

National Occupational Health and Safety Commission

SYNTHETIC MINERAL FIBRES

**National Standard
for Synthetic Mineral Fibres
[NOHSC:1004(1990)]**

**National Code of Practice
for the Safe Use of Synthetic Mineral Fibres
[NOHSC:2006(1990)]**

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FOREWORD

The National Occupational Health and Safety Commission (NOHSC) is a tripartite body established by the Commonwealth Government to develop, facilitate and implement a national occupational health and safety strategy.

This strategy includes standards development, the development of hazard-specific preventive strategies, research, training, information collection and dissemination, and the development of common approaches to occupational health and safety legislation.

The National Commission comprises representatives of the peak employee and employer bodies - the Australian Council of Trade Unions (ACTU) and the Confederation of Australian Industry (CAI) - as well as the Commonwealth, State and Territory governments.

Consistent with the National Commission's philosophy of consultation, tripartite standing committees have been established to deal with issues relating to standards development and research. Expert groups may be established to provide advice to standing committees on those issues with which the National Commission is concerned.

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PREFACE

Synthetic mineral fibres (SMF) is a generic term used to collectively describe a number of amorphous (non-crystalline) fibrous materials including glassfibre, mineral wool and ceramic fibre. Much of the international literature refers to SMF as 'Man Made Mineral Fibres' (MMMMF).

Glassfibre and mineral wool have been used for many decades. The major application of SMF materials is in thermal and acoustic insulation, and as a reinforcing agent.

In some specialised instances, these materials have been used as a replacement for asbestos, especially where high temperature insulation properties are required. Ceramic fibre has also been used to replace refractory brick and mortar materials.

Because of their similar application and appearance to asbestos, there has been some concern in the community regarding the health effects associated with exposure to SMF. Responding to this concern, the National Occupational Health and Safety Commission, at its tenth meeting on 29 February - 1 March 1988, established a State-based (expert) working group under the Standards Development Standing Committee (SDSC). The SMF Working Group was asked to investigate typical levels of exposure associated with various manufacturing and user processes, possible health effects and, based upon collected information, recommend exposure standards and appropriate safe working practices. A copy of the SMF Working Group's report¹ may be obtained from the Commonwealth Government Bookshops.

Following consideration of the Working Group's recommendations by the SDSC, a tripartite code of practice for the safe use of synthetic mineral fibres was developed. This draft code of practice was accompanied by three schedules which detailed specific work practices for glasswool, rockwool and ceramic fibres. The draft code of practice, schedules and the report of the SMF Working Group were then forwarded to the National Commission for consideration and possible declaration.

Acknowledging that there are diverse opinions within the community on an approach to SMF, the National Commission, at its fifteenth meeting on 8 March 1989, agreed to release the draft code of practice and schedules for public comment, and, having considered the social and economic implications of the report of the SMF Working Group, recommended that, for the purposes of public comment, a time-weighted average (TWA) national (exposure) standard of 0.5 respirable fibres per millilitre of air (f/mL) should be proposed for all forms of SMF.

Submissions received during the public comment period were assessed by the SMF Working Group and the SDSC and a number of changes were made to the draft national standard and national code of practice.

The National Commission, having considered public comment on the draft document, now declares a final *National Standard for the Safe Use of Synthetic Mineral Fibres* [NOHSC:1004(1990)] and a final *National Code of Practice for the Safe Use of Synthetic Mineral Fibres* [NOHSC:2006(1990)] under s.38 (1) of the *National Occupational Health and Safety Commission Act 1985* (Cwlth).

The standard proposed for respirable fibres will be subject to review within two years.

1. National Occupational Health and Safety Commission, 'Technical Report on Synthetic Mineral Fibres' in *Technical Report on Synthetic Mineral Fibres and Guidance Note on the Membrane Filter Method for the Estimation of Airborne Synthetic Mineral Fibres*, Australian Government Publishing Service, Canberra, 1989.

Note:

The readers' attention is drawn to the following changes that have occurred to referenced documents since the national standard and national code of practice were declared:

The SMF national code of practice refers to Australian Standards AS 1715 *Selection Use and Maintenance of Respiratory Protective Devices*, and AS 1716 *Respiratory Protective Devices*. These standards were revised in 1991 and now use the generic term "filters" to replace the original terms "filters, cartridges and canisters". They also now use "Class P1, P2 and P3 respirators" rather than Class "L, M and H respirators" respectively. These changes are nomenclature changes and not changes in the type of filters.

The national code of practice also refers to the National Commission guidance notes on labelling and Material Safety Data Sheets. These guidance notes have been amended and subsequently declared as national codes of practice. Details of these national codes of practice are as follows:

- ***National Code of Practice for the Labelling of Workplace Substances* [NOHSC:2012(1994)], Australian Government Publishing Service, Canberra, 1994; and**
- ***National Code of Practice for the Preparation of Material Safety Data Sheets* [NOHSC:2011(1994)], Australian Government Publishing Service, Canberra, 1994.**

**NATIONAL STANDARD
FOR
SYNTHETIC MINERAL FIBRES
[NOHSC:1004(1990)]**

NATIONAL STANDARD FOR SYNTHETIC MINERAL FIBRES

1.1 The National Commission has declared that a time-weighted average (TWA) exposure standard of 0.5 respirable fibres per millilitre of air (f/mL) should be applied to all forms of synthetic mineral fibres. The airborne concentration of respirable fibres shall be determined in accordance with the National Commission's *Membrane Filter Method for the Estimation of Airborne Synthetic Mineral Fibres*¹.

1.2 In addition, in situations where almost all the airborne material is fibrous, a secondary, yet complementary, exposure standard of 2 mg/m³ (TWA) of inspirable dust shall be applied to minimise upper respiratory tract irritation from largely non-respirable fibre. This inspirable standard is not to take precedence over the respirable fibre standard.

1.3 The airborne concentration of inspirable fibrous dust shall be determined in accordance with Australian Standard AS 3640².

1.4 The standard proposed for respirable fibres will be subject to review within two years.

1. National Occupational Health and Safety Commission, 'Guidance Note on the Membrane Filter Method for the Estimation of Airborne Synthetic Mineral Fibres' in *Technical Report on Synthetic Mineral Fibres and Guidance Note on the Membrane Filter Method for the Estimation of Airborne Synthetic Mineral Fibres*, AGPS, Canberra, 1989.

2. Standards Australia, AS 3640 *Workplace Atmospheres - Methods for Sampling and Gravimetric Determination of Inspirable Dust*, Standards Australia, Sydney.

**NATIONAL CODE OF PRACTICE
FOR THE SAFE USE OF
SYNTHETIC MINERAL FIBRES
[NOHSC:2006(1990)]**

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1. TITLE

1.1 This national code of practice may be cited as the *National Code of Practice for the Safe Use of Synthetic Mineral Fibres*.

2. PURPOSE

2.1 The purpose of this *National Code of Practice for the Safe Use of Synthetic Mineral Fibres* is to provide a safe and healthy workplace by outlining safe work practices and general responsibilities when handling synthetic mineral fibres (SMF). Compliance with this should eliminate or control the level of respirable SMF fibres in the atmosphere. This national code of practice provides the basis for the specific schedules which are attached.

2.2 This document is based on the two main principles that:

- (a) there are general provisions which are applicable in all SMF applications and these are set out in this national code of practice; and
- (b) detailed provisions relating to the use of specific materials in the workplace can be provided through schedules to this national code of practice.

2.3 The application of this national code of practice is designed to ensure that actual exposure should not exceed 0.5 respirable f/mL.

3. SCOPE

3.1 This national code of practice applies to all applications involving mineral wool (rockwool and slagwool), glasswool (including superfine glassfibre) and ceramic fibres, and activities involving their installation or removal or any related handling or work.

3.2 This national code of practice does not apply to the use of continuous glass filament which is used as a reinforcing agent in industries such as boat building and swimming pools. This product does not produce measurable levels of respirable fibres. The safe working practices for the use of this material require differing approaches to other forms of SMF, due to the associated use of materials such as catalysts and resins.

4. DEFINITIONS

4.1 In this national code of practice, unless the contrary appears:

`Ceramic fibres' are amorphous, glassy, predominantly alumino-silicate materials which are created from molten masses of either alumina and silica or naturally occurring kaolin clays. Australian materials are only made from alumina and silica melts.

`Epidemiology' is the study of the relationships of various factors determining the frequency and distribution of disease in a human community.

An `exposure standard' represents an airborne concentration of a particular substance in the worker's breathing zone, exposure to which, according to current knowledge, should not cause adverse health effects nor cause undue discomfort to nearly all workers. The exposure standard can be in three forms; time-weighted average (TWA), peak, or short term exposure limit.

A `fibre' is a particle with a length to width ratio of at least 3:1.

`Glassfibre' may be either reinforcing filament, glasswool or superfine glassfibre.

`Glass filament', *see Reinforcing filament*.

`Glasswool' is a fibrous product formed by either blowing or spinning a molten mass of glass. The resultant fibres are subsequently collected as an entangled matt of fibrous product.

`Inspirable' is that fraction of dust which enters the respiratory tract as defined in Australian Standard AS 3640¹.

`Material Safety Data Sheets' (MSDS) are documents that describe the properties and uses of a substance, that is, identity, chemical and physical properties, health hazard information, precautions for use and safe handling information.

`Micrometre' (μm) represents one thousandth of a millimetre. A strand of human hair is approximately 50 μm in diameter.

`Mineral wool' is a fibrous product manufactured by the process of blowing or spinning from a molten mass of raw material. The resultant fibres are subsequently collected as an entangled matt of fibrous product. Mineral wool may be either slagwool or rockwool, depending upon the raw material from which it is produced.

`Nominal fibre diameter' is the median diameter to which the fibrous product is manufactured. It may be thought of as the diameter at the midpoint of a long fibre created by joining all the fibres in a sample together in order of increasing thickness.

`Refractory ceramic fibre (RCF)', *see Ceramic fibres*.

`Reinforcing filament' is an extruded filament usually having a relatively large diameter, greater than 6 micrometres, and a very narrow range of diameter distribution. It is typically formed from a glass melt.

`Respirable fibre' is a particle with a diameter less than 3 micrometres and a length greater than 5 micrometres and with a length to width ratio of greater than 3:1. These fibres can reach the deepest part of the lung.

`Rockwool' is a fibrous product manufactured by a process of blowing or spinning from a molten mass of rock. In Australia this is usually basalt. The resultant fibres are subsequently collected as an entangled matt of fibrous product.

`Shall' Indicates that a requirement is mandatory.

`Should' Indicates a recommendation.

`Slagwool' is a fibrous product manufactured by a process of blowing or spinning from a molten mass of metallurgical furnace slag.

`SMF' means synthetic mineral fibres.

`Superfine glassfibre' is an extremely fine fibre with a diameter less than 1 micrometre, usually made of glass for specialist applications.

`TWA' (time-weighted average) is the average airborne concentration of a particular substance over a normal eight-hour working day, for a five-day working week. (*see also Exposure Standard*).

`Workable' encompasses the meaning of `practicable' in Victoria, Queensland, Western Australia and the Northern Territory, `reasonably practicable' in New South Wales, South Australia and the Australian Capital Territory, and a `reasonable precaution' in Tasmania.

5. RESPONSIBILITIES

DUTIES OF MANUFACTURERS

- 5.1** The manufacturing process should be so designed that the lowest workable amount of fibres become airborne. Appropriate professional advice from, for example, an industrial ventilation engineer or occupational hygienist, may be required.
- 5.2** Packaging shall be clearly labelled in accordance with the provisions contained in the National Commission's guidance note on labelling².
- 5.3** Manufacturers shall produce and make available Material Safety Data Sheets (MSDS) for SMF materials, including additives, in the approved National Commission format³.
- 5.4** Manufacturers shall package SMF materials in a form that minimises the release of fibres and/or dust.
- 5.5** Manufacturers shall endeavour to supply SMF materials which emit a minimum amount of fibres and/or dust, especially during cutting and shaping.
- 5.6** Manufacturers shall provide appropriate information to enable the safe use of SMF materials.

DUTIES OF EMPLOYERS

- 5.7** An employer using SMF materials shall, so far as is workable, select materials or product-forms so as to minimise the release of fibres and/or dust.
- 5.8** An employer shall provide appropriate instruction, training and supervision to enable employees to safely perform their tasks.
- 5.9** Employees shall be instructed in safe work practices for handling SMF materials and, where necessary, correct procedures for the selection, wearing and maintenance of personal protective clothing and equipment. The extent of instruction and training shall be appropriate to the duties of the individual within the organisation and be sufficiently detailed to ensure that the individual understands not only the procedural and safety requirements, but also the reasons for these requirements.
- 5.10** Employers shall ensure that they obtain information as to the likely exposure levels that employees may experience with each given task (see Section 6.10). Where monitoring is undertaken to determine exposure levels, such monitoring shall be in accordance with the SMF membrane filter method⁴.
- 5.11** Action shall be taken to apply appropriate control strategies on a continuing basis. The aim of these strategies is to reduce exposure to SMF to the lowest workable levels. Personal protection should not be used to replace other control measures unless these are shown to be inadequate or not workable.
- 5.12** Employers should ensure appropriate site maintenance, follow proper procedures to minimise the creation and spread of fibres and/or dust and ensure that the disposal of SMF waste is carried out in accordance with the requirements of the local waste disposal authority.

DUTIES OF EMPLOYEES

5.13 An employee, while at work, shall take care of, to the degree to which the employee is capable, the employee's own health and safety and the health and safety of any other person who may be affected by the employee's acts or omissions at the workplace.

5.14 An employee shall ensure that work is carried out so as to incorporate the work practices as instructed.

5.15 An employee shall wear, when required, and in the manner instructed, the personal protective equipment which is supplied.

5.16 An employee shall report to the employer and employee representative any observed malfunctions in the work practices.

5.17 An employee shall take part in any jointly agreed instruction or training program provided by the employer.

6. WORK PRACTICES

6.1 There are three main factors which alone, or in combination, largely determine the fibre levels present during specific applications of SMF. These are:

- (a) the degree of disturbance of the product;
- (b) the proportion of respirable fibres in the product; and
- (c) the extent of any binders, cladding or sealants.

6.2 The above-mentioned factors therefore determine the appropriate work practices.

PRE-DELIVERY

6.3 Prior to working with SMF, employers and employees, through their representatives, should consult and agree on the following details to provide acceptable working arrangements:

- (a) the provision of MSDS in the approved National Commission format³;
- (b) usage of the product as defined in the appropriate schedule;
- (c) estimated duration of the SMF work;
- (d) confirmation of site arrangements, for example, training, storage, site processing, personal protective equipment and monitoring, in accordance with this national code of practice and the appropriate schedule; and
- (e) consideration of protection of the health and safety of employees not directly working in the SMF process.

OVERALL STRATEGY

6.4 Action should be taken on a continuing basis to achieve the lowest workable exposure levels to SMF.

6.5 This could be achieved by, for example:

- (a) the provision of engineering controls, such as exhaust ventilation;
- (b) greater attention to plant cleanliness and the containment of waste material;
- (c) where appropriate, the use of materials, for example, binders, or work practices, which reduce the liberation of fibres; and
- (d) the provision of appropriate personal protective equipment.

6.6 Following this national code of practice and the specific schedules will result in fibre levels significantly below the exposure standard of 0.5 f/mL. Monitoring to date has shown that this is the case⁵.

6.7 In addition, in situations where almost all the airborne SMF material is fibrous, a secondary, yet complementary, standard of 2 mg/m³ of inspirable dust should be applied to avoid short term irritation to, for example, the nose and throat, from largely non-respirable fibres. Further detail on the approach to be taken for gravimetric measurements can be found in section 8.2 of the *Technical Report on Synthetic Mineral Fibres*⁵.

6.8 Provided this code of practice is applied, and the specified work practices nominated above are implemented, employees should not be exposed to unsafe conditions nor face any measurable level of risk to health.

AIR SAMPLING

6.9 Where reasonable concern exists over possible respirable fibre concentrations in any application, the first step shall be to confirm that the work practices, as recommended for the particular product in the schedules to the national code of practice, are being followed. Air monitoring is not required when it has been clearly established that the work practices outlined in the schedules are being carried out.

6.10 In the event that establishment of likely respirable fibre levels is still required, then the following steps shall be taken:

- (a) Reference shall be made to available information relating to similar jobs to determine their typical respirable fibre concentration levels. (One source of such information is Chapter 7, 'Levels of Exposure to SMF During End-User Operations', of the National Commission's *Technical Report on Synthetic Mineral Fibres*⁵.)
- (b) Available information shall be checked to determine whether the job has previously been assessed for typical air concentrations.
- (c) While any issues relating to establishing respirable fibre concentrations are being pursued, appropriate respirators shall be worn.
- (d) Where reasonable doubt still exists as to the levels of exposure, monitoring of fibre levels should be undertaken in accordance with accepted practices. Air sampling shall be undertaken by adequately trained personnel in accordance with the SMF membrane filter method⁴.

6.11 The employer should ensure that each employee who works with SMF is kept informed of the results of all monitoring and assessment of exposure. The employer should explain what measures are being undertaken to minimise the risk of excessive SMF exposure where this exists.

6.12 Records of monitoring shall be securely stored by the employer and kept for a period of 30 years.

6.13 Measures of exposure should be determined over a minimum sampling period of 4 hours during which time one or more consecutive samples may be collected to ensure a representative sample is obtained and hence a time-weighted average (TWA) result can be calculated.

GENERAL PRACTICES

6.14 The following **engineering controls, general housekeeping** and **work practices** shall be adhered to when handling SMF materials:

- (a) Work practices should minimise the release of, and exposure to, fibres and/or dust.
- (b) Packaging and transport of materials shall be done so as to minimise the release of fibres and/or dust.
- (c) Where possible, SMF material should be ordered in a form and shape which requires a minimum of cutting and handling on site.
- (d) Correct tools shall be used for the task. Where required, manual tools should be used to trim or cut SMF materials. If power tools are used, these should be fitted with exhaust extraction at the point of dust generation, or other effective local exhaust ventilation supplied.
- (e) SMF materials should be stored in low traffic areas, and in intact containers or under sheet covers.
- (f) SMF materials to be sprayed or gunned should be used and handled in a wet, rather than dry, form where workable.
- (g) Work areas should be cleaned regularly to remove any build up of fibres and/or dust. Visible waste materials should be removed promptly to avoid being trampled and spread about.
- (h) Cleaning should be by an industrial vacuum cleaner, but wet mopping and wiping is acceptable if vacuuming is not workable.
- (i) Waste shall be placed in plastic bags or other containers which prevent fibre and/or dust emission, and disposed of in accordance with the requirements of the local waste disposal authority.
- (j) Designation of work areas using ropes (or similar barriers) and appropriate signs should be utilised, where workable, for all overhead work involving SMF. Where workable, employees not engaged in SMF work should not be within 3 metres of the SMF work area. An example of an appropriate sign is as follows:

SMF WORK AREA

FOLLOW SAFETY INSTRUCTIONS

All warning signs should comply with Australian Standard AS 1319⁶.

7. PERSONAL HYGIENE

- 7.1** Adequate washing facilities shall be available, on site, to wash and treat both skin and eye irritation.
- 7.2** General hand washing facilities shall be available.
- 7.3** Amenity rooms shall be kept free of any fibres and/or dust as far as is workable.

8. FIRST AID

8.1 First aid services shall conform with the requirements of the relevant State or Territory authority.

9. PERSONAL PROTECTIVE EQUIPMENT

9.1 Where exposure levels are such that personal protective equipment is required, it shall be readily available in the workplace. Protective equipment is not to be regarded as a substitute for control measures to reduce exposure levels.

9.2 Respirators shall be correctly fitted, maintained in good condition, and kept in clean storage when not in use.

9.3 Replaceable filters and cartridges should be replaced regularly, in accordance with guidelines issued by the manufacturer.

9.4 The protection offered by some types of respirators may be affected by personal characteristics such as beards and the wearing of glasses or goggles. Appropriate respirators to ensure protection shall be used (see Appendix 1). All respirators shall comply with the provisions of Australian Standards AS 1715 and AS 1716^{7,8}.

9.5 Safety goggles or face shields can be worn to avoid eye irritation or injury, especially when performing overhead work.

9.6 Skin irritation can be minimised by the use of gloves and loose fitting, long garments. This clothing should be washed regularly, separate from other laundry to avoid cross-contamination and subsequent skin irritation of non-workers. To avoid undue heat stress and general discomfort to the wearer, consideration should be given to the type of material chosen for this clothing.

9.7 Examples of suitable personal protective equipment referred to in the attached schedules are given in Appendix 1.

10. EDUCATION AND TRAINING

10.1 Supervisors and employees who work with SMF shall be provided with adequate information, instruction and training on:

- (a) any health information relating to SMF handling and/or exposure obtained from labels and MSDS;
- (b) the importance of controlling the creation of SMF and/or fibrous dust in the atmosphere to the lowest workable levels;
- (c) the probable exposure levels associated with the type of job;
- (d) how safe work practices, such as control measures, respiratory protective equipment and protective clothing, can be used effectively;
- (e) the role and significance of air monitoring;
- (f) employer responsibilities; and
- (g) employee responsibilities.

11. HEALTH SURVEILLANCE PRINCIPLES

11.1 If exposure to SMF is kept below the level specified in this national code of practice, then detrimental health effects should not be observed. However, there is merit in employees in potentially hazardous occupations receiving health surveillance through the workplace. It provides a means for general health promotion, reinforcing previous training, and reassurance to employees with any concerns about exposure.

11.2 In most situations, **routine** medical surveillance of employees is not necessary as it will serve no useful purpose in identifying possible disease or adverse health effects arising from exposure to SMF.

11.3 The timing and form of any medical examination varies within individual circumstances, depending upon the degree of exposure, type of industry, medical resources and size of the workforce.

11.4 As a guide, medical examinations would not normally include X-ray, lung function and physical examination unless indications present.

11.5 The purpose of the national code of practice is **primary prevention**, based on reducing or eliminating exposure, rather than attempting to identify disease and then taking curative action.

12. REMOVAL OF SMF PRODUCTS

12.1 Procedures to be applied for removal depend on the form of the original SMF insulation installed.

12.2 The two basic forms of SMF insulation are bonded and unbonded. The *bonded form* is where adhesives or cements have been applied to the SMF before delivery and the SMF product has a specific shape. The *unbonded form* has no adhesives or cements and the SMF is loose material packed into a package. The unbonded form can be packed loose or mixed with adhesives or cements before, or during, installation.

12.3 **Removal of bonded material** is easier and less hazardous. Any physical abrasion, including cutting, should be kept to a minimum during removal. Such removal can be performed in a dry condition if there is minimal physical abrasion. Only in circumstances where heat or other causes have made the bonded SMF attach itself to the substrate should physical abrasion take place. If this occurs, removal should be performed as for unbonded SMF removal.

12.4 **Removal of unbonded material** is difficult and more hazardous. The unbonded material should be thoroughly wetted before removal takes place. Dry removal may be necessary when there are electrical and heat considerations. Increased respiratory protection may be necessary when working in enclosed or poorly ventilated spaces or where the SMF insulation has undergone physical change.

12.5 Details of the specific work practices and recommended protective equipment are provided in the schedules attached to this national code of practice.

1. SCHEDULE FOR WORKING WITH ROCKWOOL

(This schedule forms an integral part of the national code of practice.)

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SCOPE

- 1 This schedule for working with rockwool follows on from the general principles outlined earlier in the *National Code of Practice for the Safe Use of Synthetic Mineral Fibres* and deals in detail with the application of all rockwool materials.
- 2 Compliance with this schedule in association with the national code of practice will ensure a safe working environment.
- 3 By applying the national code of practice and this schedule, the lowest workable airborne concentrations of respirable rockwool fibres should be achieved, ensuring compliance with an exposure standard of 0.5 f/mL.

PRODUCT DESCRIPTION

- 4 Rockwool is manufactured by melting volcanic rock (usually basalt in Australia), and then blowing or spinning it into a fibrous 'woollen' blanket-form. This is done because volcanic rock is known to be a good insulator with great strength.
- 5 A combination of dust suppressors and binders (for example, phenolic resin) are usually added to assist in reducing any dust or fibre release.
- 6 Rockwool materials are used in a variety of applications, the major ones being for thermal, acoustic and fire protection in domestic, commercial and industrial situations. In thermal performance, however, it is generally limited to a maximum service temperature of 820°C.
- 7 Rockwool is generally manufactured to a nominal fibre diameter of between 5-8 µm (micrometers), with the actual fibre diameters depending upon the chemistry/viscosity (stickiness) of the molten rock plus the method used to generate the fibres. The typical proportion of fibres less than 3 µm contained in rockwool materials is in the order of 15-25 per cent.

PRODUCT FORMS AND TYPICAL APPLICATIONS

- 8 The application of rockwool materials can be classified into two main categories based on the friability and potential for release of airborne fibre:
 - (a) bonded materials; and
 - (b) unbonded materials.
- 9 *Bonded rockwool materials* can be defined as those manufactured using binding or sealing agents to hold the rockwool in a batt or blanket form. Additionally, some bonded materials may be clad in various coverings on one or more sides. The advantage of the presence of binding agents is that they significantly reduce fibre release during handling.
- 10 *Unbonded rockwool materials* can be defined as those manufactured without the use of any binding agents, facing/cladding or other sealants. There are two main applications of unbonded materials: wet spray and loose-fill. The product also has limited use as insulation in wall and ceiling cavities using a dry spray product.
- 11 Examples of rockwool products are given in the attachment to this schedule.

12 Some examples of the application of rockwool are as follows:

- (a) as batts or blankets (bonded materials) in ceilings, walls or around air conditioning ducts of buildings;
- (b) as preformed pipe sections (bonded materials), for example, over steampipes on boilers;
- (c) mixed with cement (unbonded materials) as sprayed fire protection in multi-storey buildings; and
- (d) as loose-fill material or sprayed into ceiling and cavity spaces of buildings (unbonded materials).

WORK PRACTICES FOR BONDED ROCKWOOL MATERIALS

13 The fibres in rockwool materials are bound together by binding or sealing agents and/or may be clad in various coverings. As such, the potential for the release of fibres is significantly reduced.

14 Typical examples of the use of bonded rockwool materials include:

- (a) preformed insulation batts in ceilings and cavity walls;
- (b) insulation blankets or batts around air conditioning ducts; and
- (c) preformed pipe sections as lagging around steampipes and hot or chilled water pipes.

15 In these applications, the following **handling and installation procedures** are recommended:

- (a) storage as packaged in sealed containers or bags;
- (b) transfer from storage to the point of use should be in sealed boxes or bags;
- (c) care should be taken to minimise dust release when opening bags or boxes;
- (d) all used containers or bags should be disposed of in a manner which minimises the generation of dust and in accordance with the requirements of local waste disposal authorities; and
- (e) hand tools should always be used in preference to power tools in any site processing.

16 The following **personal protective equipment** should be used by persons installing bonded rockwool materials:

- (a) long sleeve, loose fitting clothing and gloves;
- (b) where overhead work is involved, goggles and head covering should be worn; and
- (c) a half-face (Class L or M) respirator should be worn during work in enclosed or poorly ventilated spaces, for example, in ceiling spaces, or where evidence suggests that respirable fibre levels may exceed 0.5 f/mL.

17 For further information on work practices, see text earlier in this national code of practice.

WORK PRACTICES FOR UNBONDED ROCKWOOL MATERIALS

Wet Spray

18 This technique generally involves the use of fire-protection spray wools, for example, a rockwool and cement mix.

19 In this application, the following **handling and installation procedures** are recommended:

- (a) storage as packaged in sealed bags;
- (b) transfer rockwool and cement from storage to the point of use in sealed bags;
- (c) bags should be placed into a hopper and then slit to open;
- (d) avoid excess shaking of bags and the production of unnecessary dust;
- (e) fold used bags and store in waste container;
- (f) care should be taken to ensure that material is sprayed only in the desired area; and
- (g) a cleaning and maintenance program for the machine and adjacent area, including vacuuming or wet mopping and wiping, should be available.

20 The following **personal protective equipment** should be used by both the spray operator and assistant during the wet spray operation:

- (a) long sleeve, loose fitting clothing and gloves;
- (b) where overhead work is involved, goggles and head covering should be worn; and
- (c) a half-face (Class L or M) respirator should be worn during work in enclosed or poorly ventilated spaces, for example, in ceiling spaces or when loading the hopper, or where evidence suggests that respirable fibre levels may exceed 0.5 f/mL.

21 For further information on work practices, see text earlier in this national code of practice.

Loose Fill

22 Work with loose fill has the potential of creating relatively high airborne fibre levels. Therefore, the product should be handled more carefully (as outlined below). Typical examples of the applications of loose fill include use as loose fire-seal and cryogenic rockwool.

23 In this application, the following **handling and installation procedures** are recommended:

- (a) storage as packaged in sealed bags;

- (b) transfer from storage to the point of use in sealed bags;
- (c) using gloves, remove rockwool from bags and place into desired location;
- (d) avoid unnecessary disturbance, for example, tearing, of the product;
- (e) where tamping (packing down) is required, this should be done only to the required degree so as to minimise the disturbance of the product;
- (f) empty bags should be folded and stored in a waste container;
- (g) for overhead applications, there should be adequate sealing of the application site or protection of workers below; and
- (h) excess material should be removed from the work area at completion of job.

24 The following **personal protective equipment** should be used by persons installing loose rockwool:

- (a) long sleeve, loose fitting clothing and gloves;
- (b) where overhead work is involved, goggles and head covering should be worn; and
- (c) a half-face (Class L or M) respirator should be worn during work in enclosed or poorly ventilated spaces, for example, in ceiling spaces, or where evidence suggests that respirable fibre levels may exceed 0.5 f/mL.

25 For further information on work practices, see text earlier in this national code of practice.

Dry Spray

26 Dry spraying should only occur where the target area is enclosed and prevents the release of loose fibres. Typical examples of the use of this dry spray include cavity-wall and loose fill. This work has a potential of creating relatively high fibre levels and therefore the recommended procedures and personal protective equipment, as outlined below, should be closely followed.

27 In this application, the following **handling and installation procedures** are recommended:

- (a) storage as packaged in sealed bags;
- (b) transfer from storage to the point of use in sealed bags;
- (c) bags should be placed into a hopper and then slit to open;
- (d) avoid excess shaking of bags;
- (e) fold used bags and store in waste container;
- (f) *spray operator* - no spraying to commence until the nozzle is securely in the target area;
- (g) the spray is to be terminated before the nozzle is removed from the target area;

- (h) no material should be left in the machine unless the machine is adequately covered; and
- (i) cleaning and maintenance of the machine and adjacent area should be carried out at the completion of the job.

28 The following **personal protective equipment** should be used by both the spray operator and assistant:

- (a) long sleeve, loose fitting clothing and gloves;
 - (b) where overhead work is involved, goggles and head covering should be worn; and
 - (c) a half-face (Class L or M) respirator should be worn during work in enclosed or poorly ventilated spaces, for example, in ceiling spaces, or where evidence suggests that respirable fibre levels may exceed 0.5 f/mL.
- 29** For further information on work practices, see text earlier in this national code of practice.

REMOVAL OF ROCKWOOL MATERIALS

30 The two considerations which determine the necessary work practices during removal of rockwool materials are the degree of burn-out of binding material in the product matrix, and the probable dust concentrations which may arise during removal.

31 Accordingly, the following **precautions** should be applied:

- (a) The work area should be designated by using ropes and signs where workable. Persons not involved in the removal should not be within 3 metres of the designated area.
- (b) Waste shall be placed in plastic bags or other containers which prevent fibre and/or dust emission, and disposed of in accordance with local waste disposal authority requirements.

32 The following **personal protective equipment** should be used by personnel directly involved in the removal work:

- (a) long sleeve, loose fitting clothing and gloves;
- (b) where overhead work is involved, goggles and head covering should be worn; and
- (c) a half-face (Class L or M) respirator.

33 For further information on work practices, see text earlier in this national code of practice.

SOME CURRENT ROCKWOOL PRODUCTS

<i>Manufacturer</i>	<i>Trade Name/Form</i>
Bradford	Fibretex Rockwool Fibertex Ductliners Fibretex Acoustic Baffles Fireseal Loose Fireseal Fire Damper Strips Fibretex Spraywool Fibretex Granulated Fibremesh Fibremesh Pipe Wrap Cavity Wall Insulation Thermaclad
Bells Thermalag	KBS Sealbags Thermaspray
Roberts Fire Protection	M34 Mineral Fibre HT Mineral Fibre BD6 Hard-set Cement FP/GP Mineral Fibre

Source: Rockwool industry.

2. SCHEDULE FOR WORKING WITH CERAMIC FIBRES

(This schedule forms an integral part of the national code of practice.)

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SCOPE

1 This schedule for working with ceramic fibres follows on from the general principles outlined earlier in the *National Code of Practice for the Safe Use of Synthetic Mineral Fibres* and deals in detail with the application of ceramic fibre materials.

2 Compliance with this schedule in association with the national code of practice will ensure a safe working environment.

3 By applying the national code of practice and this schedule, the lowest workable airborne concentrations of respirable ceramic fibres should be achieved, ensuring compliance with an exposure standard of 0.5 f/mL.

PRODUCT DESCRIPTION

4 Ceramic fibre is a synthetic non-crystalline alumino-silicate product manufactured by melting masses of raw materials, pouring a stream of the molten mixture and blowing it into a fibrous form. In some specialised applications, other oxides (additives) may be used. The resulting bulk fibre is then converted into blankets, felts, paper, woven textiles, rope, braid, modules, boards, castables, mastics, preformed shapes and other specialised materials.

5 Ceramic fibre materials are often used in a variety of high-temperature, high-performance applications. The major use of these materials is as the refractory lining of furnaces, kilns and other industrial heaters. Other applications exist in the automotive, marine, petrochemical, steel, aluminium, ceramic, glass and construction industries as an insulation medium or thermal barrier.

6 Ceramic fibres are generally manufactured to a nominal fibre diameter of between 3-4 µm (micrometres), although a typical range of actual diameters is 0.2-8.0 µm. The typical proportion of fibres less than 3 µm is 30-40 per cent in materials such as batts and modules. In other products, such as boards, it is 10-15 per cent.

PRODUCT FORMS AND TYPICAL APPLICATIONS

7 The application of ceramic fibre materials can be classified into one of four categories based on the required work practices:

- bonded materials;
- dry unbonded materials;
- wet materials; and
- wet spray.

8 Examples of ceramic fibre products are given in the attachment to this schedule.

9 Some examples of the application of ceramic fibres are as follows:

- (a) blankets, boards and modules as insulation lining of furnace walls, arches and doors;

- (b) boards as back-up insulation to hard refractory linings in process equipment;
- (c) blankets and paper as insulation lining of mufflers and catalytic convertors and high temperature gaskets;
- (d) bulk fibre and blankets as expansion joint in-fill in furnaces and buildings;
- (e) ropes and braids as high temperature seals and packing;
- (f) cloth as welding curtains, fire curtains and slow-cool covers;
- (g) tape to protect hydraulic cables from molten metal splashes; and
- (h) preformed shapes to create troughs for the transport of molten metals.

WORK PRACTICES FOR BONDED CERAMIC FIBRE MATERIALS

10 Bonded materials contain between 5 and 20 per cent organic binders and hence generate relatively low levels of airborne fibres. Examples of such materials include:

- modules (some modules are supplied with a latex or similar binding system);
- castables (supplied dry with a cement binder system);
- paper;
- felt;
- boards;
- preformed shapes; and
- rope, braid and cloth.

11 In the installation of bonded materials, the following **handling and installation procedures** are recommended:

- (a) All installation practices should be designed to minimise the liberation of any airborne fibre or dust.
- (b) In large installations of several days/weeks duration, the installation area should be clearly designated and barriers erected to prevent casual access.
- (c) The ceramic fibre materials should be stored in sealed plastic bags or similar containers until installation is to proceed. These containers should only be opened within the designated work area when work is to start.
- (d) Where possible, materials should be delivered in sizes such that a minimum of handling and machining is required. However, when cutting or drilling is required, these should be done with hand tools or using power tools fitted with local exhaust extraction. The exhaust from such extraction equipment should be filtered and positioned away from other work areas.
- (e) Empty storage bags should be folded and stored in a waste container along with any other waste material.

(f) On completion of the job, all excess material should be sealed in bags prior to removal from the designated work area. The work area should then be vacuumed using an industrial vacuum cleaner. Wet mopping and wiping can be utilised if an industrial vacuum cleaner is not available.

12 The following **personal protective equipment** should be used by personnel installing bonded ceramic materials:

- (a) disposable coveralls or long sleeve, loose fitting clothing and gloves (laundryable clothing should be washed separately from other clothing);
- (b) where overhead work is involved, goggles and head covering should be worn; and
- (c) a half-face (Class L or M) respirator should be worn during work in enclosed or poorly ventilated spaces, for example, in ceiling spaces, or where evidence suggests that respirable fibre levels may exceed 0.5 f/mL.

13 For further information on work practices, see text earlier in this national code of practice.

WORK PRACTICES FOR UNBONDED CERAMIC FIBRE MATERIALS

Dry Unbonded Materials

14 Some examples of dry unbonded materials include:

- blanket/batt;
- bulk fibre (some bulk fibres are supplied with a dust-suppressing lubricant);
- modules (some modules are supplied using unbonded blanket); and
- overbraided lagging.

15 In the installation of unbonded materials, the following **handling and installation procedures** are recommended:

- (a) All installation practices should be designed to minimise the liberation of any airborne fibre or dust.
- (b) In large installations of several days/weeks duration, the installation area should be clearly designated and barriers erected to prevent casual access.
- (c) The ceramic fibre materials should be stored in sealed plastic bags or similar containers until installation is to proceed. These containers should only be opened within the designated work area when work is to start.
- (d) Where possible, materials should be delivered in sizes such that a minimum of handling and machining is required. However, when cutting or drilling is required, these should be done with hand tools or using power tools fitted with local exhaust extraction. The exhaust from such extraction equipment should be filtered and positioned away from other work areas.

(e) Empty storage bags should be folded and stored in a waste container along with any other waste material.

(f) Upon completion of the job, all excess material should be sealed in bags prior to removal from the designated work area. The work area should then be vacuumed using an industrial vacuum cleaner. Wet mopping and wiping can be utilised if an industrial vacuum cleaner is not available.

16 The following **personal protective equipment** should be used by personnel installing unbonded ceramic materials:

(a) disposable coveralls or long sleeve, loose fitting clothing and gloves (launderable clothing should be washed separately from other clothing);

(b) where overhead work is involved, goggles and head covering should be worn; and

(c) a half-face (Class L or M) respirator should be worn during work in enclosed or poorly ventilated spaces, for example, in ceiling spaces, or where evidence suggests that respirable fibre levels may exceed 0.5 f/mL.

17 For further information on work practices, see text earlier in this national code of practice.

Wet Materials

18 Wet ceramic fibre materials use a combination of organic and inorganic binders. These products, because of their nature, do not release airborne fibres as supplied. Some examples of wet materials include:

- wet felt;
- mastic/putty/mouldable; and
- coating cements.

19 In the installation of wet materials, the following **handling procedures** are recommended:

(a) Rubber gloves should be worn to prevent direct skin contact. With continuous contact, inorganic binders found in the majority of wet ceramic fibre forms will dry the skin.

(b) Hand tools should be used to mould, form, shape or apply wet mixes.

(c) All waste or excess material should be cleaned up prior to completion of the job and sealed in plastic bags.

20 The following **personal protective equipment** should be used by personnel installing wet ceramic materials:

(a) long sleeve, loose fitting clothing and gloves should be worn during installation; and

(b) where overhead work is involved, goggles and head covering should be worn.

21 For further information on work practices, see text earlier in this national code of practice.

Wet Spray

22 This technique generally involves the use of a spray consisting of a ceramic fibre and cement mix. This spray is used as an abrasion resistant lining for furnaces and, to a lesser extent, for fire protection in buildings. Very few airborne fibres are generated because the fibre content is bound in cement.

23 In this application, the following **handling procedures** are recommended:

- (a) all the materials used in this type of application should be stored in sealed bags;
- (b) these materials should be delivered to the point of use in sealed bags;
- (c) the bags should be placed into a hopper and then slit open.
- (d) excess shaking of the bags should be avoided;
- (e) empty storage bags should be folded and stored in a waste container along with any other waste material;
- (f) on completion of the job, all excess material should be sealed in bags prior to removal from the designated work area;
- (g) a cleaning and maintenance program for the relevant work areas must be implemented;
- (h) *spray operator* - no spraying to commence until the nozzle is aimed at the target area;
- (i) no material should be left in the machine unless the machine is adequately covered; and
- (j) cleaning and maintenance of the machine and adjacent area should be carried out at the completion of the job.

24 The following **personal protective equipment** should be used by personnel involved in spraying wet ceramic materials:

- (a) disposable coveralls or long sleeve, loose fitting clothing and gloves (laundryable clothing should be washed separately from other clothing);
- (b) where overhead work is involved, goggles and head covering should be worn; and
- (c) a half-face (Class L or M) respirator should be worn during work in enclosed or poorly ventilated spaces, for example, in ceiling spaces, or where evidence suggests that respirable fibre levels may exceed 0.5 f/mL.

25 For further information on work practices, see text earlier in this national code of practice.

REMOVAL OF CERAMIC FIBRE MATERIALS

26 For the majority of small removal jobs where the ceramic fibre material is in the same condition as when it was installed, the required work practices for removal do not differ significantly from those used for installation. However, where the bulk ceramic fibre material has become embrittled, or must be removed from enclosed or poorly ventilated spaces, such as from within large boilers or kilns, more stringent procedures must be adopted (see below).

Removal of Ceramic Fibre Materials

27 For small removal jobs, for example, pottery kilns and laboratory ovens, or where the spent ceramic fibre material has not been subjected to sustained high temperatures and the ceramic material has not become embrittled or changed significantly since installation, the following **handling procedures** are recommended:

- (a) All practices should be designed to minimise the liberation of any airborne fibre or dust.
- (b) In large removals of several days/weeks duration, the removal area should be clearly designated and barriers erected to prevent casual access.
- (c) On completion of the job, all waste material should be sealed in bags prior to removal from the designated work area. The work area should then be vacuumed using an industrial vacuum cleaner. Wet mopping and wiping can be utilised if a industrial vacuum cleaner is not available.

28 The following **personal protective equipment** should be used by personnel directly involved in the removal work:

- (a) disposable coveralls or long sleeve, loose fitting clothing and gloves should be worn during installation (launderable clothing should be washed separately from other clothing);
- (b) where overhead work is involved, goggles and head covering should be worn; and
- (c) a half-face (Class L or M) respirator.

29 For further information on work practices, see text earlier in this national code of practice.

Removal of Embrittled Ceramic Fibre Materials

30 The removal of ceramic fibre materials from large furnaces, kilns and boilers may present an additional difficulty due to the presence of refractory materials, such as bricks and mortar with very high silica content, and cristobalite in the spent material. This problem also arises when the ceramic material has been maintained at temperatures exceeding 1000°C for a considerable period of time (typically months) and some of the silicate material in the ceramic fibre, fillers and bricks has been converted into cristobalite.

31 Accordingly, the following **procedures**, in particular the selection of respiratory protection, should be implemented during the removal of embrittled ceramic fibre materials:

- (a) the removal area should be signposted and contained, where workable, to minimise the transfer of dust to other work areas;

- (b) separate changing areas should be provided to minimise the transfer of dust to general work areas;
- (c) where workable, the spent material should be wetted to suppress dust generation;
- (d) waste shall be placed in containers, plastic bags or other methods which prevent fibre and/or dust emission, and disposed of in accordance with local waste disposal authority requirements;
- (e) the removal area should then be cleaned using an industrial vacuum cleaner; and
- (f) once visible dust has been cleaned up, containment material should be removed in a manner that minimises the liberation of any trapped dust.

32 The following **personal protective equipment** should be used by all personnel directly involved in the removal work:

- (a) Disposable coveralls or long sleeve, loose fitting clothing and gloves (laundryable clothing should be washed separately from other clothing).
- (b) Where overhead work is involved, goggles and head covering should be worn. Eye protection would be provided as an integral component of a full-face respirator.
- (c) A Class M respirator provides the necessary protection factor for this task. However, in some circumstances where excessive levels of dust are created, the limitations of filter loading capacity and facial seal may necessitate the use of:
 - a full-face (Class H particulate) cartridge respirator; or
 - a full-face (Class H particulate), powered air- purifying respirator; or
 - a full-face, positive pressure, demand airline respirator.

33 The choice of respirator will be dependent on a number of factors, particularly the manoeuvrability required by the job. When such equipment is used, it is important that such personal protective equipment is properly maintained and stored (see Appendix 1 to this national code of practice).

SOME CURRENT CERAMIC FIBRE PRODUCTS

<i>Manufacturer/ Supplier</i>	<i>Trade Name</i>	<i>Form</i>
Carborundum	Fiberfrax	Bulk loose Durablanket Duraboard Felt and paper Rope and braid Textiles Cement and mixes
Morganite	Triton Kaowool	Bulk loose Blanket Board Modules Blanket modules Cements and coatings Mastic Rope and textiles Felt and paper
Bells Thermalag	Kaowool	Ceramospray I Ceramospray IAL Ceramocote I
Pyrotek		Pyrotek M6 felt Pyrotek J1 rope Pyrotek U1 millboard 1Pyrotek M13 fiberseal board
FHC	Nefalit	Millboard Valves and Insulation
ICI	Saffil	Saffil bulk fibre
Manville	Cerafibre	Cerablanket Ceraboard Cerawool Cerachem

Source: Ceramic fibre industry.

3. SCHEDULE FOR WORKING WITH GLASSWOOL

(This schedule forms an integral part of the national code of practice.)

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