Asbestos in some types of marble and other stone: assessing the risk

Introduction

This information sheet is for those supplying, working with, or using marble or other natural stone products It provides an overview of naturally occurring asbestos in such products including:

- the risk to health;
- the actions you should take to comply with the law;
- a staged approach to identifying any possible naturally occurring asbestos content.

A summarised case study in Appendix 1, investigating various sources of faintly-veined white marble, concluded that the marble contained insignificant amounts of asbestos. The marble would not therefore be classified as asbestos-containing material (ACM) and would have an extremely low potential for asbestos risk.

Note: The principles in this document regarding investigation of the presence of asbestos can be applied to other natural stone types including crushed stone and aggregate.

1. When might asbestos occur naturally in stone and other mineral products?

Asbestos is the general term for the fibrous minerals chrysotile, amosite, crocidolite, anthophyllite, tremolite and actinolite. Certain rocks and minerals can occasionally contain small amounts of naturally occurring asbestos.

These materials include some sources of dolomite, basalt, marble (including green marbles or ‘Verde’ stones) and vermiculite. This natural asbestos occurs in some geological environments due to the specific chemical composition and the geological processes involved

The same minerals can occur in a non-fibrous form and be mistaken for asbestos without suitable laboratory analysis.

2. Is this asbestos a risk to health?

The potential risk depends on the quantity of asbestos in the material and the extent to which asbestos fibres will be released into the air if the material is

disturbed or degraded. Breathing in asbestos fibres in sufficient quantity can cause long-term serious disease.

Quantity of asbestos

The risk from asbestos fibres within stone is generally considered to be **negligible when they are present at 'trace' levels.**

Trace levels are defined as detecting the presence of only 'one or two fibres' during the analysis of bulk materials for asbestos by the recognised polarised light microscopy (PLM) method. The method is published in the HSE publication *Asbestos: The analyst's guide for sampling, analysis and clearance procedures* (HSG248).

Release of asbestos

If a stone product is found to have asbestos present above trace levels, this does not necessarily mean there is a significant risk. The asbestos is locked in the stone and can only be released where the stone is subjected to processes or actions that cause damage or degradation such as cutting and grinding.

The more destructive and energetic these processes, the greater the potential for fibre release. **Significant release** usually only occurs in other situations particularly from asbestos manufactured products such as insulation and boards which contain high proportions of asbestos.

3. Actions you may need to take

Importing and supplying raw stone

You should determine whether naturally occurring asbestos is present above trace levels or not. This can be done by checking a petrographic examination report for the stone to see whether the mineral composition suggests the presence of potential asbestos minerals, ie chrysotile, amosite, crocidolite, anthophyllite, tremolite or actinolite.

If any of these minerals are present, follow the stepped analytical approach described in Appendix 1 to determine whether they are present in a fibrous form that would be classed as asbestos and, if so, whether they are present above trace levels as a proportion of the stone.

If the stone contains more than trace levels of confirmed asbestos, then the Control of Asbestos Regulations 2012 (CAR2012) will apply to work with that material. Alternatively, you may wish to consider using a different stone.

Further actions:

- Ensure that the analysis information is provided to customers.
- Ensure that samples analysed are representative of the products being supplied.

- If there is any doubt regarding the accuracy of the petrographic examination report, further testing may be required.

Supplying stone or working stone

Obtain and check the petrographic examination report for the stone to see whether the composition suggests the presence of potential asbestos minerals.

If any of the potential asbestos minerals are present, follow the stepped analytical approach described in Appendix 1 to determine whether they are confirmed as asbestos above trace levels.

If the stone contains more than trace levels of confirmed asbestos, then CAR2012 will apply to work with that material. Alternatively, you could consider using a different stone.

Further actions:

- Retain information for subsequent provision along with the finished product.
- Dust from stone products (including respirable crystalline silica) will still need to be properly controlled as required by the Control of Substances Hazardous to Health Regulations 2002 Regulations (COSHH) even if no asbestos is present.
- If there is any doubt regarding the accuracy of the petrographic examination report further testing may be required.

Selecting, specifying or working with finished stone products in buildings etc

Obtain the analysis information outlined above.

If the stone contains more than trace levels of confirmed asbestos, then CAR2012 will apply to work with that material. Alternatively, you could consider using a different stone.

Further actions:

- Retain relevant information as part of the health and safety file.
- Plan, manage and control your work as required by the COSHH Regulations.

Maintenance work

The asbestos component of any dust will be insignificant where there are only trace levels present in the stone.

Further actions:

- Other constituents may be more significant, eg crystalline silica.
- Plan, manage and control your work as required by the COSHH Regulations.

Using stone products in your home or your building

This is extremely unlikely to present a risk. Stone products are stable. If any asbestos fibres were present these would not be released during normal use.

Fibre release would only potentially occur when using power tools and fine dust is being produced. A competent contractor using the right dust controls should control any residual risk to you that might exist.

There is no requirement for marble or other stone to be removed.

Potential risks from other marble types

Marble products have been used for centuries and are relatively common in many types of premises and buildings, eg churches, theatres, public buildings, offices, homes etc.

Based on the case study results (see Appendix 2), it is reasonable to presume that other marble types/sources are also likely to present an insignificant asbestos risk from normal use or occupancy situations.

There is no requirement for marble to be removed.

4. How do I know if any asbestos content is above trace level?

It is the responsibility of the importer, supplier or manufacturer as appropriate to determine if any asbestos content of the stone is above trace level. The check can be made through the stepped analytical approach outlined in detail in Appendix 1, which also includes a flowchart to help explain the process.

5. What health and safety legislation applies?

Health and Safety at Work etc Act 1974 (HSW)

Section 6 places general duties in relation to articles and substances. Quarried stone is defined as a substance and any importer or supplier of quarried stone should therefore ensure that, so far as is reasonably practicable, the substance is safe and without risks to health when being used, handled, processed, stored or transported by a person at work.

They should also provide adequate information along the supply chain about any health or safety risks from the inherent properties of the substance. This will include those situations where naturally occurring asbestos is present in quantities above trace levels.

Control of Asbestos Regulations 2012 (CAR2012)

These regulations set out an employer's responsibilities for work with asbestos containing materials and would include stone materials where the asbestos content is found to be above trace levels. These responsibilities include:

- assessing the risks;
- having a suitable plan detailing how the work is to be carried out;
- preventing exposure to asbestos for workers or, where this is not possible, putting in place the measures and controls necessary to reduce exposure to as low as is reasonably practicable;
- preventing the spread of asbestos.

Construction (Design and Management) Regulations 2015 (CDM)

Designers must eliminate, reduce or control foreseeable health and safety risks through the design process, such as those that may arise during construction work or in maintaining and using the building once it is built. This includes making informed decisions about the materials used and any risks associated with such materials.

Any relevant information should be included in the project's health and safety file and should be taken into account when planning and carrying out subsequent work.

Control of Substances Hazardous to Health Regulations 2002 (COSHH)

Where asbestos is found to be present at trace levels or below, the normal control measures used for work with natural stone are still required under the COSHH Regulations.

Hazardous materials within the stone may include crystalline silica. This will require engineering controls such as water suppression or local exhaust ventilation (LEV) along with suitable respiratory protective equipment (RPE) to control respirable dust generated during work. Health surveillance may also be required.

Legislation that is unlikely to apply

The restriction for asbestos under the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) does not apply as the asbestos is naturally present in the stone and has not been 'intentionally added'.

Such products are not expected to meet the criteria for classification under the Classification, Labelling and Packaging Regulations (CLP) either.

Appendix 1: Stepped analytical approach to determine if asbestos is present in stone above trace levels

Step 1: Petrographic analysis

The Construction Products Regulations (CPR) require natural stone to have a declaration of performance (DoP) and CE marking to demonstrate compliance with the relevant harmonised standards as enforced by Trading Standards.

A detailed petrographic examination for the DoP in accordance with BS EN 12407:2007: Natural Stone Test Methods Petrographic Examination may suggest the presence of the minerals chrysotile, amosite, crocidolite, anthophyllite, tremolite and actinolite. Laboratories should take steps to ensure they are analysing representative sample(s).

- **Minerals not detected** – no further action is necessary as any asbestos will be insignificant (see the case study in Appendix 2).
- **Minerals are identified** –carry out further investigation before using the stone, to establish if the minerals are present in asbestiform. Step 2 analysis should be conducted. Alternatively, you could use a replacement marble or stone product.

If there is any doubt regarding the result of the petrographic analysis, or on the presence of asbestos (eg from information from other sources), further testing should be conducted, eg by a UKAS-accredited laboratory – see https://www.ukas.com/search-accredited-organisations/

Before selecting a laboratory, consider their experience in carrying out the method(s) of testing as described in Steps 2 and 3.

Step 2: Stereo-binocular microscopy followed by polarised light microscopy (PLM)

This analysis should determine whether any of the minerals are present in a fibrous form that would be classed as asbestos and, if so, whether the amount is above ‘trace’ levels (see Section 2: ‘Is this asbestos a risk to health?’). The possible outcomes of this analysis and consequent actions are summarised below:

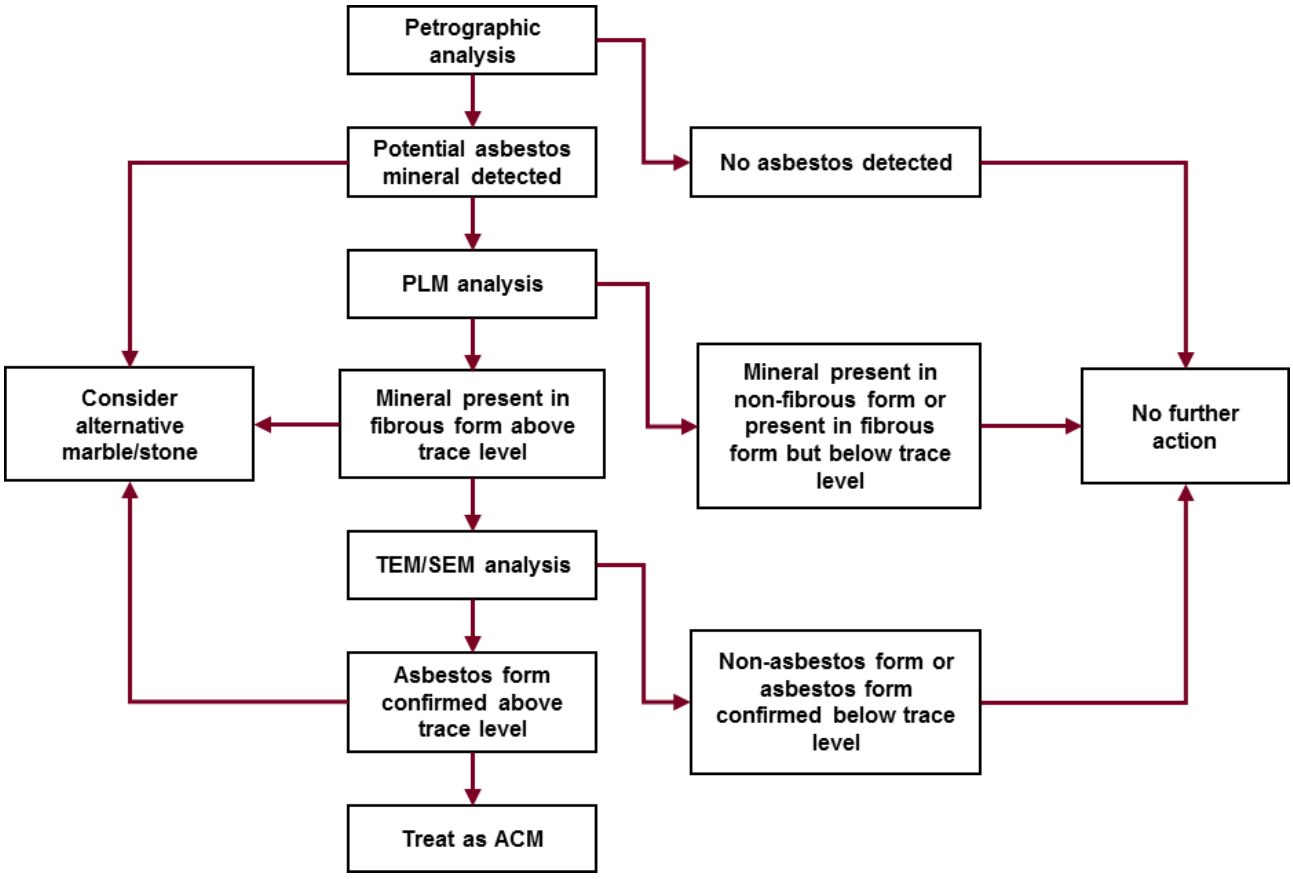
- **The mineral is present in non-fibrous form**: no further action.
- **The mineral is present in fibrous form but below trace level**: no further action.
- **The mineral is present in fibrous form and above trace level**: further detailed analysis (as outlined in Step 3) will be required to precisely determine whether any fibres present can be identified as asbestos and whether the identified asbestos is present at or above trace levels. Alternatively, you could source a replacement marble or stone product.

Step 3: Further detailed analysis by electron microscopy

This can be carried out either through transmission electron microscopy (TEM) with elemental analysis by energy dispersive X-ray spectroscopy (EDX) and crystal structure determined by selected area electron diffraction (SAED) or scanning electron microscopy (SEM) with EDX.

These specialist analytical methods will conclusively identify asbestiforms of the minerals. Only a small number of laboratories have accreditation for this work.

The stepped approach is summarised in the flowchart below.



Appendix 2: Case study

Condition of marble

Faintly-veined white marble, believed to originate from Africa, was used as a finishing material in new residential accommodation. Before and after property handover, faults and imperfections (cracking along the 'vein' fault lines in the stone) were identified in some of the marble products.

Tests

Petrographic tests were conducted to try and establish the reason for this cracking. The possible presence of asbestos in the marble was identified as part of technical tests. The tests identified that the marble contained tremolite* (an amphibole mineral that can occur in non-asbestiform and occasionally asbestiform) in the vein material.

Marble is used extensively in the construction sector, so further tests were therefore carried out on 20 samples of faintly-veined white marble from different sources including suppliers, end-users and testing laboratories. Some samples were believed to originate from Africa, others had no identification.

***Note**: Tremolite occurs widely and, in rare circumstances (particular geological conditions), it has been formed with an asbestos morphology (usually in veins). It is important to note this distinction between asbestiform and non-asbestiform varieties of tremolite. Accordingly, not all tremolite is classified as asbestos. The authoritative definition used in *Asbestos: The analysts guide for sampling, analysis and clearance procedures* (HSG248) has been used in this analysis work.

Analysis

The stepped analytical approach outlined in Appendix 1 was used to determine whether any natural asbestos content was present and whether the content was above trace level.

Results

General:

The tests revealed that asbestiform tremolite was found almost exclusively in the vein material.

Polarised light microscopy (PLM):

The majority of fibres were classified as elongated cleavage fragments (ie not an asbestiform of tremolite). The proportion of asbestos fibres in the vein material was estimated to be low, around trace levels, using the criteria specified in HSG248.

Transmission electron microscopy (TEM):

Fibres identified as tremolite asbestos were detected in nine of the eleven samples of vein material analysed by TEM/EDX (energy dispersive X-ray spectroscopy). However, most of the fibres were short fibres and would not meet the hazardous fibre size classification if they became airborne.

Quantitative assessment:

Analysis using XRD (X-ray diffraction) established that around 1.1% of the material was tremolite. However, TEM analysis showed that the tremolite asbestos concentration was around 0.00004% of the original bulk material. The material would therefore not be classified as an asbestos-containing material (ACM).

Conclusions

While tremolite asbestos fibres were positively identified in the majority of marble samples analysed, the proportion of asbestos fibres in the vein material was low, around trace levels as defined in HSG248. Also, the vein material (although variable) only represents a small proportion of the overall marble product.

The quantity of asbestos fibre identified in the marble investigated is extremely low (less than trace in a minor constituent and only around 0.00004% of the original material). Therefore, the marble would **not** be classified as an ACM under CAR2012.

Further reading

Asbestos: The analyst's guide for sampling, analysis and clearance procedures (HSG248) HSE Books www.hse.gov.uk/pubns/books/hsg248.htm

Managing and working with asbestos (L143) HSE Books www.hse.gov.uk/pubns/books/l143.htm

Control of Substances Hazardous to Health Regulations 2002. Approved Code of Practice and Guidance (L5) HSE Books www.hse.gov.uk/pubns/books/l5.htm

The Construction Products Regulations 2013 and Approved Document 7 (2013 edition)

https://www.gov.uk/government/publications/the-construction-products-regulations-2013-and-approved-document-7-2013-edition

Further information

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