect	Pupae mortality by examination (count) of beetles hatched from treated pupae 3 days after treatment and finally 28 days after treatment.	
2.4.3	Intervals of examination	3 days after treatment and finally 28 days after treatment.	
2.4.4	Statistics	Post fumigation mean total mortality was calculated by dividing the number of dead pupae by the total number of treated pupae 3 days after treatment and finally 28 days after treatment.	
2.4.5	Post fumigation monitoring of the test organism	The total mortality-effect of sufuryl fluoride on pupae was determined 3 days after treatment and finally 28 days after treatment.	
		3 RESULTS	
3.1	**Efficacy**	The percentage mortality was calculated by dividing the total number of dead pupae by the total number of treated pupae.	X

Percentage mortality of pupae of *Anobium punctatum* 3 days after exposure to sulfuryl fluoride

A	Untreated Control			
No.	Pupae	beetles hatched	Living pupae	Dead pupae
K	10	2	8	0

Total mortality of untreated pupae: 0 %

B	Treated pupae			
No.	Pupae	beetles hatched	Living pupae	Dead pupae
1	10	0	1	9

Total mortality of treated pupae: 90 %

Percentage mortality of pupae of *Anobium punctatum* 28 days after exposure to sulfuryl fluoride

A	Untreated Control			
No.	Pupae	beetles hatched	Living pupae	Dead pupae
K	10	8	0	2

Total mortality of untreated pupae: 20 %

B	Treated pupae			
No.	Pupae	beetles hatched	Living pupae	Dead pupae
1	10	0	0	10

Total mortality of treated pupae: 100 %

Section B5.10.2 **Efficacy Data**

Annex Point IIB5.10
TNsG: Pt. I-B5.10,
Pt. III-Ch. 6

B5.10.2/40 Anobium punctatum Laboratory study (Ref. Z40)

3.1.1	Dose/Efficacy curve	Not available from report.
3.1.2	Begin and duration of effects	A mortality of 100 % was achieved 28 days after treatment.
3.1.3	Observed effects in the post monitoring phase	No unusual effect observed.
3.2	**Effects against organisms or objects to be protected**	None reported.
3.3	**Other effects**	None reported.
3.4	**Efficacy of the reference substance**	No reference substance was used.
3.5	**Tabular and/or graphical presentation of the summarised results**	See 3.1.
3.6	**Efficacy limiting factors**	
3.6.1	Occurrences of resistances	None reported.
3.6.2	Other limiting factors	None reported.
		4 RELEVANCE OF THE RESULTS COMPARED TO FIELD CONDITIONS
4.1	**Reasons for laboratory testing**	1 Precise conditions could be determined. 2 Practical, accurate procedure. Data generated is considered relevant for field of use. Test insects obtained from the field.
4.2	**Intended actual scale of biocide application**	Not applicable.
4.3	**Relevance compared to field conditions**	
4.3.1	Application method	The principle of fumigation is to confine a sufficient concentration for a sufficient period of time to enable a toxic dose to be received by the target pest. There are a number of ways in laboratory and field studies to achieve this although the principle is the same.
4.3.2	Test organism	There are different life stages of *Anobium punctatum.* Pupae are considered to be a stage which would require a higher dose of sulfuryl

Section B5.10.2 **Efficacy Data**

Annex Point IIB5.10
TNsG: Pt. I-B5.10,
Pt. III-Ch. 6

B5.10.2/40 Anobium punctatum
Laboratory study (Ref. Z40)

		fluoride compared to larvae.
4.3.3	Observed effect	The complete mortality effect, recorded in the laboratory test is considered as the desired field response for eradication of pupae of *Anobium punctatum*.
4.4	**Relevance for read-across**	Not applicable.
		5 APPLICANT'S SUMMARY AND CONCLUSION
5.1	**Materials and methods**	Pupae of *Anobium punctatum* were fumigated with sulfuryl fluoride for 30 hours and 45 minutes at a temperature of 11.5 ^{o}C and 58 % relative humidity in laboratory fumitoria. Bioassays from laboratory population were tested to determine LAD. Fumigant concentration was measured using a Fumiscope gas analyser. Mortality rate was evaluated 3 days after treatment and 28 days after treatment.
5.2	**Reliability**	Reliability indicator 2: Study conducted in accordance with generally accepted scientific principles, possibly with incomplete reporting or methodological deficiencies, which do not affect the quality of relevant results.
5.3	**Assessment of efficacy, data analysis and interpretation**	The result of this investigation was that under the described conditions a complete level of control of *Anobium punctatum* pupae was achieved. Additional trials have to be performed to understand the variability of the dose rates of the fumigant to achieve the LAD for this specific life stage at different temperatures.
5.4	**Conclusion**	There are different life stages of *Anobium punctatum* present in infested wooden structures. The laboratory fumigation test undertaken was considered to be a valid and effective procedure for evaluating the efficacy of sulfuryl fluoride on the pupae of *A. punctatum*. The efficacy results showed that sulfuryl fluoride was highly effective on pupae of this pest species.
5.5	**Proposed efficacy specification**	Total control of pupae of *Anobium punctatum.*

Evaluation by Competent Authorities

EVALUATION BY RAPPORTEUR MEMBER STATE

Date	October 2004.
Comments	Field 2.3.3. Table 1.3, dosage rate: All pupae were fumigated at 12.5 g/m^3 ….. leading to an accumulated dosage of 384 g-h/m^3. Field 3.1: Within the body of each table the numbers are counts and not percentages (as stated in the table legend above the tables).
Summary and conclusion	Applicant's version is adopted.

1.1 Test organism - *Anobium puntatum*

Criteria	Details
Family	Anobiidae.
Species	*Anobium punctatum.*
Source	10 pupae in one block of pine-wood (*Picea abies*) according to LGA ("Ein Fichtenholz-Spaltblock wurde mit 10 parasitenfreien, lebendigen Puppen des Gewöhnlichen Nagekäfers (*Anobium punctatum*) in den vorgebohrten Probetrögen versehen. Nach Zusammenfügen der Spaltblockhälften verklebte man die Trennfugen mit Klebeband.").
Life stage	Pupae.
Mixed age population	Not applicable.
Number of pupae in test	10.

1.2 Test system

Criteria	Details
Test chamber	Fumitoria (fumigation chambers) made of acrylic glass, 40 x 25 x 14.5 cm = 14.5 litres, gas introduction via polyamide (PA) -lines 6 mm external diameter/4 mm internal diameter, gas monitoring via separate PA-lines 6 mm external diameter/4 mm internal diameter.
Test insects introduction into chamber	10 pupae in one block of pine-wood (*Picea abies*) according to LGA ("Ein Fichtenholz-Spaltblock wurde mit 10 parasitenfreien, lebendigen Puppen des Gewöhnlichen Nagekäfers (*Anobium punctatum*) in den vorgebohrten Probetrögen versehen. Nach Zusammenfügen der Spaltblockhälften verklebte man die Trennfugen mit Klebeband.").
Measuring equipment	Gas concentrations were verified upon initiation, periodically during fumigation and upon termination using a Fumiscope gas-analyser.

1.3 Application of test substance

Criteria	Details
Application procedure	Sulfuryl fluoride was supplied in commercial steel cylinders as a liquid under pressure. It was introduced into the fumitoria in its gaseous form.
Delivery method	Sulfuryl fluoride was made available for introduction into the fumitorium by using a heat-exchanger-system. Exact amounts of sulfuryl fluoride were transferred from the cylinder to the fumatorium using a gas syringe.
Dosage rate	Pupae All pupae were fumigated at 11.9 g/m^3 for a total exposure period of 30 hours and 45 minutes leading to an accumulated dosage of 367 g-h/m^3.

1.4 Test conditions

Criteria	Details
Incubation temperature	Fumigation was conducted at an average temperature of 11.5 ^oC.
Moisture	Fumigation was conducted at an average 58 % relative humidity.

Section B5.10.2 Efficacy Data

Annex Point IIB5.10
TNsG: Pt. I-B5.10, Pt. III-Ch. 6

B5.10.2/41 Anobium punctatum Field study (Ref. Z41)

			Official use only
		1 REFERENCE: Z41, B5.10.2/41	
1.1	**Reference**	[1]Binker, G., [1]Binker, J., [1]Fröba G. and [2]Franke P. (1997). [1]Binker Materialschutz GmbH, Westendstr. 3, D-91207 Lauf, Germany [2]Von der IHK Nürnberg öffentlich bestellte und vereidigte Sachverständige für Vorratsschädlinge und biologische Schäden am Holz, Hohe Linde 2, D-90607 Rückersdorf, Germany. Field study on *Anobium punctatum* Number: 111.05.1997.	
1.2	**Data protection**	Yes.	
1.2.1	Data owner	Dow AgroSciences LLC.	
1.2.2	Companies with letter of Access	None.	
1.2.3	Criteria for data protection	Data submitted to the MS after 13 May 2000 on existing b.p. for the purpose of its entry into Annex I	
1.3	**Guideline study**	The study was undertaken on the basis of sound principles of fumigation practice.	
1.4	**Deviations**	Not applicable as the study not conducted to an international standard method.	
		2 METHOD	
2.1	**Test Substance (Biocidal Product)**	Sulfuryl fluoride.	
2.1.1	Trade name/ proposed trade name	Vikane.	
2.1.2	Composition of Product tested	> 99% Sulfuryl fluoride.	
2.1.3	Physical state and nature	Fumigant.	
2.1.4	Monitoring of active substance concentration	Monitoring was undertaken using a Fumiscope gas analyser.	
2.1.5	Method of analysis	Not applicable.	
2.2	**Reference substance**	No reference substance was included in the study.	
2.2.1	Method of analysis for reference substance	Not applicable.	
2.3	**Testing procedure**		

2.3.1	Test population / inoculum / test organism	See Table 1.1.	
2.3.2	Test system	See Table 1.2.	
2.3.3	Application of TS	See Table 1.3.	
2.3.4	Test conditions	See Table 1.4.	
2.3.5	Duration of the test / Exposure time	70 hours.	
2.3.6	Number of replicates performed	One.	
2.3.7	Controls	No controls were included in this study.	
2.4	**Examination**		
2.4.1	Effect investigated	Lethal accumulated dosage (LAD) expressed as g-h/m^3. LAD was determined 6 days after treatment.	
2.4.2	Method for recording / scoring of the effect	Pupae-mortality by examination (count) of dead pupae 6 days after treatment.	
2.4.3	Intervals of examination	6 days after treatment.	
2.4.4	Statistics	Post fumigation mean total mortality was calculated by dividing the number of dead pupae by the total number of treated pupae 6 days after treatment.	
2.4.5	Post fumigation monitoring of the test organism	See 2.4.4.	
		3 RESULTS	
3.1	**Efficacy**	The percentage mortality was calculated by dividing the total number of dead pupae by the total number of treated pupae.	X

Percentage mortality of pupae of *Anobium punctatum* after exposure to sulfuryl fluoride.

	Treated pupae	
No.	Pupae	Dead Pupae
1	12	12

Total mortality of treated pupae: 100 %.

Section B5.10.2 **Efficacy Data**

Annex Point IIB5.10
TNsG: Pt. I-B5.10,
Pt. III-Ch. 6

B5.10.2/41 Anobium punctatum
Field study (Ref. Z41)

3.1.1	Dose/Efficacy curve	Not available from report.
3.1.2	Begin and duration of effects	A mortality of 100 % was achieved 6 days after treatment.
3.1.3	Observed effects in the post monitoring phase	No unusual effect observed.
3.2	**Effects against organisms or objects to be protected**	None reported.
3.3	**Other effects**	None reported
3.4	**Efficacy of the reference substance**	No reference substance was used.
3.5	**Tabular and/or graphical presentation of the summarised results**	See 3.1.
3.6	**Efficacy limiting factors**	
3.6.1	Occurrences of resistances	None reported.
3.6.2	Other limiting factors	None reported.

4 RELEVANCE OF THE RESULTS COMPARED TO FIELD CONDITIONS

4.1	**Reasons for laboratory testing**	Not applicable.
4.2	**Intended actual scale of biocide application**	Not applicable.
4.3	**Relevance compared to field conditions**	Not applicable.
4.3.1	Application method	Not applicable.
4.3.2	Test organism	Not applicable.
4.3.3	Observed effect	Not applicable.
4.4	**Relevance for read-across**	Not applicable.

Section B5.10.2 Efficacy Data

Annex Point IIB5.10
TNsG: Pt. I-B5.10, Pt. III-Ch. 6

B5.10.2/41 Anobium punctatum Field study (Ref. Z41)

5 APPLICANT'S SUMMARY AND CONCLUSION

5.1	**Materials and methods**	Pupae of *Anobium punctatum* were fumigated with sulfuryl fluoride for 70 hours at a temperature of 12.0°C in a practical fumigation under field condition (church of a volume of 525 m³). Bioassays from laboratory population were tested to determine LAD. Fumigant concentration was measured using a Fumiscope gas analyser. Mortality rate was evaluated 6 days after treatment.
5.2	**Reliability**	Reliability indicator 2: Study conducted in accordance with generally accepted scientific principles, possibly with incomplete reporting or methodological deficiencies, which do not affect the quality of relevant results.
5.3	**Assessment of efficacy, data analysis and interpretation**	The result of this investigation was that under the described conditions complete control of *Anobium punctatum* pupae was achieved. Additional trials have to be performed to understand the variability of the dose rates of the fumigant to achieve the LAD for this specific life stage at different temperatures.
5.4	**Conclusion**	There are different life stages of *Anobium punctatum* present in infested wooden structures. The field fumigation test undertaken was considered to be a valid and effective procedure for evaluating the efficacy of sulfuryl fluoride on the pupae of *A. punctatum*. The efficacy results showed that sulfuryl fluoride was highly effective on pupae of this pest species.
5.5	**Proposed efficacy specification**	Total control of pupae of *Anobium punctatum.*

Evaluation by Competent Authorities

EVALUATION BY RAPPORTEUR MEMBER STATE

Date	October 2004.
Comments	Field 3.1: Within the body of each table the numbers are counts and not percentages (as stated in the table legend above the tables).
Summary and conclusion	Applicant's version is adopted.

1.1 Test organism - *Anobium punctatum*

Criteria	Details
Family	Anobiidae.
Species	*Anobium punctatum.*
Source	Laboratory population.
Life stage	Pupae.
Mixed age population	Not applicable.
Number of pupae in test	12.

1.2 Test system

Criteria	Details
Test chamber	Fumigation was carried out under field conditions in a typical Bavarian church in Germany (volume: 525 m³). Gas introduction via polyamide (PA) lines 6 mm external diameter 4 mm internal diameter, gas monitoring via separate PA-lines 6 mm external diameter/4 mm internal diameter.
Test insects introduction into chamber	12 pupae in one block of pine-wood (*Picea abies*) according to LGA ("Ein Fichtenholz-Spaltblock wurde mit 12 parasitenfreien, lebendigen Puppen des Gewöhnlichen Nagekäfers (*Anobium punctatum*) in den vorgebohrten Probetrögen versehen. Nach Zusammenfügen der Spaltblockhälften verklebte man die Trennfugen mit Klebeband.").
Measuring equipment	Gas concentrations were verified upon initiation, periodically during fumigation and upon termination using a Fumiscope gas analyser.

1.3 Application of test substance

Criteria	Details
Application procedure	Sulfuryl fluoride was supplied in commercial steel cylinders as a liquid under pressure. It was introduced into the structure in its gaseous form.
Delivery method	Sulfuryl fluoride was made available for introduction into the structure by using a heat-exchanger-system. Exact amounts of sulfuryl fluoride were transferred from the cylinder to the structure using a digital scale. Gas was mixed as it was injected using a fan inside the structure.
Dosage rate	<u>Pupae</u> All pupae were fumigated at a mean concentration of 10.8 g/m^3 for a total exposure period of 70 hours leading to an accumulated dosage of 757 g-h/m^3.

1.4 Test conditions

Criteria	Details
Incubation temperature	Fumigation was conducted at an average temperature of 12.0 ^{o}C.
Moisture	Not available from report.

Data protection is claimed by Dow AgroSciences in accordance with Article 12.1(c) (i) and (ii) of Council Directive 98/8/EC for all study reports marked "Y" in the "Data Protection Claimed Y/N" column of the lists below (numbered 1-2). For studies marked Y(i) data protection is claimed under Article 12.1(c) (i), for studies marked Y(ii) data protection is claimed under Article 12.1(c) (ii). These claims are based on information from the applicant. It is assumed that the relevant studies are not already protected in any other MS of the European Union under existing national rules relating to biocidal products. It is not possible for the rapporteur to confirm the accuracy of this information.

Sweden has earlier received those studies marked with Y(i) to support national product authorisation and according the Biocidal Products Ordinance (SFS 2000:338) section 14, those studies may be used for the benefit of other applicants only after 13 May 2010, while studies marked with Y(ii) may be used for the benefit of another applicant only after the expiry of a period of ten years from the date the active substance was first listed in Annex I or IA to the Biocides Directive 98/8/EC.

Data Owner:	D = Dow AgroSciences
	P= Public domain

1. List of Studies Sorted by <u>Section Number and</u> <u>Reference Number</u>

98/8 Section Number (IIIB)	91/414 Annex Section	Author	Title	Laboratory	GLP/GEP Study Y/N	Published Y/N	Vertebrate Study Y/N	Data Protection Claimed Y/N	Data Owner	Report No. / Study ID	Report Date	Dow AgroSciences Report No	**Ref**.
5.10.2/01	n/a 98/8 specific	Osbrink, W.L.A., Scheffrahn, R.H., Su, N-Y., and Rust, M.K.	Laboratory comparisons of sulfuryl fluoride toxicity and mean time of mortality among ten termite species (Isoptera: Hodotermitidae, Kalotermitidae, Rhinotermitidae).	Publication: Journal of Economic Entomology Volume 80, pages 1044 – 1047.	N	Y	N	N	P	01	1987	None	Z1

					GLP/GEP Study Y/N	Published Y/N	Vertebrate Study Y/N	Data Protection Claimed Y/N	Data Owner				
98/8 Section Number (IIIB)	91/414 Annex Section	Author	Title	Laboratory						Report No. / Study ID	Report Date	Dow AgroSciences Report No	**Ref**.
5.10.2/02	n/a 98/8 specific	Su, N-Y., Osbrink, W.L.A., and Scheffrahn, R.H.	Concentration-time relationship for fumigant efficacy of sulfuryl fluoride against the Formosan subterranean termite (Isoptera: Rhinotermitidae).	Publication: Journal of Economic Entomology Volume 82, pages 156 – 158.	N	Y	N	N	P	02	1989	None	Z2
5.10.2/03	n/a 98/8 specific	Su, N-Y., and Scheffrahn, R.H.	Field comparison of sulfuryl fluoride susceptibility among three termite species (Isoptera: Kalotermitidae, Rhinotermitidae) during structural fumigation.	Publication: Journal of Economic Entomology Volume 79, pages 903 – 908.	N	Y	N	N	P	03	1986	None	Z3
5.10.2/04	n/a 98/8 specific	La Fage, J.P., Jones, M., and Lawrence, T	A laboratory evaluation of the fumigant, sulfuryl fluoride (Vikane), against the Formosan termite *Coptotermes formosanus* Shiraki.	Publication: The International Research Group on Wood Preservation, Thirteenth Annual Meeting, May 1982. IRG Secretariat Drottning Kristinas väg 47C, S – 11428 Stockholm, Sweden.	N	Y	N	N	P	04	1982	None	Z4

98/8 Section Number (IIIB)	91/414 Annex Section	Author	Title	Laboratory	GLP/GEP Study Y/N	Published Y/N	Vertebrate Study Y/N	Data Protection Claimed Y/N	Data Owner	Report No. / Study ID	Report Date	Dow AgroSciences Report No	Ref.
5.10.2/05	n/a 98/8 specific	Soma, Y., Naito, H., Misumi, T., Mizobuchi, m., Tsuchiya, Y., Matsuoka, I., Kawakami, F., Hirata, K., and Komatsu., H.	Effects of some fumigants on pine wood nematode, *Buraphelenchus xylophilus*, infecting wooden packages. Susceptibility of pine wood nematode to methyl bromide, sulfuryl fluoride and methyl isothiocyanate.	Publication: Research Bulletin Plant Protection, Japan, 2001, Number 37, pages 19 – 26.	N	Y	N	N	P	05	2001	None	Z5
5.10.2/06	n/a 98/8 specific	Dwinell, L.D., Thoms, E., and Prabhakaran, S.	Exploratory research on sulfuryl fluoride fumigation to eradicate the pine wood nematode in unseasoned pine lumber.	Annual International Research Conference on Methyl Bromide Alternatives and Emission Reduction, 2003, San Diego, California, USA.	N	Y	N	N	P	06	2003	None	Z6
5.10.2/07	n/a 98/8 specific	Verheyen, H.	Investigatory studies on the ovicidal effect of a fumigant on dry wood insect pests.	Fachhochschule, Eberswalde, Germany. Student Research Project	Y	N	N	Y (ii)	D	07	2002	None	Z7

98/8 Section Number (IIIB)	91/414 Annex Section	Author	Title	Laboratory	GLP/GEP Study Y/N	Published Y/N	Vertebrate Study Y/N	Data Protection Claimed Y/N	Data Owner	Report No. / Study ID	Report Date	Dow AgroSciences Report No	**Ref**.
5.10.2/08	n/a 98/8 specific	Ducom, P., Roussel, C., and Stefanini, V.	Efficacy of sulfuryl fluoride on European house borer eggs, Hylotrupes bajulus (L.) (Coleoptera; Cerambycidae).	Laboratoire National de la Protection des Végétaux, Station d`Etude des Tech-niques de fumigation et de Protection des Denrées Stockées, Chemin d`Artigues - 33150 Cenon, France.	Y	N	N	Y (ii)	D	08	2003	None	Z8
5.10.2/09	n/a 98/8 specific	Su, N-y., and Scheffrahn, R.H.	Efficacy of sulfuryl fluoride against four beetle pests of museums (Coleoptera: Dermestidae, Anobiidae).	Publication: Journal of Economic Entomology Volume 83, pages 879 – 882.	N	Y	N	N	P	09	1990	None	Z9
5.10.2/10	n/a 98/8 specific	Williams, L.H., and Sprenkel, R.J.	Ovicidal activity of sulfuryl fluoride to Anobiid and Lyctid beetle eggs of various ages.	Publication: Journal of Entomological Science, Volume 25(3), pages 366 – 375.	N	Y	N	N	P	10	1990	None	Z10

98/8 Section Number (IIIB)	91/414 Annex Section	Author	Title	Laboratory	GLP/GEP Study Y/N	Published Y/N	Vertebrate Study Y/N	Data Protection Claimed Y/N	Data Owner	Report No. / Study ID	Report Date	Dow AgroSciences Report No	Ref.
5.10.2/11	n/a 98/8 specific	Binker, G., Binker, J., Fröba, G., Graf, E., and Lanz, B.	Laboratory study on *Anobium punctatum* Number: 121641. Unpublished.	Binker Materialschutz, Germany	Y	N	N	Y (ii)	D	11	1995	None	Z11
5.10.2/12	n/a 98/8 specific	Binker, G., Binker, J., Fröba, G., Graf, E., and Lanz, B.	Field study on *Anobium punctatum* Number: 123418/B and 123418/D. Unpublished.	Binker Materialschutz, Germany	Y	N	N	Y (ii)	D	12	1996	None	Z12
5.10.2/13	n/a 98/8 specific	Binker, G., Binker, J., Fröba, G., Graf, E., and Lanz, B.	Field study on *Anobium punctatum* Number: 123418/C and 123418/D. Unpublished.	Binker Materialschutz, Germany	Y	N	N	Y (ii)	D	13	1996	None	Z13
5.10.2/14	n/a 98/8 specific	Binker, G., Binker, J., Fröba, G., Graf, E., and Lanz, B.	Laboratory study on *Anobium punctatum* Number: 125749/C and 125749/E (Bioassay 151 – 160). Unpublished.	Binker Materialschutz, Germany	Y	N	N	Y (ii)	D	14	1997	None	Z14
5.10.2/15	n/a 98/8 specific	Binker, G., Binker, J., Fröba, G., Graf, E., and Lanz, B.	Laboratory study on *Anobium punctatum* Number: 125749/C and 125749/E (Bioassay 161 - 180). Unpublished.	Binker Materialschutz, Germany	Y	N	N	Y (ii)	D	15	1997	None	Z15

98/8 Section Number (IIIB)	91/414 Annex Section	Author	Title	Laboratory	GLP/GEP Study Y/N	Published Y/N	Vertebrate Study Y/N	Data Protection Claimed Y/N	Data Owner	Report No. / Study ID	Report Date	Dow AgroSciences Report No	Ref.
5.10.2/16	n/a 98/8 specific	Binker, G., Binker, J., Fröba, G., Graf, E., and Lanz, B.	Laboratory study on *Anobium punctatum* Number: 125749/C and 125749/E (Bioassay 181 – 200). Unpublished.	Binker Materialschutz, Germany	Y	N	N	Y (ii)	D	16	1997	None	Z16
5.10.2/17	n/a 98/8 specific	Binker, G., Binker, J., Fröba, G., Graf, E., and Lanz, B.	Field study on *Anobium punctatum* Number: 402741/A and 402741/B (Bioassay 1 – 60). Unpublished.	Binker Materialschutz, Germany	Y	N	N	Y (ii)	D	17	2000	None	Z17
5.10.2/18	n/a 98/8 specific	Binker, G., Binker, J., Fröba, G., Graf, E., and Lanz, B.	Field study on *Anobium punctatum* Number: 402741/A and 402741/B (Bioassay 61 - 120). Unpublished.	Binker Materialschutz, Germany	Y	N	N	Y (ii)	D	18	2000	None	Z18
5.10.2/19	n/a 98/8 specific	Binker, G., Binker, J., Fröba, G., Graf, E., and Lanz, B.	Laboratory study on *Anobium punctatum* Number: 402741/C and 402741/D (Bioassay 143 - 165). Unpublished.	Binker Materialschutz, Germany	Y	N	N	Y (ii)	D	19	2000	None	Z19

98/8 Section Number (IIIB)	91/414 Annex Section	Author	Title	Laboratory	GLP/GEP Study Y/N	Published Y/N	Vertebrate Study Y/N	Data Protection Claimed Y/N	Data Owner	Report No. / Study ID	Report Date	Dow AgroSciences Report No	**Ref**.
5.10.2/20	n/a 98/8 specific	Binker, G., Binker, J., Fröba, G., Graf, E., and Lanz, B.	Laboratory study on *Anobium punctatum* Number: 402741/C and 402741/D (Bioassay 166 - 188). Unpublished.	Binker Materialschutz, Germany	Y	N	N	Y (ii)	D	20	2000	None	Z20
5.10.2/21	n/a 98/8 specific	Binker, G., Binker, J., Fröba, G., Graf, E., and Lanz, B.	Laboratory study on *Anobium punctatum* Number: 130377/A and 403972 (Bioassay 11 – 15). Unpublished.	Binker Materialschutz, Germany	Y	N	N	Y (ii)	D	21	1999	None	Z21
5.10.2/22	n/a 98/8 specific	Binker, G., Binker, J., Fröba, G., Graf, E., and Lanz, B.	Laboratory study on *Anobium punctatum* Number: 130377/A and 403972 (Bioassay 16 - 20). Unpublished.	Binker Materialschutz, Germany	Y	N	N	Y (ii)	D	22	1999	None	Z22
5.10.2/23	n/a 98/8 specific	Binker, G., Binker, J., Fröba, G., Graf, E., and Lanz, B.	Laboratory study on *Anobium punctatum* Number: 130377/A and 403972 (Bioassay 21 - 25). Unpublished.	Binker Materialschutz, Germany	Y	N	N	Y (ii)	D	23	1999	None	Z23

98/8 Section Number (IIIB)	91/414 Annex Section	Author	Title	Laboratory	GLP/GEP Study Y/N	Published Y/N	Vertebrate Study Y/N	Data Protection Claimed Y/N	Data Owner	Report No. / Study ID	Report Date	Dow AgroSciences Report No	Ref.
5.10.2/24	n/a 98/8 specific	Binker, G., Binker, J., Fröba, G., Graf, E., and Lanz, B.	Laboratory study on *Anobium punctatum* Number: 130377/A and 403972 (Bioassay 26 - 30). Unpublished.	Binker Materialschutz, Germany	Y	N	N	Y (ii)	D	24	1999	None	Z24
5.10.2/25	n/a 98/8 specific	Binker, G., Binker, J., Fröba, G., Graf, E., and Lanz, B.	Laboratory study on *Anobium punctatum* Number: 130377/A and 403972 (Bioassay 31 - 35). Unpublished.	Binker Materialschutz, Germany	Y	N	N	Y (ii)	D	25	1999	None	Z25
5.10.2/26	n/a 98/8 specific	Binker, G., Binker, J., Fröba, G., Graf, E., and Lanz, B.	Laboratory study on *Anobium punctatum* Number: 130377/A and 403972 (Bioassay 36 - 40). Unpublished.	Binker Materialschutz, Germany	Y	N	N	Y (ii)	D	26	1999	None	Z26
5.10.2/27	n/a 98/8 specific	Binker, G., Binker, J., Fröba, G., Graf, E., and Lanz, B.	Laboratory study on *Anobium punctatum* Number: 130377/A and 403972 (Bioassay 41 - 45). Unpublished.	Binker Materialschutz, Germany	Y	N	N	Y (ii)	D	27	1999	None	Z27

98/8 Section Number (IIIB)	91/414 Annex Section	Author	Title	Laboratory	GLP/GEP Study Y/N	Published Y/N	Vertebrate Study Y/N	Data Protection Claimed Y/N	Data Owner	Report No. / Study ID	Report Date	Dow AgroSciences Report No	Ref.
5.10.2/28	n/a 98/8 specific	Binker, G., Binker, J., Fröba, G., Graf, E., and Lanz, B.	Laboratory study on *Anobium punctatum* Number: 130377/A and 403972 (Bioassay 46 - 50). Unpublished.	Binker Materialschutz, Germany	Y	N	N	Y (ii)	D	28	1999	None	Z28
5.10.2/29	n/a 98/8 specific	Binker, G., Binker, J., Fröba, G., Graf, E., and Lanz, B.	Laboratory study on *Anobium punctatum* Number: 130377/A and 403972 (Bioassay 51 - 55). Unpublished.	Binker Materialschutz, Germany	Y	N	N	Y (ii)	D	29	1999	None	Z29
5.10.2/30	n/a 98/8 specific	Binker, G., Binker, J., Fröba, G., Graf, E., and Lanz, B.	Laboratory study on *Anobium punctatum* Number: 130377/A and 403972 (Bioassay 56 - 60). Unpublished.	Binker Materialschutz, Germany	Y	N	N	Y (ii)	D	30	1999	None	Z30
5.10.2/31	n/a 98/8 specific	Binker, G., Binker, J., Fröba, G., Franke, P. and Ultsch, R.	Field study on *Anobium punctatum* Number: LBM 541 1320/113. Unpublished.	Binker Materialschutz, Germany	Y	N	N	Y (ii)	D	31	2001	None	Z31
5.10.2/32	n/a 98/8 specific	Binker, G., Binker, J., Fröba, G., Franke, P. and Ultsch, R.	Field study on *Anobium punctatum* Number: LBM 541 1320/116. Unpublished.	Binker Materialschutz, Germany	Y	N	N	Y (ii)	D	32	2001	None	Z32

98/8 Section Number (IIIB)	91/414 Annex Section	Author	Title	Laboratory	GLP/GEP Study Y/N	Published Y/N	Vertebrate Study Y/N	Data Protection Claimed Y/N	Data Owner	Report No. / Study ID	Report Date	Dow AgroSciences Report No	Ref.
5.10.2/33	n/a 98/8 specific	Binker, G., Binker, J., Fröba, G., Franke, P. and Ultsch, R.	Field study on *Anobium punctatum* Number: MBP 548 1317/20. Unpublished.	Binker Materialschutz, Germany	Y	N	N	Y (ii)	D	33	2001	None	Z33
5.10.2/34	n/a 98/8 specific	Binker, G., Binker, J., Fröba, G., Franke, P. and Ultsch, R.	Field study on *Anobium punctatum* Number: MBP 548 1317/32. Unpublished.	Binker Materialschutz, Germany	Y	N	N	Y (ii)	D	34	2001	None	Z34
5.10.2/35	n/a 98/8 specific	Binker, G., Binker, J., Fröba, G., Franke, P. and Ultsch, R.	Field study on *Anobium punctatum* Number: LBM 540 1336/30. Unpublished.	Binker Materialschutz, Germany	Y	N	N	Y (ii)	D	35	2000	None	Z35
5.10.2/36	n/a 98/8 specific	Binker, G., Binker, J., Fröba, G., Franke, P. and Ultsch, R.	Field study on *Anobium punctatum* Number: LBM 540 1336/37. Unpublished.	Binker Materialschutz, Germany	Y	N	N	Y (ii)	D	36	2000	None	Z36
5.10.2/37	n/a 98/8 specific	Binker, G., Binker, J., Fröba, G. and Franke, P.	Laboratory study on *Anobium punctatum* Number: 121.08.1998 No.1. Unpublished.	Binker Materialschutz, Germany	Y	N	N	Y (ii)	D	37	1998	None	Z37

98/8 Section Number (IIIB)	91/414 Annex Section	Author	Title	Laboratory	GLP/GEP Study Y/N	Published Y/N	Vertebrate Study Y/N	Data Protection Claimed Y/N	Data Owner	Report No. / Study ID	Report Date	Dow AgroSciences Report No	Ref.
5.10.2/38	n/a 98/8 specific	Binker, G., Binker, J., Fröba, G. and Franke, P.	Laboratory study on *Anobium punctatum* Number: 121.08.1998 No.2. Unpublished.	Binker Materialschutz, Germany	Y	N	N	Y (ii)	D	38	1998	None	Z38
5.10.2/39	n/a 98/8 specific	Binker, G., Binker, J., Fröba, G. and Franke, P.	Laboratory study on *Anobium punctatum* Number: 121.08.1998 No.3. Unpublished.	Binker Materialschutz, Germany	Y	N	N	Y (ii)	D	39	1998	None	Z39
5.10.2/40	n/a 98/8 specific	Binker, G., Binker, J., Fröba, G. and Franke, P.	Laboratory study on *Anobium punctatum* Number: 121.08.1998 No.4. Unpublished.	Binker Materialschutz, Germany	Y	N	N	Y (ii)	D	40	1998	None	Z40
5.10.2/41	n/a 98/8 specific	Binker, G., Binker, J., Fröba, G. and Franke, P.	Field study on *Anobium punctatum* Number: 111.05.1997. Unpublished.	Binker Materialschutz, Germany	Y	N	N	Y (ii)	D	41	1997	None	Z41
5.11	n/a	Prabhakaran, S.K. and Ray, S.	ProFume Resistance Risk Analysis (Sequential Quantitative Resistance Model)	Dow AgroSciences, Mooresville, USA	N	N	N	Y (ii)	D	None	December 2002	None	Z42

2. List of Studies Sorted by Author

98/8 Section Number III-B	91/414 Annex Section	**Author**	Title	Laboratory	GLP/GEP Study Y/N	Published Y/N	Vertebrate Study Y/N	Data Protection Claimed Y/N	Data Owner	Report No. / Study ID	Report Date	Dow AgroSciences Report No	Ref.
5.10.2/37	n/a 98/8 specific	Binker, G., Binker, J., Fröba, G. and Franke, P.	Laboratory study on *Anobium punctatum* Number: 121.08.1998 No.1. Unpublished.	Binker Materialschutz, Germany	Y	N	N	Y (ii)	D	37	1998	None	Z37
5.10.2/38	n/a 98/8 specific	Binker, G., Binker, J., Fröba, G. and Franke, P.	Laboratory study on *Anobium punctatum* Number: 121.08.1998 No.2. Unpublished.	Binker Materialschutz, Germany	Y	N	N	Y (ii)	D	38	1998	None	Z38
5.10.2/39	n/a 98/8 specific	Binker, G., Binker, J., Fröba, G. and Franke, P.	Laboratory study on *Anobium punctatum* Number: 121.08.1998 No.3. Unpublished.	Binker Materialschutz, Germany	Y	N	N	Y (ii)	D	39	1998	None	Z39
5.10.2/40	n/a 98/8 specific	Binker, G., Binker, J., Fröba, G. and Franke, P.	Laboratory study on *Anobium punctatum* Number: 121.08.1998 No.4. Unpublished.	Binker Materialschutz, Germany	Y	N	N	Y (ii)	D	40	1998	None	Z40

98/8 Section Number III-B	91/414 Annex Section	**Author**	Title	Laboratory	GLP/GEP Study Y/N	Published Y/N	Vertebrate Study Y/N	Data Protection Claimed Y/N	Data Owner	Report No. / Study ID	Report Date	Dow AgroSciences Report No	Ref.
5.10.2/41	n/a 98/8 specific	Binker, G., Binker, J., Fröba, G. and Franke, P.	Field study on *Anobium punctatum* Number: 111.05.1997. Unpublished.	Binker Materialschutz, Germany	Y	N	N	Y (ii)	D	41	1997	None	Z41
5.10.2/31	n/a 98/8 specific	Binker, G., Binker, J., Fröba, G., Franke, P. and Ultsch, R.	Field study on *Anobium punctatum* Number: LBM 541 1320/113. Unpublished.	Binker Materialschutz, Germany	Y	N	N	Y (ii)	D	31	2001	None	Z31
5.10.2/32	n/a 98/8 specific	Binker, G., Binker, J., Fröba, G., Franke, P. and Ultsch, R.	Field study on *Anobium punctatum* Number: LBM 541 1320/116. Unpublished.	Binker Materialschutz, Germany	Y	N	N	Y (ii)	D	32	2001	None	Z32
5.10.2/33	n/a 98/8 specific	Binker, G., Binker, J., Fröba, G., Franke, P. and Ultsch, R.	Field study on *Anobium punctatum* Number: MBP 548 1317/20. Unpublished.	Binker Materialschutz, Germany	Y	N	N	Y (ii)	D	33	2001	None	Z33

98/8 Section Number III-B	91/414 Annex Section	**Author**	Title	Laboratory	GLP/GEP Study Y/N	Published Y/N	Vertebrate Study Y/N	Data Protection Claimed Y/N	Data Owner	Report No. / Study ID	Report Date	Dow AgroSciences Report No	Ref.
5.10.2/34	n/a 98/8 specific	Binker, G., Binker, J., Fröba, G., Franke, P. and Ultsch, R.	Field study on *Anobium punctatum* Number: MBP 548 1317/32. Unpublished.	Binker Materialschutz, Germany	Y	N	N	Y (ii)	D	34	2001	None	Z34
5.10.2/35	n/a 98/8 specific	Binker, G., Binker, J., Fröba, G., Franke, P. and Ultsch, R.	Field study on *Anobium punctatum* Number: LBM 540 1336/30. Unpublished.	Binker Materialschutz, Germany	Y	N	N	Y (ii)	D	35	2000	None	Z35
5.10.2/36	n/a 98/8 specific	Binker, G., Binker, J., Fröba, G., Franke, P. and Ultsch, R.	Field study on *Anobium punctatum* Number: LBM 540 1336/37. Unpublished.	Binker Materialschutz, Germany	Y	N	N	Y (ii)	D	36	2000	None	Z36
5.10.2/11	n/a 98/8 specific	Binker, G., Binker, J., Fröba, G., Graf, E., and Lanz, B.	Laboratory study on *Anobium punctatum* Number: 121641. Unpublished.	Binker Materialschutz, Germany	Y	N	N	Y (ii)	D	11	1995	None	Z11

98/8 Section Number III-B	91/414 Annex Section	**Author**	Title	Laboratory	GLP/GEP Study Y/N	Published Y/N	Vertebrate Study Y/N	Data Protection Claimed Y/N	Data Owner	Report No. / Study ID	Report Date	Dow AgroSciences Report No	Ref.
5.10.2/12	n/a 98/8 specific	Binker, G., Binker, J., Fröba, G., Graf, E., and Lanz, B.	Field study on *Anobium punctatum* Number: 123418/B and 123418/D. Unpublished.	Binker Materialschutz, Germany	Y	N	N	Y (ii)	D	12	1996	None	Z12
5.10.2/13	n/a 98/8 specific	Binker, G., Binker, J., Fröba, G., Graf, E., and Lanz, B.	Field study on *Anobium punctatum* Number: 123418/C and 123418/D. Unpublished.	Binker Materialschutz, Germany	Y	N	N	Y (ii)	D	13	1996	None	Z13
5.10.2/14	n/a 98/8 specific	Binker, G., Binker, J., Fröba, G., Graf, E., and Lanz, B.	Laboratory study on *Anobium punctatum* Number: 125749/C and 125749/E (Bioassay 151 – 160). Unpublished.	Binker Materialschutz, Germany	Y	N	N	Y (ii)	D	14	1997	None	Z14
5.10.2/15	n/a 98/8 specific	Binker, G., Binker, J., Fröba, G., Graf, E., and Lanz, B.	Laboratory study on *Anobium punctatum* Number: 125749/C and 125749/E (Bioassay 161 - 180). Unpublished.	Binker Materialschutz, Germany	Y	N	N	Y (ii)	D	15	1997	None	Z15

98/8 Section Number III-B	91/414 Annex Section	**Author**	Title	Laboratory	GLP/GEP Study Y/N	Published Y/N	Vertebrate Study Y/N	Data Protection Claimed Y/N	Data Owner	Report No. / Study ID	Report Date	Dow AgroSciences Report No	Ref.
5.10.2/16	n/a 98/8 specific	Binker, G., Binker, J., Fröba, G., Graf, E., and Lanz, B.	Laboratory study on *Anobium punctatum* Number: 125749/C and 125749/E (Bioassay 181 – 200). Unpublished.	Binker Materialschutz, Germany	Y	N	N	Y (ii)	D	16	1997	None	Z16
5.10.2/17	n/a 98/8 specific	Binker, G., Binker, J., Fröba, G., Graf, E., and Lanz, B.	Field study on *Anobium punctatum* Number: 402741/A and 402741/B (Bioassay 1 – 60). Unpublished.	Binker Materialschutz, Germany	Y	N	N	Y (ii)	D	17	2000	None	Z17
5.10.2/18	n/a 98/8 specific	Binker, G., Binker, J., Fröba, G., Graf, E., and Lanz, B.	Field study on *Anobium punctatum* Number: 402741/A and 402741/B (Bioassay 61 - 120). Unpublished.	Binker Materialschutz, Germany	Y	N	N	Y (ii)	D	18	2000	None	Z18
5.10.2/19	n/a 98/8 specific	Binker, G., Binker, J., Fröba, G., Graf, E., and Lanz, B.	Laboratory study on *Anobium punctatum* Number: 402741/C and 402741/D (Bioassay 143 - 165). Unpublished.	Binker Materialschutz, Germany	Y	N	N	Y (ii)	D	19	2000	None	Z19

98/8 Section Number III-B	91/414 Annex Section	**Author**	Title	Laboratory	GLP/GEP Study Y/N	Published Y/N	Vertebrate Study Y/N	Data Protection Claimed Y/N	Data Owner	Report No. / Study ID	Report Date	Dow AgroSciences Report No	Ref.
5.10.2/20	n/a 98/8 specific	Binker, G., Binker, J., Fröba, G., Graf, E., and Lanz, B.	Laboratory study on *Anobium punctatum* Number: 402741/C and 402741/D (Bioassay 166 - 188). Unpublished.	Binker Materialschutz, Germany	Y	N	N	Y (ii)	D	20	2000	None	Z20
5.10.2/21	n/a 98/8 specific	Binker, G., Binker, J., Fröba, G., Graf, E., and Lanz, B.	Laboratory study on *Anobium punctatum* Number: 130377/A and 403972 (Bioassay 11 – 15). Unpublished.	Binker Materialschutz, Germany	Y	N	N	Y (ii)	D	21	1999	None	Z21
5.10.2/22	n/a 98/8 specific	Binker, G., Binker, J., Fröba, G., Graf, E., and Lanz, B.	Laboratory study on *Anobium punctatum* Number: 130377/A and 403972 (Bioassay 16 - 20). Unpublished.	Binker Materialschutz, Germany	Y	N	N	Y (ii)	D	22	1999	None	Z22
5.10.2/23	n/a 98/8 specific	Binker, G., Binker, J., Fröba, G., Graf, E., and Lanz, B.	Laboratory study on *Anobium punctatum* Number: 130377/A and 403972 (Bioassay 21 - 25). Unpublished.	Binker Materialschutz, Germany	Y	N	N	Y (ii)	D	23	1999	None	Z23

98/8 Section Number III-B	91/414 Annex Section	**Author**	Title	Laboratory	GLP/GEP Study Y/N	Published Y/N	Vertebrate Study Y/N	Data Protection Claimed Y/N	Data Owner	Report No. / Study ID	Report Date	Dow AgroSciences Report No	Ref.
5.10.2/24	n/a 98/8 specific	Binker, G., Binker, J., Fröba, G., Graf, E., and Lanz, B.	Laboratory study on *Anobium punctatum* Number: 130377/A and 403972 (Bioassay 26 - 30). Unpublished.	Binker Materialschutz, Germany	Y	N	N	Y (ii)	D	24	1999	None	Z24
5.10.2/25	n/a 98/8 specific	Binker, G., Binker, J., Fröba, G., Graf, E., and Lanz, B.	Laboratory study on *Anobium punctatum* Number: 130377/A and 403972 (Bioassay 31 - 35). Unpublished.	Binker Materialschutz, Germany	Y	N	N	Y (ii)	D	25	1999	None	Z25
5.10.2/26	n/a 98/8 specific	Binker, G., Binker, J., Fröba, G., Graf, E., and Lanz, B.	Laboratory study on *Anobium punctatum* Number: 130377/A and 403972 (Bioassay 36 - 40). Unpublished.	Binker Materialschutz, Germany	Y	N	N	Y (ii)	D	26	1999	None	Z26
5.10.2/27	n/a 98/8 specific	Binker, G., Binker, J., Fröba, G., Graf, E., and Lanz, B.	Laboratory study on *Anobium punctatum* Number: 130377/A and 403972 (Bioassay 41 - 45). Unpublished.	Binker Materialschutz, Germany	Y	N	N	Y (ii)	D	27	1999	None	Z27

98/8 Section Number III-B	91/414 Annex Section	**Author**	Title	Laboratory	GLP/GEP Study Y/N	Published Y/N	Vertebrate Study Y/N	Data Protection Claimed Y/N	Data Owner	Report No. / Study ID	Report Date	Dow AgroSciences Report No	Ref.
5.10.2/28	n/a 98/8 specific	Binker, G., Binker, J., Fröba, G., Graf, E., and Lanz, B.	Laboratory study on *Anobium punctatum* Number: 130377/A and 403972 (Bioassay 46 - 50). Unpublished.	Binker Materialschutz, Germany	Y	N	N	Y (ii)	D	28	1999	None	Z28
5.10.2/29	n/a 98/8 specific	Binker, G., Binker, J., Fröba, G., Graf, E., and Lanz, B.	Laboratory study on *Anobium punctatum* Number: 130377/A and 403972 (Bioassay 51 - 55). Unpublished.	Binker Materialschutz, Germany	Y	N	N	Y (ii)	D	29	1999	None	Z29
5.10.2/30	n/a 98/8 specific	Binker, G., Binker, J., Fröba, G., Graf, E., and Lanz, B.	Laboratory study on *Anobium punctatum* Number: 130377/A and 403972 (Bioassay 56 - 60). Unpublished.	Binker Materialschutz, Germany	Y	N	N	Y (ii)	D	30	1999	None	Z30

98/8 Section Number III-B	91/414 Annex Section	**Author**	Title	Laboratory	GLP/GEP Study Y/N	Published Y/N	Vertebrate Study Y/N	Data Protection Claimed Y/N	Data Owner	Report No. / Study ID	Report Date	Dow AgroSciences Report No	Ref.
5.10.2/08	n/a 98/8 specific	Ducom, P., Roussel, C., and Stefanini, V.	Efficacy of sulfuryl fluoride on European house borer eggs, Hylotrupes bajulus (L.) (Coleoptera; Cerambycidae).	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.	Y	N	N	Y (ii)	D	08	2003	None	Z8

98/8 Section Number III-B	91/414 Annex Section	**Author**	Title	Laboratory	GLP/GEP Study Y/N	Published Y/N	Vertebrate Study Y/N	Data Protection Claimed Y/N	Data Owner	Report No. / Study ID	Report Date	Dow AgroSciences Report No	Ref.
5.10.2/06	n/a 98/8 specific	Dwinell, L.D., Thoms, E., and Prabhakaran, S.	Exploratory research on sulfuryl fluoride fumigation to eradicate the pine wood nematode in unseasoned pine lumber.	Annual International Research Conference on Methyl Bromide Alternatives and Emission Reduction, 2003, San Diego, California, USA.	N	Y	N	N	P	06	2003	None	Z6
5.10.2/04	n/a 98/8 specific	La Fage, J.P., Jones, M., and Lawrence, T	A laboratory evaluation of the fumigant, sulfuryl fluoride (Vikane), against the Formosan termite *Coptotermes formosanus* Shiraki.	Publication: The International Research Group on Wood Preservation, Thirteenth Annual Meeting, May 1982. IRG Secretariat Drottning Kristinas väg 47C, S – 11428 Stockholm, Sweden.	N	Y	N	N	P	04	1982	None	Z4

98/8 Section Number III-B	91/414 Annex Section	**Author**	Title	Laboratory	GLP/GEP Study Y/N	Published Y/N	Vertebrate Study Y/N	Data Protection Claimed Y/N	Data Owner	Report No. / Study ID	Report Date	Dow AgroSciences Report No	Ref.
5.10.2/01	n/a 98/8 specific	Osbrink, W.L.A., Scheffrahn, R.H., Su, N-Y., and Rust, M.K.	Laboratory comparisons of sulfuryl fluoride toxicity and mean time of mortality among ten termite species (Isoptera: Hodotermitidae, Kalotermitidae, Rhinotermitidae).	Publication: Journal of Economic Entomology Volume 80, pages 1044 – 1047.	N	Y	N	N	P	01	1987	None	Z1
5.11	n/a	Prabhakaran, S.K. and Ray, S.	ProFume Resistance Risk Analysis (Sequential Quantitative Resistance Model)	Dow AgroSciences, Mooresville, USA	N	N	N	Y (ii)	D	None	December 2002	None	Z42
5.10.2/05	n/a 98/8 specific	Soma, Y., Naito, H., Misumi, T., Mizobuchi, m., Tsuchiya, Y., Matsuoka, I., Kawakami, F., Hirata, K., and Komatsu., H.	Effects of some fumigants on pine wood nematode, *Buraphelenchus xylophilus*, infecting wooden packages. Susceptibility of pine wood nematode to methyl bromide, sulfuryl fluoride and methyl isothiocyanate.	Publication: Research Bulletin Plant Protection, Japan, 2001, Number 37, pages 19 – 26.	N	Y	N	N	P	05	2001	None	Z5

98/8 Section Number III-B	91/414 Annex Section	**Author**	Title	Laboratory	GLP/GEP Study Y/N	Published Y/N	Vertebrate Study Y/N	Data Protection Claimed Y/N	Data Owner	Report No. / Study ID	Report Date	Dow AgroSciences Report No	Ref.
5.10.2/02	n/a 98/8 specific	Su, N-Y., Osbrink, W.L.A., and Scheffrahn, R.H.	Concentration-time relationship for fumigant efficacy of sulfuryl fluoride against the Formosan subterranean termite (Isoptera: Rhinotermitidae).	Publication: Journal of Economic Entomology Volume 82, pages 156 – 158.	N	Y	N	N	P	02	1989	None	Z2
5.10.2/03	n/a 98/8 specific	Su, N-Y., and Scheffrahn, R.H.	Field comparison of sulfuryl fluoride susceptibility among three termite species (Isoptera: Kalotermitidae, Rhinotermitidae) during structural fumigation.	Publication: Journal of Economic Entomology Volume 79, pages 903 – 908.	N	Y	N	N	P	03	1986	None	Z3
5.10.2/09	n/a 98/8 specific	Su, N-y., and Scheffrahn, R.H.	Efficacy of sulfuryl fluoride against four beetle pests of museums (Coleoptera: Dermestidae, Anobiidae).	Publication: Journal of Economic Entomology Volume 83, pages 879 – 882.	N	Y	N	N	P	09	1990	None	Z9
5.10.2/07	n/a 98/8 specific	Verheyen, H.	Investigatory studies on the ovicidal effect of a fumigant on dry wood insect pests.	Fachhochschule, Eberswalde, Germany. Student Research Project	Y	N	N	Y (ii)	D	07	2002	None	Z7

98/8 Section Number III-B	91/414 Annex Section	**Author**	Title	Laboratory	GLP/GEP Study Y/N	Published Y/N	Vertebrate Study Y/N	Data Protection Claimed Y/N	Data Owner	Report No. / Study ID	Report Date	Dow AgroSciences Report No	Ref.
5.10.2/10	n/a 98/8 specific	Williams, L.H., and Sprenkel, R.J.	Ovicidal activity of sulfuryl fluoride to Anobiid and Lyctid beetle eggs of various ages.	Publication: Journal of Entomological Science, Volume 25(3), pages 366 – 375.	N	Y	N	N	P	10	1990	None	Z10