INTERNATIONAL LABOUR OFFICE
BUREAU INTERNATIONAL DU TRAVAIL
OFICINA INTERNACIONAL DEL TRABAJO

GOVERNING BODY
CONSEIL D'ADMINISTRATION
CONSEJO DE ADMINISTRACION

GB.224/7/7
224th Session

Geneva,
15-18 November 1983

Seventh item on the agenda

REPORT OF THE MEETING OF EXPERTS ON THE SAFE USE OF ASBESTOS
(Geneva, 11-20 October 1983)

1. In accordance with the decisions taken by the Governing Body, a Meeting of Experts on the Safe Use of Asbestos was held in Geneva from 11 to 20 October 1983 to draw up a code of practice. The Meeting was composed of five experts appointed following consultations with governments, five experts appointed following consultations with the Employers' group and five experts appointed following consultations with the Workers' group of the Governing Body.

2. Attached is the report of the Meeting,[1] to which the draft Code of Practice, submitted for examination by the Governing Body, is appended.

3. The Governing Body is invited to take note of the report and authorise the Director-General to publish the Code of Practice.

Geneva, 28 October 1983.

POINT FOR DECISION:

Paragraph 3.

[1] RESA(2)1983/VI.

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REPORT OF THE MEETING OF EXPERTS ON THE SAFE USE OF ASBESTOS

(Geneva, 11-20 October 1983)

1. At its 219th Session (February-March 1982) the Governing Body decided to convene a Meeting of Experts on the Safe Use of Asbestos. The Meeting was held at Geneva from 11 to 20 October 1983.

Agenda of the Meeting

2. The agenda of the Meeting as approved by the Governing Body at its session in March 1983 consisted of a single item: to draw up a Code of Practice on the Safe Use of Asbestos.

Participants

3. The Meeting was composed of 15 experts, five of them appointed after consultation with Governments, five after consulting with the Employers' group and five after consultation with the Workers' group of the Governing Body.

4. Several observers also attended the Meeting, representing the United Nations Environment Programme (UNEP), the World Health Organisation (WHO), the Commission of the European Communities (CEC), the International Organisation of Employers (IOE), the International Confederation of Free Trade Unions (ICFTU) and the World Confederation of Labour (WCL).

5. The list of participants is annexed to this report.

Opening address

6. The Meeting was opened by Mr. Vladimir Chkounaev, Assistant Director-General of the ILO. In welcoming the participants he expressed his appreciation of the attendance of a number of international organisations which had a special interest in the problems of asbestos. He sketched the ILO's concern with asbestos, dating back, so far as pneumoconiosis is concerned, to 1930 and more recently to the IVth ILO International Pneumoconiosis Conference in 1971 in Bucharest, the Vth in 1978 in Caracas and the VIth in September 1983 in Bochum. With regard to cancer, the question of asbestos had been raised during the discussions on Convention No. 139 and Recommendation No. 147 on the prevention and control of occupational hazards caused by carcinogenic substances and agents adopted in 1974.

7. With specific reference to asbestos, he reminded the Meeting that the ILO had already had two meetings of experts, one in 1973 and one in 1981. The first of these meetings had recommended the adoption of international instruments on the safe use of asbestos and this recommendation was reinforced by the meeting of 1981. Until such time as a Convention and/or Recommendation could be considered by the International Labour Conference, the Governing Body accepted the advice of the 1981 meeting that a Code of Practice on the Safe Use of Asbestos adapted to the needs of both industrialised and developing countries should be prepared.

8. He pointed out that an ILO Code of Practice provides guidance for governments, employers and workers. It sets out the principles that should be followed for the control of specific hazards and the provision of safe working conditions. It has no legal force and entails no obligation on individual member States to bring their national laws and regulations into conformity with it, but it embodies principles of importance to all concerned with occupational safety and health. In

n it is an integral part of the Programme for the Improvement of itions and Environment (PIACT) which was launched in 1976 and which is .uation at the next session of the International Labour Conference in ally, he reminded the participants that they were attending the Meeting, esentatives of any government, organisation or other interest but in onal capacity as experts.

of Chairman and Reporters

Dr. Gordon Atherley was elected Chairman of the Meeting, and Dr. Eltjo and Mr. Emilio Costa, Reporters.

ation of the working document

10. The Draft Code of Practice on the Safe Use of Asbestos prepared by the with the help of external consultants was introduced to the Meeting by eorg Kliesch, representative of the Director-General. This working document een sent to member States for comments and these comments were circulated to experts to be taken into consideration. He gave some illustrative examples he complementary nature of Conventions, Recommendations and Codes of Practice.

11. Mentioning the growing awareness of the asbestos hazard and the wide ge of information which had been disseminated, he pointed out that some of it controversial or even disputed. Several organisations, international and gional, and those of employers and workers, had demonstrated a keen interest in ie subject. Among these groups, attitudes varied from a ban on asbestos to a ualified acceptance. As far ahead as can be seen, asbestos will continue to be andled and it is therefore necessary to have an effective code of practice so that this can be done as safely as possible.

Discussion of the Code

12. Before proceeding to discuss the Code in detail, the experts mentioned a number of general points. They considered that the form of the Code, i.e. a section on general aspects of the subject followed by one dealing with specific industrial circumstances in which asbestos is handled, together with informative appendices, was a good basis for dealing with a complex problem. Some experts drew attention to the title of the Code, saying that the French and English versions of the title appear to have a different meaning and some preferred the French version. The experts recognised the value of the reports of previous meetings of experts on asbestos on which the Code had been based and regarded it as a valuable step in the control of a dangerous substance and as a necessary preliminary to further consideration by the ILO, particularly the possible adoption of an international instrument or instruments.

13. In the course of the discussions the observers from WHO, EEC and from employers' and workers' organisations several times made useful contributions in the form of statements, and comments on various aspects of the asbestos problem and the different chapters of the draft Code.

14. The experts stressed the duties of governments, employers and workers and the need for co-operation to ensure the highest possible standards. The level of achievement would be bound to vary because of the different circumstances and the technical difficulties, but the aim should be the elimination of the risk by the application of the most effective and up-to-date methods.

15. The experts recognised that the danger of asbestos lay in the inhalation of dust particles given off in the course of mining, milling and using the raw material or products containing it. Any reference to asbestos in the Code should be regarded as referring to particles which were either airborne or likely to become airborne.

16. In order to assess the level of risk it is necessary to have suitable methods of measuring the dust. After some discussion on the relative roles of the membrane filter method for fibre counting and of the gravimetric method of measuring total dust, it was finally decided to include both methods, and details included as appendices to the Code.

17. The adverse health consequences of exposure to asbestos dust only arise after a long latent period. They consist of asbestosis, lung cancer, mesothelioma and pleural changes. The significance of pleural changes gave rise to considerable discussion, although they are not the most important consequence of asbestos dust exposure.

18. The protection of workers against the inhalation of dust is of paramount importance. Having discussed the essential measures of technical control, attention was directed at personal protection, including not only the provision of appropriate respiratory protective equipment, but the workers' clothing which, if it became contaminated with asbestos dust, could present a continuing risk of inhalation for themselves and, if the clothing is taken home, for their family. It was therefore recommended, in the light of a long discussion in which the observers made a useful contribution, that, in addition to special protective clothing for particular purposes, the workers should be provided with works clothing which would not leave the workplace.

19. While medical procedures are not a substitute for technical control of the hazard, supervision of the health of workers by medical examination, chest radiography and lung function tests was accepted as necessary, though it was pointed out that, by itself, medical examination has no life-saving effect, especially on mesothelioma. The experts, recognising that health supervision should be for the benefit of workers, included safeguards for the confidentiality of medical and personal information and constraints on invasive medical procedures. The recommendations concerning the detail of medical procedures are incorporated in an appendix to the Code.

20. The replacement of asbestos by alternative materials, and even the principle of including it in the Code, was discussed at length. The experts accepted the general principle of the replacement of a dangerous substance by one which is harmless or less harmful, but, taking account of the technological developments of new materials to supplement or replace asbestos, they drew attention to the need to confirm the harmlessness of alternative materials. They also recognised the importance of technical and economic factors which are inseparable from the general problem.

21. It was considered that the ILO has already made an important contribution to the diagnosis of asbestos-related disease by the publication of the International Classification of Radiographs of Pneumoconiosis and the booklet "Respiratory Function Tests in Pneumoconiosis".

22. The need was stressed many times for training and education of all categories of persons involved in dealing with asbestos, including workers, employers and government officials. The experts recommended unanimously that, in the course of its training activities, including the Turin Centre, the ILO should be an international focus for expanding health and safety education in this field by means of this Code of Practice.

23. In conclusion, the experts unanimously adopted the Code of Practice on the Safe Use of Asbestos as amended by the Meeting.

Geneva, 20 October 1983.

(Signed) Gordon Atherley,
Chairman.

Reporters: Eltjo Buringh

Emilio Costa

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Chairman.

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Emilio Costa

APPENDIX

MEETING OF EXPERTS ON THE SAFE USE OF ASBESTOS

(Geneva, 11-20 October 1983)

Dr. G. Atherley (Canada), President and Chief Executive Officer, Canadian Center for Occupational Safety and Health, Hamilton.

Personal Adviser

Mr. G. Dahmen (Canada), Centre canadien d'information sur l'amiante, Montréal.

Mr. R.S. Baloyi (Zimbabwe), Director, Occupational Health Safety and Compensation, Harare.

Mr. D. Bouige (France), Director, Association française de l'amiante, Paris.

Personal Adviser

Dr. S.F. McCullagh (Australia), Occupational Physician, c/o James Hardie Industries Limited, Sydney.

Dr. E. Buringh (Netherland), Safety and Health Department, Netherlands Trade Union Confederation (FNV), Amsterdam.

Mr. E. Costa (Italy), Centro Nazionale Amianto, Genova.

Personal Adviser

Dr. K. Browne (United Kingdom), Cape Industries Limited, London.

Dr. S.G. Domnin (USSR), Director, Institute of Industrial Hygiene and Occupational Diseases, Sverdlovsk.

Dr. A. Fischbein (United States), Environmental Sciences Laboratory, Department of Community Medicine, The Mount Sinai Medical Center, New York.

Mr. J. Hamilton (United Kingdom), Assistant Secretary, Social Insurance and Industrial Welfare Department, Trade Union Congress, London.

Dr. Y. Hosoda (Japan), Chief, Department of Occupational Health, Central Health Institute, Japanese National Railways, Tokyo.

Dr. M. Kohn (Uruguay), Doctor en Medicina Laboral, Eternit Uruguaya S.A., Montevideo.

Personal Adviser

Dr. J. Lepoutre (Belgium), Medical Adviser, Information Asbestos Committee, Benelux.

Dr. M. Lesage (Canada), Medical Adviser, Quebec Asbestos Mining Association, Montréal.

00735 Personal Adviser

Mr. V. Pattabhi (India), Assistant Vice-President, Hyderabad Asbestos Cement Products Ltd., Hyderabad.

Dr. S.S.K. Mundia (Zambia), Member of the Medical Council and of the Association of Medical Practitioners of Zambia, Lusaka.

Personal Adviser

Dr. F. Mansour (Saudia Arabia), Head of the Middle East Research Division, Eternit Lebanon, Damman.

Mr. J.S. Oliver (United Kingdom), Deputy Superintending Inspector of Factories, HMFI, HQ., Health and Safety Executive, London.

Mr. R.K. Sharma (India), General Secretary, Asbestos Cement Mazdoor Sangh, Kymore.

Mr. A. Zverev (USSR), Chief, Département hygiène du travail, Fédération des travailleurs du bâtiment de l'URSS, Moscow.

Intergovernmental Organisations

- World Health Organization

  Dr. A. David, Medical Officer, Office of Occupational Health, WHO, Geneva

- United Nations Environment Programme

  Mr. A. Koutcherenko, Scientific Affairs Officer, International Register of Potentially Toxic Chemicals, UNEP, Geneva

- Commission of the European Communities

  Dr. A. Berlin, Head of Toxicology Section, Health and Safety Directorate, CEC, Luxemburg

Non-Governmental Organisations

- International Organisation of Employers

  Miss B. Perkins, Assistant to the Secretary-General, IOE, Geneva

  Mr. A. Kaldis, Technical Adviser of Hellenic Asbestos and Asbestos Cement Association, Athens

  Mr. B. Mohr, Arbeitskreis Asbest, Zurich

  Mr. Y. Turcot, President Director General, Intercommunica Inc., Montréal

- International Confederation of Free Trade Unions

  Mr. E. Laurijssen, Assistant Director, ICFTU, Geneva Office

  Mr. M. Malentacchi, Chief, Health and Safety Department, International Metal Workers' Federation, Geneva

  Mr. J. Elikofer, Adviser for Health and Safety, National Confederation of Danish Trade Unions, Copenhagen

  Dr. A. Englund, International Federation of Building and Woodworkers, Geneva

  Mrs. A. Normark, Research Officer, International Federation of Building and Woodworkers, Geneva

00736 Mrs. K. Tait, International Textile, Garment and Leather Workers' Federation, London

- World Confederation of Labour

  Mrs. B. Fauchère, Secretary of WCL, Geneva Office

  Mr. A. De Decker, Vice-President, Fédération mondiale de l'énergie, chimie et industries diverses (ECI/CMT) et Président de la Centrale chrétienne des ouvriers de la pierre, du ciment, de la céramique et du verre, Bruxelles.

International Labour Office

DRAFT CODE OF PRACTICE ON

THE SAFE USE OF ASBESTOS

(as adopted by the
Meeting of Experts on the Safe
Use of Asbestos
Geneva, 11-20 October 1983)

ILO
Geneva, October 1983

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PART B: CONTROL OF ASBESTOS EXPOSURE IN SPECIFIC ACTIVITIES

CODE OF PRACTICE ON THE SAFE USE OF ASBESTOS

(DRAFT)

PART A: GENERAL

1. Objects of the Code

The objects of this Code are:

1.1 to prevent the risk of exposure to asbestos dust at work and harmful effects on the health of workers arising from such exposure;

1.2 to provide reasonably practicable control procedures and practices for minimising occupational exposure to asbestos dust.

2. Application

2.1 This Code applies to any situation or operation involving a risk of occupational exposure to airborne asbestos dust including:

(a) mining and milling asbestos;

(b) manufacture of materials or products containing asbestos;

(c) use or application of asbestos containing products;

(d) stripping, repair or maintenance of products containing asbestos.

(e) demolition of plant or structures containing asbestos materials;

(f) transportation, storage and handling of asbestos or asbestos containing materials;

(g) other operations involving a risk of exposure to airborne asbestos dust.

2.2 The provisions of this Code should be considered as the basic requirements for protecting workers' health. Competent authorities are encouraged to adopt additional protective measures based on their experience, and are also encouraged to decide when these should come into effect.

3. Definitions

For the purposes of this Code:

(a) the term "asbestos" is defined as the fibrous form of mineral silicates belonging to the serpentine and amphibole groups of rock-forming minerals, including:

actinolite

amosite (brown asbestos - cummingtonite-grunnerite)

anthophyllite

chrysotile (white asbestos)

crocidolite (blue asbestos)

tremolite

or any mixture containing one or more of these;+

(b) the term "asbestos dust" is defined as airborne particles of asbestos or settled particles of asbestos which may become airborne in the working environment;

(c) the term "respirable asbestos fibre" is defined as a particle of asbestos with a diameter less than 3 µm and of which the length is at least three times the diameter;

(d) the term "workers" covers all employed persons;

+ For further information consult the Chemical Abstracts Service Registry.

(e) the term "workplace" covers all places where workers need to be or to go by reason of their work or which are under the direct or indirect control of the employer;

(f) the term "regulations" covers all provisions given force of law by the competent authority or authorities.

4. General duties

4.1 General duties of competent authority

4.1.1. In the light of national conditions and practice the competent authority should in consultation with the most representative organisations of employers and workers issue or approve and periodically update regulations or other suitable provisions for the protection of workers' health against hazards due to occupational exposure to asbestos dust.

4.1.2. The competent authority should have the expertise to supervise the enforcement of such regulations or provisions and to supply relevant advice and information.

4.1.3. The regulations on the prevention of airborne asbestos in the working environment should clearly define the agencies and persons responsible for carrying them out.

4.1.4. (1) The competent authority should establish those procedures which they consider necessary for the notification by the employer of working operations and workplaces where asbestos or materials containing

asbestos are or will be produced, handled, processed, stored or used and any other work situations where asbestos or materials containing asbestos are being used or handled in such a manner as to cause dust.

(2) This notification may include the following information:

(a) nature and place of work;

(b) type and quantity of asbestos or materials containing asbestos;

(c) total number of workers exposed;

(d) duration or anticipated duration of the work period;

(e) protective and preventive measures to be taken.

4.1.5. Where appropriate the competent authority should determine those dangerous working operations or techniques which should be prohibited or made subject to specific authorisation and which will require compliance with particular measures of prevention and protection.

4.1.6. The competent authority should establish procedures for:

(a) the setting up of airborne asbestos exposure limits in the working environment;

(b) the standardisation of methods for monitoring airborne asbestos in the working environment;

(c) the approval of personal protective equipment.

4.1.7. (1) The competent authority should:

(a) endeavour to promote close co-operation between employers and workers on matters of prevention;

(b) assist in providing safety and health committees, employers and workers with information on the hazards and on the safe use of asbestos

4.2 General duties of employers

4.2.1 The employer is responsible for the control and prevention of exposure to airborne asbestos in the working environment; the employer should therefore equip and maintain buildings, installations, machines and workplaces and organise work in such a way that the working environment is contaminated as little as possible and the exposure of workers is limited as far as is reasonably practicable and is at least within the asbestos exposure limits.

4.2.2 The employer should notify the competent authority of those working operations and workplaces where asbestos or materials containing asbestos are present according to the term of any authorisation procedures.

4.2.3 (1) The employer should stipulate and take appropriate measures to prevent as far as reasonably practicable the presence of asbestos dust in the working environment when buildings and installations are being designed and when any technical change occurs which may affect the content of asbestos dust in the air at the workplace.

(2) Similarly, when purchasing equipment or plant (machines, materials, vehicles, etc.), the employer should stipulate that such equipment or plant should comply with occupational hygiene standards or should be designed and safeguarded in such a manner as not to contaminate the working environment with asbestos dust.

4.2.4 (1) The employer should investigate asbestos health hazards before any production or use so as to identify the preventive measures appropriate to the hazard; without such measures asbestos should not be produced, used or handled.

(2) The employer should establish and implement a general control programme to reduce the workers' exposure to asbestos dust.

4.2.5 (1) The employer should provide the necessary equipment and services for monitoring the working environment.

(2) All such equipment should be maintained and calibrated properly.

4.2.6 The employer should ensure the surveillance necessary to enable workers to perform their tasks in the best possible hygienic conditions; in particular, provision should be made for the regular inspection and maintenance of installations and machinery as well as equipment to prevent the contamination of the working environment with asbestos dust.

4.2.7 (1) The employer should ensure that all workers are suitably and periodically informed of the asbestos hazards associated with the tasks assigned to them and of the measures to be taken to prevent damage to their health.

(2) This information should also be transmitted to subcontractors and their workers.

(3) In particular, provisions may be needed for newly recruited workers, foreign workers who may encounter language difficulties and for all other workers who may have difficulties in understanding written instructions.

(4) For this purpose, the employers should ensure that their managerial staff are steadily trying to improve prevention and are fully aware of their duties with regard to occupational hazards from asbestos dust exposure and in particular that they are appropriately trained and constantly updating their knowledge in this field so that they may thoroughly instruct the workers regarding the precautions to be taken in their jobs and in the event of unexpected circumstances giving rise to asbestos dust.

4.2.8 The employer should provide and maintain without cost to the workers such personal protective equipment and clothing as are necessary when airborne asbestos hazards cannot be otherwise prevented or controlled.

4.2.9. The employer should inform subcontractors and ensure so as far/is reasonably practicable that persons present at the workplace who are not under his direct control follow the regulations and take the necessary safety precautions.

4.3 General duties of workers

4.3.1 Within the limits of their responsibilities, workers should do everything in their power to prevent airborne asbestos in the working environment.

4.3.2 (1) Workers should abide by any instructions given to them in connection with the prevention of airborne asbestos in the working environment.

(2) Workers should submit themselves to medical surveillance according to national practice.

(3) Workers should wear personal samplers when necessary to measure personal exposure to asbestos dust.

(4) Workers should wear the personal protective equipment and clothing provided when either other methods for the control of asbestos dust cannot be applied, or it is necessary to wear personal protective equipment and clothing in addition to other methods of control.

4.3.3 Workers should draw to the attention of management any change in the circumstances in the process which might give rise to asbestos dust exposure.

4.4 General duties of manufacturers and vendors

4.4.1 Manufacturers and vendors of equipment used in processing asbestos or materials containing asbestos should ensure that machines and equipment are provided with devices to collect asbestos dust where it is produced and has settled.

4.4.2 Manufacturers and vendors of asbestos materials or products containing asbestos should provide purchasers with instructions concerning their safe use and draw their attention to the hazards when these instructions are not followed.

4.4.3 When supplying, leasing or selling machinery and other equipment to developing countries for the processing of asbestos, the occupational safety and health standards should be at least equivalent to those in the country of origin and in accordance with national requirements.

5. Co-operation and consultation

5.1 There should be full co-operation at all levels between the competent authority, scientific research institutions, employers, workers and their representatives and occupational safety and health personnel.

5.2 The appropriate occupational safety and health personnel according to national practice should be consulted at the design stage of new buildings and installations and before the introduction of any substantial constructional or technical change.

5.3 Joint committees of employers and workers should give due attention to the prevention of asbestos health hazards.[1]

5.4 (1) There should be regular consultations at plant level between the employers' and workers' representatives.

(2) These consultations should include frank and full exchanges of information on, for example:

(a) the nature of the harmful asbestos fibres to which workers are exposed and the risks which such exposure entails;

(b) the results of monitoring the working environment;

(c) the preventive action to be taken;

(d) the results of any epidemiological studies carried out, even in other countries, in similar working conditions;

(e) the results of plant inspections; and

(f) asbestos waste disposal.

5.5 Health and safety committees should endeavour to ensure the application of the regulations on the prevention of airborne asbestos and acquaint themselves regularly with the results of the monitoring of the working environment.

5.6 In accordance with national legislation or practice, employers' and/or workers' representatives should be permitted to accompany inspectors when they are checking the application of the regulations concerning the prevention of airborne asbestos in the working environment.

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[1] See ILO Convention No. 155 and Recommendation No. 164.

6. Possible health consequences of exposure to asbestos dust.

6.1. There are three main health consequences associated with exposure to airborne asbestos:

(a) Asbestosis: a fibrosis (thickening and scarring)of the lung tissue;

(b) Lung cancer: cancer of the bronchial tubes;

(c) Mesothelioma: cancer of the pleura or peritoneum.

6.2. In asbestos workers other consequences of asbestos exposure can be the development of diffuse pleural thickening and circumscribed pleural plaques which may become calcified. These are regarded as no more than evidence of exposure to asbestos dust.

6.3. Other types of cancer (e.g. of the gastro-intestinal tract) have been attributed to asbestos exposure though the evidence at present is inconclusive.

7. Exposure limits

7.1. The concentrations of airborne asbestos in the working environment should not exceed the exposure limits approved by the competent authority after consulting recognised scientific bodies and the most representative organisations of employers and workers concerned.

7.2. The aim of exposure limits should be to eliminate or to reduce as far as practicable the asbestos health hazards of the workers exposed.

7.3. In accordance with national legislation and practice the exposure levels of airborne asbestos in the working environment should be established:

(a) by legislation; or

(b) by collective agreement or by any other agreements drawn up between employers and workers; or

(c) by any other channel approved by the competent authority after consulting the most representative employers' and workers' organisations.

7.4. The exposure limits should be periodically reviewed in the light of technological progress and advances in technical and medical knowledge concerning the health hazards associated with exposure to asbestos dust and particularly the results of workplace monitoring.

7.5. Exposure limits for airborne asbestos in the working environment adopted in various countries are presented in Appendix I.

8. Monitoring in the workplace

8.1. General

8.1.1. Airborne concentrations of asbestos should be measured in all places of work where a risk of exposure to asbestos dust might occur.

8.1.2. (1) In order to identify the sources of asbestos dust emission and to determine the extent of asbestos dust exposure, static and personal monitoring should be carried out when asbestos or products containing asbestos are produced, handled or used in such a manner as to be liable to evolve airborne dust.

(2) Bulk analysis of the materials should be performed if data on composition are not otherwise available.

8.1.3. Manufacturers of asbestos containing products should make available results of detailed monitoring of representative exposures which could result from the main foreseeable uses of their products, including misuse; such monitoring data should be available to the users and, if appropriate, could avoid the need for them to conduct their own monitoring.

8.2. Static monitoring

8.2.1. In order to obtain indications of the spatial and temporal distribution of airborne asbestos throughout the general atmosphere of the working area, air samples should be taken:

(a) close to sources of emission in order to evaluate dust concentrations or the standard of engineering controls;

(b) at various places in the working area to ascertain

dissemination of asbestos dust; and

(c) from working areas which represent typical exposure

8.3. Personal monitoring

8.3.1. In order to evaluate the risk to the individual worker, air samples should be collected in the worker's breathing zone using personal samplers. Sampling should be carried out while the process is in operation.

8.3.2. Where concentrations of airborne asbestos may vary from one work operation or phase to another, dust sampling should be done in such a manner that the average level, and in any case the maximum exposure of each individual worker, can be determined.

8.3.3. (1) Personal sampling should be done at various times throughout the work shift and should be supplemented by short-term sampling during periods of peak emissions where necessary.

(2) Exposure profiles of particular jobs or occupational categories should be constructed from the air sampling data of different operations and from the workers' exposure time in these jobs.

8.4. Measuring methods

8.4.1. Concentrations of airborne asbestos should be measured according to standardized procedures in fibres per millilitre of air or milligrams per cubic meter (mg/m^3).

8.4.2. Laboratory modifications of the method should be validated by reference to quality control programmes.

8.4.3. The methods and instruments used for monitoring the working environment should be as far as possible the same as those used for establishing or revising the exposure limits. If different methods are used, the results should be appropriately amended.

8.4.4. The measurement of airborne asbestos fibre concentrations in fibres/ml in the workplace air should be made by the membrane filter method (phase contrast light microscopy) as described in Appendix II. All respirable fibres over five micrometers in length should be counted by this method.

8.4.5. The measurement of airborne dust concentrations (mg/m^3) in the workplace air should be made by gravimetric methods as described in Appendix III. The mass of the collected total dust should be determined and, by analysis, the type of asbestos and its mass percentage.

8.4.6. In general direct-reading instruments such as particle counters and dust photometers should only be used for static monitoring and engineering applications. For reliable evaluation of working conditions, these instruments should be carefully calibrated with the workplace dust in question and the results should regularly be related to the membrane filter method.

5. Monitoring strategy

8.5.1. A systematic measuring programme should be dr n up to keep the workers' exposure to asbestos dust under control. For fibre concentrations it should preferably include personal monitoring. Additionally, static sampling where relevant is necessary. The aims of this programme should be:

(a) to ensure that the health of the workers is efficiently protected;

(b) to ensure that the preventive actions which have been taken are still effective;

(c) to ensure that the levels, as measured previously, remain unchanged or fall;

(d) to ensure that any changes made in manufacturing processes or work practices will not lead to an excessive asbestos dust exposure; and

(e) to promote the implementation of more efficient preventive measures.

8.5.2. (1) When an initial hygiene survey is to be carried out, a preliminary visit to the workplace should be made in order to determine the possible sources of airborne asbestos exposure, to decide whether a major survey or a continuous monitoring programme is needed and to establish especially the place and time at which samples are to be taken.

(2) The representatives of the workers assigned to the work in question, the supervisor and occupational safety and health personnel should be consulted.

8.5.3. (1) The monitoring of airborne asbestos concentrations in the working environment should be performed only by skilled personnel with adequate equipment and technical training.

(2) It should be the duty of the employer to arrange for the measuring equipment to be regularly inspected, maintained and calibrated.

8.5.4. The service responsible for monitoring the working environment should be kept informed about any change in plant, equipment, process, materials or work practices likely to bring about any substantial alteration in levels of asbestos dust exposure.

8.6. Record keeping

8.6.1 (1) All relevant data from measurements of airborne asbestos in the working environment should be systematically recorded.

(2) The workers or their representatives, should have access to these records.

(3) Besides the numerical results of measurements, the monitoring data should include for example;

(a) the composition and trade names of materials containing asbestos;

(b) the location, nature, dimensions and other distinctive features of the workplace where static measurements were made; the exact location at which personal monitoring measurements were made and the names and job titles of the workers involved;

(c) the source or sources of airborne asbestos emission, their location and the type of work and operations being performed during sampling;

(d) relevant information on the functioning of the process, engineering controls, ventilation and weather conditions in respect to emission of asbestos dust;

(e) sampling instrument used, its accessories and the method of analysis;

(f) the date and exact time of sampling;

(g) the duration of the workers' exposure, use or non-use of respiratory protection and other comments relating to the exposure evaluation;

(h) the names of the persons responsible for the sampling and analytical determinations.

8.6.2. Individual results of concentration measurements should be recorded and in appropriate cases the time weighted averages of exposure concentration should be calculated and presented.

8.7. Interpretation of data

8.7.1. Any purely numerical exposure estimates should be interpreted only when considered in relation to duration of exposure and other circumstances of work.

8.8. Application of monitoring data

8.8.1. When asbestos dust exposure limits are exceeded, the necessary remedial action should be taken as rapidly as possible in consultation with the workers' representatives.

8.8.2. The relevant monitoring procedures should continue to be applied even if previous results did not exceed the exposure limits.

8.8.3. In the event that monitoring discloses levels which are in excess of the exposure limits, employers should inform the workers of the excess and the action to be taken.

8.8.4. Warning signs and instructions for appropriate means of protection should be provided at each location where concentrations of airborne asbestos fibres may exceed the exposure limits.

9. General preventive methods

9.1. Alternative materials

9.1.1. Whenever possible, harmful substances should be replaced by substances which offer the same technical advantages but which are harmless or less harmful.

9.1.2. When safety considerations call for alternative materials, account should be taken of all health hazards associated with the manufacture, handling, use, transportation, storage and disposal of the alternatives proposed.

9.1.3. In prescribing alternative materials for asbestos, primary consideration should be given to the associated health hazards; and regard should be paid to the technological and economic circumstances which determine the need for the alternatives.

9.2. Methods of control

9.2.1. All appropriate and practicable measures of engineering, work practice and administrative controls should be taken to eliminate or to reduce the workers' exposure to asbestos dust in the working environment to the lowest possible level.

9.2.2. Engineering controls should include mechanical handling, ventilation and redesign of the process to eliminate, contain or collect asbestos dust emissions by such means as:

(a) process separation, automation or enclosure;

(b) bonding asbestos fibres with other materials to prevent dust generation;

(c) general ventilation of the working areas with clean air;

(d) local ventilation of processes, operations, equipment and tools for the prevention of dust dissemination;

(e) use of wet methods where appropriate;

(f) separate workplacesfor certain processes.

9.2.3. Appropriate work practices should be followed where materials or processes are used which may give rise to asbestos dust in the working environment. Such work practices should include:

(a) requirements to use and maintain process machinery, installations, equipment, tools, local exhausts and ventilation systems in accordance with instructions;

(b) damping where appropriate of asbestos products and materials at worksites before processing, handling, using, machining, cleaning, stripping or removing;

(c) regular cleaning of machinery and work areas by appropriate methods;

(d) proper use of personal protective equipment.

9.3. Control programme

9.3.1. Each employer after consultation with workers' representatives should establish and implement a general control programme to reduce the workers' exposure to asbestos dust.

9.3.2. Where appropriate the programme should take due account of the specific features based on the evaluation of each workplace and should include in written form at least the following:

(a) a description of each operation in which airborne asbestos is emitted, the processes and machinery used, the materials handled, control devices, number of exposed workers, job responsibilities of each worker, operating procedures and maintenance practices;

(b) a description of the specific means for controlling exposure to asbestos dust;

(c) engineering plans, safety data sheets, study reports or other relevant technical information;

(d) air monitoring data on the efficiency of control measures;

(e) a description of work practices or administrative controls needed; and

(f) a detailed schedule for implementation of the control programme.

9.3.3. (1) Upon request, the written programme should be made available at the worksite to the labour inspector and the workers' representatives.

(2) It should be regularly revised and updated to reflect the current status of technical and other developments.

(3) The employer should define and assign technical responsibilities in this connection.

9.3.4. Where appropriate in large enterprises specified departments, branches or persons should have special duties in the implementation of the control programme particularly in connection with:

(a) the design of new buildings, equipment, processes and materials;

(b) the purchase of materials, products, machinery or equipment;

(c) the contracts for the supply and maintenance of ventilation systems and other engineering controls;

(d) the information and training given to the workers; and

(e) the purchase and maintenance of personal protective equipment and the provision of instructions in regard to its use.

9.4. Design and installation

9.4.1. The materials, processes and equipment should be so designed that the workers' exposure to asbestos dust is eliminated or reduced to the lowest practicable level.

9.4.2. Manufacturers of machinery, equipment and materials should provide information concerning the nature and level of asbestos dust emissions as well as the means of control.

9.4.3. Workrooms should be designed, built and maintained in such a manner as to:

(a) separate the hazardous operations from the remainder of the premises;

(b) reduce as far as possible surfaces on which asbestos dust and waste may accumulate;

(c) facilitate the cleaning of floors, walls, ceilings and machinery; and

(d) facilitate the collection of asbestos dust which may escape in the event of an incident.

9.4.4. (1) Direct handling of asbestos or materials containing asbestos should be avoided by the use where practicable of automatic processes or by remote control systems.

(2) When practicable, total process enclosures should be designed and constructed for preventing emissions of asbestos dust.

(3) These enclosures should be supplemented with international exhaust ventilation to create a negative pressure inside the enclosure.

9.4.5. Where practicable building materials such as boards, sheets and plates should be so designed, prefabricated and packed in the factory so that no further cutting, drilling or other machining is needed by the user.

9.4.6. Measurements of asbestos dust emissions and workers' exposure should be made as soon as the machinery and equipment have been installed in order to establish that the standard required by the competent authority in those respects has been achieved.

9.5. Local exhaust ventilation

9.5.1. (1) Where total enclosure of the dust-producing process is not practicable, local exhaust ventilation equipment should be provided and maintained.

(2) For efficient operation, the exhaust ventilation should be located as close as possible to the source of dust emission by use of captor hoods, booths or enclosures.

(3) The local exhaust systems should be designed to collect and remove all dust-laden air.

(4) Openings in the enclosures should be as small as possible consistent with access to the necessary work operation.

(5) In the case of captor hoods and booths, the ventilation equipment should be so constructed that air turbulence and eddies created by the process or the workers do not prevent the effective removal of dust.

9.5.2. Local exhaust ventilation (or other effective methods) should be used for such factory operations as, by way of example:

(a) feeding, conveying, crushing, milling, screening, mixing or bagging of asbestos materials;

(b) carding, spinning, weaving, sewing and cutting of asbestos textiles; and

(c) cutting, punching, drilling, sawing, grinding or machining of asbestos cement and friction materials.

9.5.3. (1) The design of local exhaust ventilation systems for any particular process requires special expertise and should therefore be referred to a suitably qualified person.

(2) The nature and quantity of dust emissions should be taken into consideration when:

(a) enclosures are designed;

(b) equipment for air movement, ducting and and dust filtration is selected;

(c) air flow rates and capture velocities are calculated; and

(d) monitoring instruments are chosen.

9.5.4. (1) The supplier of the exhaust ventilation system should test the installation in the presence of the workers' representative and provide the purchaser and the workers' representative with a copy of the test figures obtained.

(2) Checks on the performance of the exhaust system should be periodically made with smoke tests, air flow measurements or by comparing the static pressure readings in the system with the readings recorded at the same points upon commissioning.

(3) A certificate of effectiveness should be issued and made available for inspection.

(4) Asbestos dust collected by the filtration equipment should be regularly removed under strictly hygienic conditions.

9.5.5. All types of dust control equipment should be inspected by a technically competent person under conditions specified by the competent authority.

9.5.6. It should also be the duty of the employer to ensure that such equipment is at all times operated, maintained and serviced in the prescribed manner.

9.6 General ventilation

9.6.1 Where appropriate in conjunction with local exhaust ventilation the entire work area should be supplied with clean air to replace the air as it is exhausted, and to reduce airborne asbestos concentrations.

9.6.2 The flow rates of general ventilation should be sufficient to change the air of the workroom according to safety and health requirements.

9.6.3 The exhausted air should be efficiently filtered and should not be recirculated back to the working environment, except when the following provisions are fulfilled:

(a) the airborne asbestos concentration is substantially less than the exposure level and does not add to the exposure;

(b) the filtration and ventilation system is regularly checked and maintained;

(c) the air quality is monitored by adequate instruments;

(d) approval by the competent authority according to national practices.

10. Personal protection

10.1 Provision and use of respiratory equipment

10.1.1 The use of respiratory equipment should be regarded only as a temporary or emergency measure and not as an alternative to technical control.

10.1.2 Such equipment should be provided for all workers employed in any situation where levels of airborne asbestos fibre exceed or are liable to exceed the exposure limits.

10.1.3 A sufficient and suitable supply of equipment should be available in the workplace.

10.1.4 Workers should be informed when levels of airborne asbestos reach such levels.

10.1.5 When workers have been so informed, they should use the equipment provided.

10.1.6 Workers required to wear protective equipment should be fully instructed in its use.

10.1.7 Employers should provide supervision to ensure that the equipment is properly used.

10.1.8 All respiratory equipment should be provided and maintained by the employer without cost to the worker.

10.2 Selection of respiratory equipment

10.2.1 Only those types of respiratory equipment should be worn which have been tested and approved by the competent authorities.

10.2.2 (1) The competent authorities should provide guidelines for classifying the range of concentrations for which each type of respiratory equipment is recommended. For example:

(a) air-purifying respirators of the negative pressure (half face mask) type;

(b) positive pressure respiratory equipment;

(c) direct air-line breathing apparatus.

10.2.2 (2) The equipment should be selected in consultation with workers' representatives on the basis of the maximum concentration of airborne asbestos likely to be encountered.

10.2.3 Where alternative respirators providing the same standard of protection are available, employers should offer workers a choice to ensure maximum comfort in use.

10.2.4 Where an adequate facial seal cannot be ensured e.g. as in the case of bearded workers, a positive-pressure respirator should be worn, but full protection will not be achieved.

10.3 Training in use of respiratory equipment

10.3.1 All workers required to use respiratory equipment should be instructed in its use.

10.3.2 Instruction should be given on the following points:

(a) the reasons for the use of the equipment, and the importance of using it conscientiously;

(b) the circumstances in which it should be used and how these circumstances should be recognised;

(c) the manner in which the equipment operates;

(d) the correct method of use and of checking the fit;

(e) the method of checking for correct operation;

(f) the need for regular servicing.

10.4 Cleaning, maintenance and storage of respiratory equipment

10.4.1 Respirators should be issued for the exclusive use of the workers to whom they are supplied.

10.4.2 Respirators should be regularly cleaned and serviced by appropriately trained operators before re-issue.

10.4.3 A suitable container such as a metal box or plastic bag should be provided for the storage of individual respirators when not in use.

10.4.4 Cleaning should be undertaken weekly or more often when the respirator is in regular use. Pre-filters on filtered air respirators should be changed and filters checked on each occasion.

10.4.5 A record should be kept for each respirator or air-line apparatus showing the worker to whom it is issued and the dates on which it is cleaned and serviced.

10.4.6 A record of training and instruction in the use of respiratory protective equipment should be made for each worker concerned.

10.4.7 Where respiratory protection is used, this fact should be recorded on the monitoring records of dust exposure for the particular job.

10.5 Protective clothing

10.5.1 Where personal clothing may become contaminated with asbestos dust, the employer, in accordance with national regulations and in consultation with workers' representatives should provide appropriate works clothing.

10.5.2 Where airborne asbestos levels necessitate the use of respirators, special protective clothing should also be provided and worn.

10.5.3 Such special protective clothing should cover completely all works clothing so that no asbestos dust is retained when the protective clothing is removed. Suitable head covering should also be provided.

10.5.4 When re-usable protective or works clothing is provided, separate locker rooms should be available so that contaminated clothing can be stored separately from personal clothing.

10.5.5 Vacuum cleaners for preliminary de-dusting of protective or works clothing should be provided at the entrance to the locker room in which it is removed and stored. Where a respirator has been worn, it should only be removed after de-dusting.

10.5.6 Shower or washroom facilities should be provided and sited between the contaminated and clean locker rooms. They should be cleaned regularly.

10.5.7 Personal clothing should be removed, stored or put on only in the clean locker room.

10.5.8 Regular cleaning and inspection of the contaminated locker room should be undertaken to ensure that no accumulation of asbestos dust occurs.

10.5.9 Special protective clothing should not be worn outside the work area or contaminated locker room.

10.6 Laundering

10.6.1 Provision should be made by the employer for the laundering of protective and works clothing by the undertaking.

10.6.2 Such clothing should be laundered under controlled conditions to prevent the emission of airborne asbestos during handling, transport and laundering.

10.6.3 Where contaminated clothing is sent for laundering outside the factory, it should be packed in dust-proof containers such as plastic bags secured at the neck.

10.6.4 Such containers should be clearly and suitably identified as containing asbestos contaminated clothing.

10.6.5 Care should be taken when a contract laundry is employed that the contractor fully understands the precautions necessary for handling asbestos contaminated clothing.

10.6.6 The laundering of protective or works clothing in workers' homes should be strictly prohibited.

11. Cleaning of premises and plant

11.1 General provisions

11.1.1 Every employer should ensure, as far as is practicable, that the work premises are maintained in a clean state, and free of asbestos waste.

11.1.2 All machinery, plant and equipment should be kept free from dust, together with all external surfaces of exhaust ventilation equipment, and all internal surfaces of the building in which they are operated.

11.1.3 Cleaning should be carried out as far as is practicable by vacuum cleaning equipment or other means so that asbestos dust neither escapes nor is discharged into the air of the workplace.

11.1.4 (1) Where cleaning by a dustless method is impracticable, workers undertaking the cleaning should wear appropriate protective clothing and respiratory equipment.

(2) Such cleaning should be carried out as far as practicable when no other workers are present. If the presence of other workers is necessary they should also wear protective equipment.

11.2 Floors

11.2.1 Floors should be regularly cleared of accumulated dust and waste material.

11.2.2 Floor cleaning should be by vacuum equipment or other means that causes no secondary dust generation. Where mechanical sweepers are used, they should if necessary be modified to ensure that the cleaning operation does not generate airborne dust.

11.2.3 Floor surfaces should be kept in good repair. Cracked or broken surfaces should be repaired. Concrete surfaces should where practicable be treated to produce a surface which can be satisfactorily cleaned of dust.

11.3 Walls

11.3.1 Walls of new buildings should be constructed with smooth surfaces. Walls of existing buildings should be rendered smooth as far as practicable.

11.3.2 Walls should be cleaned annually or more frequently should this be necessitated by the nature of the building or the process.

11.3.3 (1) Walls should be cleaned either by vacuum cleaner or by washing.

(2) If washing is undertaken, the asbestos-containing waste water should be disposed of suitably.

(3) Care should be taken that waste water containing asbestos fibres does not dry out on the floor below.

11.4 Machinery and equipment

11.4.1 Where machinery is fitted with exhaust equipment, the exhaust ventilation should be in operation while cleaning is in progress.

11.4.2 Cleaning should be carried out wherever practicable by vacuum cleaners, with suitable extension leads when required.

11.4.3 Parts of equipment inaccessible to the vacuum cleaner should be cleaned out with oiled brushes where practicable, using vacuum equipment to take up the material so removed.

11.4. Machinery and equipment should, where practicable, be cleaned at the end of each shift. The interval should never exceed one week.

11.5 Overhead structures

11.5.1 Overhead structures of new buildings should be constructed with smooth surfaces and high ledges should be avoided.

11.5.2 Where practicable, dust should be removed by vacuum cleaner, using extension hoses as required, or by other means which causes no secondary dust generation.

11.5.2 Where dustless methods of cleaning are not practicable, protective clothing and respiratory equipment should be worn by all present in the building.

11.5.4 When overhead cleaning is taking place, equipment should be covered by plastic sheeting.

11.6 Vacuum cleaning equipment

11.6.1 Only vacuum equipment with appropriate filters should be used for collecting asbestos dust and waste and should be designed so that the dust cannot escape from the equipment back into the workplace.

11.6.2 Since portable equipment necessarily involves locating the collecting unit within the work area, a suitable high-efficiency filter should be used.

11.6.3 The collection bags within the vacuum cleaning units should be disposable.

11.6.4 (1) In the event of a collection bag within a portable cleaner bursting during use, the unit should be removed from the workplace, if possible into the open.

(2) The burst bag and its contents should be removed and placed inside an impermeable bag by an operator wearing protective clothing and respiratory equipment.

(3) The interior of the cleaner should then be cleared of dust, where practicable with the use of another vacuum cleaner.

11.6.5 The collected material should be disposed of in accordance with the provisions of this code of practice.

12. Storage, handling and transport

12.1 Initial packing of fibre

12.1.1 Asbestos fibre should always be packed in impermeable bags.

12.1.2 Where water-soluble bags are used they should be transported in closed containers without transhipment.

12.1.3 Plastic material used for bags should incorporate an ultra-violet inhibitor for protection of the bags from sunlight during transhipment.

12.1.4 Bags should be closed either by heat sealing or stitching. If stitched, this should be at not less than two stitches per centimetre.

12.1.5 All bags should be printed with an approved label identifying the contents as asbestos and carrying a health warning.

12.2 Packaging for transport

12.2.1 Packaging for transport should eliminate handling of individual bags as far as practicable and should minimise damage to bags which could result in spillage.

12.2.2 Before being transported, bags should be assembled as unitised loads.

12.2.3 Unit loads should be stabilised and protected from damage by the use of plastic covers. These should be applied as shrink or stretch wrapping, or be strapped in position.

12.2.4 The top of the unit as well as the four sides should be covered by plastic which should incorporate an ultra-violet inhibitor.

12.2.5 Where small tonnages are being carried in mixed cargo vessels, the bags should be palletised where practicable in an interlocked fashion.

12.2.6 The bags should be securely attached to the pallet by the shrink wrapping or other techniques used to form the unitised load.

12.2.7 The size of the pallet should be such that the bags overhang on all sides to avoid damaging adjacent bags during the course of loading.

12.2.8 (1) Where very large shipments are to be stowed, pallets should not be used because of the risk of damage to bags during loading or unloading or from cargo movement during the voyage.

(2) An alternative is to support the unitised load on a base of plastic sheet with disposable webbing straps which are then secured over the top of the load for use in lifting. Once removed from the ship these unitised loads should be placed on pallets for further handling.

12.3 Transport

12.3.1 Where practicable, unitised loads other than in very large shipments should be palletised and carried in closed road vehicles or railway wagons for overland and closed containers for overseas shipment.

12.3.2 Loading and unloading should, where practicable be by forklift trucks or equally effective method, to avoid single bag handling and therefore the risk of damaging bags.

12.3.3 Hooks and other sharp equipment should not be used on bags or unitised loads.

12.3.4 Loads carried in containers should be so stacked as to reduce the risk of damage to sacks from the wooden pallets.

12.3.5 All vehicles used for the transport of asbestos should be properly cleaned after they have been unloaded.

12.3.6 Cleaning should be by the use of a vacuum cleaner. Where this is not practicable, surfaces should be thoroughly wetted before being swept.

12.3.7 Where the wrapping of a bag is damaged and spillage of asbestos is likely suitable protective clothing and respiratory equipment should be provided and worn.

12.4 Damaged loads and bags

12.4.1 Suitable adhesive tape should be available for the repair of damaged loads.

12.4.2 Damaged loads should be repaired immediately.

12.4.3 Damaged bags which are not part of unitised loads should be repaired with tape, and if need be placed in a second impermeable bag, sealed and clearly identified before being forwarded.

12.5 Warehousing

12.5.1 Before final storage, all units should be carefully inspected for cleanliness and for damage.

12.5.2 All bags should be palletised.

12.5.3 All damaged bags should be immediately repaired.

12.5.4 All units having loose asbestos or other debris on them should be cleaned by vacuum as soon as possible, or other means that causes no secondary dust generation, and the worker should be provided with appropriate protective clothing and respiratory equipment.

12.5.5 Final storage should be in a warehouse. If outside storage cannot be avoided, units should be protected by tarpaulins, black plastic sheeting or other suitable covering.

13. The disposal of asbestos waste

13.1 Waste avoidance

13.1.1 The creation of asbestos waste should be minimised by the adoption of the most effective production techniques.

13.2 Waste collection

A. Dust

The following measures should be carried out or other equally effective means used.

13.2.1 Bagging of outlets from dust collection hoppers should be designed to make bag-changing easy and to minimise dust leakage.

13.2.2 Bag-changing should only be carried out by persons who have been properly trained for this operation.

13.2.3 Bags of translucent material such as polythylene should be used wherever practicable so that the dust level can be seen and over-filling avoided.

13.2.4 Water-soluble paper sacks should not be used where any risk exists of deterioration by wetting before final disposal.

13.2.5 (1) When filled, the bags should be sealed to prevent the escape of dust during subsequent handling.

(2) Plastic bags should be twisted tightly, folded over and the neck secured in the folded position by wire tie, adhesive tape or other effective method.

(3) Paper sacks should be folded over twice and stapled along the folded edge.

13.2.6 Suitable protective clothing and respirators should be worn when bags on a dust collector are changed.

B. Loose fibre, swarf, floor sweepings

13.2.7 Loose fibre handled by fixed extraction systems should wherever practicable be returned to the production process.

13.2.8 Swarf accumulating around and under machinery should be cleaned by suitable vacuum cleaners.

13.2.9 Loose materials collected by other means should be placed in impermeable bags and sealed.

C. Waste materials from fixing or removing insulation

13.2.10 Floor surfaces where fixing or stripping operations are being carried out should be covered with plastic sheeting which can be folded to form sealed containers.

13.2.11 Provision should be made wherever practicable in the design of machines for the automatic removal of offcuts and their collection in disposable receptacles which can be sealed and removed.

13.2.12 Where automatic removal and collection is not practicable, suitable receptacles which can be closed should be provided.

13.2.13 If asbestos dust emissions from the receptacle occur during use, a dust extraction hood should be provided to prevent the escape of asbestos dust into the workplace.

13.2.14 The supply of receptacles should be sufficient to prevent overfilling.

13.2.15 Receptacles should be sited to minimise asbestos dust emissions in use. Material should be placed in the receptacles in a controlled manner.

13.2.16 Where offcuts and rejects need to be broken down before disposal, this should be done mechanically under suitable exhaust ventilation wherever practicable.

13.2.17 (1) If breakage by mechanical means is not practicable the work should be performed in a separate area such that asbestos dust cannot escape to other working areas.

(2) If appropriate, asbestos dust emission should be minimised by wetting, and workers engaged in this task should wear suitable protective clothing and respirators.

D. Offcuts, broken pieces and rejects of high-density materials

13.2.18 Hard waste such as bonded asbestos, asbestos cement, jointings, bitumastic rubber residues should be stored in such a manner as to ensure that it will not be abraded or crushed while awaiting disposal.

E. Sacks or bags which have contained asbestos

13.2.19 Sacks or bags which have contained loose asbestos fibres should be disposed of by grinding, melting or bagging. Grinding or melting should be carried out under closed conditions adjacent to the bag-opening station.

13.2.20 Where bagging is employed, the used sacks or bags should be collected under strict dust control conditions in impermeable containers such as unused plastic bags, and closed and sealed.

13.2.21 Bags which have contained asbestos fibre should not be re-used for this purpose, but can be recycled.

F. Wet waste: asbestos sludge or slurry

13.2.22 Asbestos waste in the form of sludge or slurry should preferably be recycled or loaded into specially designed carriers or other means used in such a way as to ensure that no spillage occurs which may subsequently dry out.

13.3 Identification and isolation of waste

13.3.1 All asbestos waste awaiting disposal should be adequately identified by markings on the bag or receptacle.

13.3.2 Asbestos waste awaiting disposal should be stored in such a way that it is not exposed to damage likely to cause spillage.

13.3.3. Asbestos waste should not be mixed with other waste for which there are no special disposal requirements. Where practicable, a special area should be set aside for its storage.

13.4. Transport of waste

13.4.1. Asbestos waste, whether loose or in sealed containers, should be transported to the disposal point in such a way that no asbestos dust is emitted into the air during transport.

13.4.2. In the event of accidental spillage (for example, as the result of a road accident) during transport to the disposal site, immediate action should be taken as appropriate to the extent of the spillage.

13.4.3. Where the amount of spilled material is small, the waste should be collected into its original receptacle and reloaded without delay.

13.4.4. If the spillage is substantial and the material dusty, it should be wetted if practicable and covered immediately. The material should then be removed using appropriate safety precautions, which may include protective clothing and respiratory equipment.

13.4.5. Written instructions on the action to be taken in the event of accidental spillage should be issued to drivers of vehicles carrying asbestos waste.

13.5. Disposal of waste

13.5.1. Before a site is used for the disposal of asbestos waste, care should be taken to establish that it is both suitable and acceptable for the purpose.

13.5.2. The disposal site chosen should have vehicular access to the working face, or to a hole or trench dug to receive the asbestos waste.

13.5.3. The waste should wherever practicable be deposited at the foot of the working face, of the landfill site or into the bottom of an excavation dug for it.

13.5.4. Where the waste has to be deposited over the working face, or into an excavation, care should be taken to avoid spillage from bags.

13.5.5. All waste other than high density waste when deposited should be covered to an acceptable depth (for example 20-25 cm) as soon as possible. No asbestos waste should be left uncovered at the end of a working day.

13.5.6. Final covering of asbestos waste should be to a minimum depth of 2 metres.

13.5.7. If wet waste is tipped, it should be covered in the same way as dry waste to prevent the escape of asbestos dust on drying out.

13.5.8. Wet pits should not normally be used for disposal of asbestos waste other than high density material.

13.5.9. Where high density waste is deposited on a dry site, care should be taken to ensure that it is not ground to dust by the passage of vehicles over it.

13.6. Personal protection and hygiene

13.6.1. Workers occupied in the collection, transport or disposal of asbestos waste who may be at risk of exposure to airborne asbestos should be provided with suitable protective clothing and respiratory equipment.

13.6.2. Where vehicles and reusable receptacles and covers have been in contact with asbestos waste, they should be cleaned after use using a vacuum cleaner or an alternative dustless method.

13.7. Supervision

13.7.1. Where an undertaking disposes of its own asbestos waste, written instructions should be issued to the workers concerned. Periodic supervision should be undertaken to ensure that the necessary safety precautions are being followed.

13.7.2. If a waste disposal contractor is employed, the relevant sections of the code should be incorporated in the contract.

13.7.3. The contract should state that the contractor is responsible for ensuring that safety measures are observed at the disposal site.

13.7.4. Periodic checks should also be made by the undertaking to ensure that the contractor is observing the code.

13.8. Besides what has already been stated, appropriate measures should be taken to prevent pollution of the soil, subsoil, air and water.

14. Supervision of the health of workers

14.1 General

14.1.1 Workers with occupational exposure to asbestos should be provided with supervision of their health. Medical guidelines are suggested in Appendix IV.

14.1.2 This supervision is designed for the benefit of workers individually and collectively.

14.1.3 Workers submitting themselves to supervision of their health should have the following rights:

(a) confidentiality of personal and medical information;

(b) full and detailed explanations of the purposes and results of the supervision;

(c) the right to refuse invasive medical procedures which infringe the integrity of their bodies.

14.1.4 A medical examination of the potentially asbestos-exposed worker should take place upon recruitment and prior to assignment to a place of work involving asbestos dust exposure.

14.1.5 Supervision of health should be provided at no expense to the exposed worker, and medical examinations should, so far as practicable, be conducted during working hours.

14.1.6 Results of medical examinations should not be used to discriminate unfairly against the worker or prospective employee.

14.1.7 The aim of this supervision also include:

(a) advice to and care of individual workers;

(b) health education;

(c) identification of workers requiring workers' compensation;

(d) statistics of occupational disease;

(e) research.

14.2 Organisation

14.2.1 Workers' health supervision should include:

(a) pre-assignment medical examinations;

(b) periodic medical exa

(c) medical examination a acticable, following cessation c

14.2.2 The objective signment medical examination should be:

(a) to determine any cond. d be a contraindication to occupational asbestos exposure;

(b) to establish baseline records for future supervision of the health of workers;

(c) to educate and advise workers about the risks associated with asbestos exposure.

14.2.3 The objectives of the periodic medical examination should be:

(a) to detect the earliest signs of asbestos-related disease;

(b) to detect any significant change in health status relative to the baseline examination;

(c) to continue to educate and advise the workers about health risks, and to ensure that appropriate preventive measures are being taken to minimise risk.

14.2.4 Workers should be informed of the results of their medical examination. They should be informed if, in the occupational physician's opinion, they are suffering from an asbestos-related disease. Copies of the worker's medical record should be made available to the worker or upon request of the worker to his physician.

15. Records

15.1. General considerations

15.1.1. Records should be kept by the employer on aspects of asbestos dust exposure. Such records should be clearly marked by date, work area and plant location.

15.1.2. Access to these records should be available to exposed workers and, except where such access infringes on trade secrets, to trade unions and government agencies.

15.1.3. The individual medical record should be maintained by the appropriate physician unless released to the individual worker or his personal physician, subject to the explicit consent of the worker. It is recognised that governmental agencies with authority and responsibility for occupational health research, and which will maintain the confidentiality of the medical record, may be given access to such records for specific research investigations.

15.1.4. Records regarding all aspects of asbestos dust exposure should be maintained for a 30-year period as far as practicable following termination of employment. Records dealing with asbestos sources, product composition and asbestos content, environmental concentrations in the workplace, and the medical information may be reduced to microfilm for storage. All chest radiographs should be retained as originally collected.

16. Information, labelling, education and training

16.1. General considerations

16.1.1. Because of the importance of cigarette smoking as a risk factor which interacts with asbestos particularly

in relation to bronchogenic carcinoma, specific information regarding the importance of cigarette smoking as a risk factor in this disease and in causing other health effects should be provided to all groups concerned with occupational exposure to asbestos dust.

16.2. Labelling and data sheets

16.2.1. All asbestos containing products should have an internationally recognised warning symbol designating the product as asbestos-containing and warning the user that inhalation of asbestos dust may cause serious damage to health.

16.2.2. Where practicable, asbestos-containing products should be accompanied by a safety data sheet or other approved form containing information such as:

(a) the product designation on both front and back to facilitate filing and retrieval;

(b) the name and address of the manufacturer or supplier of the product;

(c) the chemical or widely recognised common name of all asbestos ingredients;

(d) the approximate percentage by weight or volume (indicate basis) which asbestos bears to the whole mixture;

(e) health hazard data including dangerous properties of asbestos;

(f) detailed procedures for cleaning up and safe disposal of asbestos leaked or spilled, to include proper labelling and disposal of containers retaining residues or contaminated materials;

(g) requirements for personal protective equipment, such as respirators and protective clothing;

(h) any other general precautionary information regarding handling the product.

16.2.3. All work areas where asbestos dust may cause a hazard should be clearly posted as an abestos dust exposure area through the use of a well-displayed sign which identifies the hazard as asbestos dust area and the associated health effects.

16.2.4. The information on the warning label and poster should be written in the vernacular language understood by the workers.

16.3. Education and training

16.3.1. All workers should, on employment and periodically, be provided with education and training in regard to sources of asbestos dust exposure, potential health effects, risks associated with asbestos dust exposure and smoking, and methods of prevention. This educatiom and training should be provided by the employer utilising written, oral, visual and worker participation approaches in order to ensure adequate awareness of health risks, methods of prevention and proper work practices.

16.3.2 All categories of personnel involved in the prevention of the asbestos related diseases such as: managers, technicians, trade union representatives, labour inspectors, administrators, safety and health personnel, etc. should be given appropriate training.

16.3.3 Specialised training should be provided for occupational hygienists regarding sampling, analytical and engineering aspects of asbestos dust exposure.

16.3.4 Occupational physicians and other occupational health personnel should have specialised training regarding health effects associated with asbestos dust exposure, chest radiography, technical aspects of collection and interpretation of pulmonary function tests and principles of screening.

PART B: CONTROL OF ASBESTOS EXPOSURE IN SPECIFIC ACTIVITIES

The list of acceptable measures, as detailed below, is not necessarily exhaustive. Only fully acceptable measures may be taken.

17. Mining and milling

17.1. Opencast mining

17.1.1. Dust generated by drilling operations should be controlled by extraction equipment mounted on the drills.

17.1.2. Dust emissions from blasting should be minimised by using multiple small blasts wherever practicable rather than one large blast.

17.1.3. Roadways should be regularly wetted in order to reduce to a minimum the creation of asbestos dust.

17.2. Underground mining

17.2.1. Mining should only be carried out when an adequate water supply is available.

17.2.2. Underground working places should be kept wet continuously during working shifts.

17.2.3. The floor of every main travelling road underground should be kept wet.

17.2.4. Hanging and foot walls should be regularly washed down to prevent the accumulation of dust.

17.2.5. Ore discharged into bins or ore passes and at conveyor transfer points should be wetted.

17.2.6. After blasting, workings should only be entered after time has been allowed for ventilation to clear dust, smoke and fumes.

17.2.7. The rock walls and broken ore should be properly wetted before the area is entered.

17.2.8. All underground dead ends should be effectively ventilated.

17.3. Crushing and screening

17.3.1. Control of dust during ore crushing and screening should be by exhaust ventilation to a cyclone and bag-house.

17.3.2. Where new plant is installed, the higher efficiency of bag extraction is to be preferred.

17.3.3. Vibrating screens, owing to their higher potential for dust generation, should be in leak-tight enclosures, with nylon or other suitable flexible connections to the feed chutes.

17.4. Chutes

17.4.1. Chutes feeding belts either from other belts or other equipment should always be enclosed.

17.4.2. Chutes should feed axially where practicable.

17.4.3. Long vertical drops cause puffing of dust and should be avoided. Chutes should be run at angles to reduce the velocity of the material fed to the conveyor.

17.4.4. Chute design should enable sufficient quantities to be carried without plugging; chutes should therefore be adequate in cross-section and run at angles which minimise liability to blockage.

17.4.5. The chute enclosures should be free of leakage and yet allow ready access.

17.4.6. Access doors should be leak-proof.

17.4.7. Where ore-containing rocks are being conveyed and bolted steel plate is used, the unions should be gasketted.

17.4.8. Where fibre only is conveyed, seams may be welded but should be leak-tight.

17.5. Conveyors

17.5.1. All conveyors should be totally enclosed.

17.5.2. Belt width and speed should be adequate to carry the material within the rubber skirting at each side, so that material is not forced out of the conveyor.

17.5.3. The return belt should in all cases be cleaned by scrapers or rotating brushes.

17.5.4. Where practicable it should also be enclosed.

17.5.5. Dust exhaust connections should be installed at intervals along belt conveyor enclosures.

17.5.6. Exhaust connections should be sited particularly at chute feeding points and conveyor junction points, since air pressure is generated there by movement of material.

17.5.7. They should also be sited at the exits from the conveyor enclosure, where otherwise dust would be pumped into the mill.

17.5.8. Dust connections should normally be attached to the conveyor enclosures by means of a settling box to reduce the exhaust velocity and minimise the extraction of materials.

17.5.9. The exhausted air should be passed to a baghouse, possibly preceded by a cyclone separator or electrostatic precipitator.

17.5.10. The air used in aspiration and pneumatic conveying of fibre, after passing through cyclone collectors, should also pass to the main baghouse.

17.5.11. Final emissions to atmosphere should be within the prescribed control limits for the general atmosphere.

17.6. Packing

17.6.1. Separation, grading and mixing should be carried out without manual intervention as part of the totally enclosed milling operation.

17.6.2. The finished fibre should also be weighed, compressed and packaged automatically.

17.6.3. These processes should take place in enclosed booths with adequate dust exhaust ventilation.

17.6.4. Fibre should be packaged in impermeable bags.

17.6.5. Filled bags should be assembled in unitised loads securely fastened for mechanical handling.

17.6.6. Unitised loads should, where practicable, be further enclosed in a cover of impermeable material.

17.7. Tailings

17.7.1. For the disposal of tailings wider conveyor belts operating at slower speeds should be used in preference to high speed belts.

17.7.2. Conveyors should operate close to the dump to minimise wind-borne dust. This may be facilitated by the use of swing conveyors.

17.7.3. High-speed conveyor-flingers should not be used.

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17.7.4. Where practicable, tailings should be wetted at or before the point of deposition.

17.7.5. Baghouse dust should be adequately damped before it is deposited with the tailings.

18. Asbestos cement

18.1. Fibre preparation

18.1.1. Where asbestos fibre is supplied in paper or plastic bags these should be opened and emptied automatically whenever practicable.

18.1.2. If bags are opened by hand this should be carried out in an enclosed booth under negative pressure.

18.1.3. Bags should be placed as close as possible to the hopper or feed chamber.

18.1.4. The contents of the bag should be discharged without shaking.

18.1.5. Empty bags should be disposed of immediately under / the same dust extraction system to prevent the release of asbestos dust to the atmosphere.

18.1.6. Where the booth enclosure and exhaust ventilation are insufficient to prevent the release of asbestos dust to the air of the workplace, the workers present should wear respiratory protective equipment.

18.1.7. The delivery of the fibre to the storage chamber and any subsequent weighing and mixing with other materials should be under enclosed conditions with automatic control.

18.1.8. Exhaust ventilation with negative pressure should be maintained within the enclosure to prevent leakage of asbestos dust.

18.2. Handling finished products

18.2.1. At the end-stage of manufacturing, or wherever asbestos-cement products are being handled in large quantities, mechanical handling equipment should be employed when practicable.

18.2.2. (1) Individual boards, sheets or other products, when moved manually, should be placed with care on the stack or other resting site.

(2) Dropping and dragging of finished products should be avoided.

18.2.3. All storage of asbestos cement products on site should be within a designated area.

18.2.4. The designated area should be maintained in a clean condition.

18.3. Finishing operations within the factory

18.3.1. All power-sawing, drilling, sanding or milling machines should be fitted with efficient dust extraction equipment. Low-volume high-velocity air systems are usually the most suitable for this purpose. It is recommended that slow running tools with hard metal teeth be used.

18.3.2. The equipment should be designed to remove loose dust and swarf from the cut edges.

18.3.3. Where appropriate, boards should be treated with a sealing solution for dust suppression on surfaces and edges.

18.3.4. Boards should be cut singly where practicable.

18.3.5. The surfaces of all dry sheets which require finishing should be vacuum cleaned before stacking, where there is a risk of air-borne asbestos.

18.3.6. (1) Dust and swarf should be removed from the workplace by vacuum cleaning.

(2) Where this is not practicable, the material should be thoroughly wetted before removal.

18.3.7. Where maintenance work is carried out within enclosures, on dust filters or in other situations of higher dust exposure, protective clothing and respiratory equipment should be provided and worn.

18.3.8. (1) The provision of personal protective equipment should be accompanied by training in its use.

(2) Changing rooms, storage lockers and laundering should also be provided in accordance with this Code of Practice.

18.4. Work on site

18.4.1. Asbestos cement products should, where practicable, be delivered to the site ready for use, without need for further processing which may generate dust.

18.4.2. Hand or slow running tools producing coarse dust or chips should be used where practicable rather than high speed machines or those which cut by abrading the material.

18.4.3. When high speed power tools are used, they should be fitted with efficient dust extraction equipment designed for the purpose.

18.4.4. Abrasive or masonry discs should not be used for cutting asbestos material.

18.4.5. (1) Sheets to be fixed in an overhead position should be drilled, trimmed or rasped before they are in place.

(2) Where it is necessary to work on sheets in an overhead position, a respirator should be worn.

18.4.6. (1) Work-areas should be kept clean from cutting dust by the use of portable vacuum equipment.

(2) Where this is not practicable floors should be thoroughly wetted before sweeping.

18.5. Waste disposal

18.5.1. Broken pieces and off-cuts of asbestos cement material should be collected and disposed of in a manner which does not generate dust.

18.5.2. Loose swarf and dust collected from fabrication processes should be wetted where practicable and placed in sealed impermeable bags or dealt with in another approved manner in accordance with national regulations.

19. Textiles

19.1. Fibre preparation

19.1.1. Where asbestos fibre is supplied in paper or plastic bags these should be opened and emptied either automatically or in an enclosed booth under negative pressure.

19.1.2. In either case there should be provision for the collection and disposal of empty bags within the same dust extraction system to prevent the escape of respirable dust into the work area.

19.1.3. The delivery of fibre from the hopper to the machine employed for opening and elimination of non-fibrous material should be by full enclosure with a hood.

19.1.4. The fibre should be fed into the machine mechanically and discharged under enclosed conditions with negative pressure into the storage chamber.

19.1.5. Where blending is required with other grades of asbestos fibre or with cotton or man-made fibres, input and output should be automatically controlled, the blending itself taking place within an enclosed chamber. Blending should not be carried out by hand-mixing or in open spaces.

19.2. Carding

19.2.1. Where practicable, direct mechanical or pneumatic feed from the blending operation to the card input should be employed. Alternatively the fibre should be transported in a dust-tight container.

19.2.2. Where a container is employed, it should be discharged into the card in a way which minimises dust escape. This may be achieved by joining the container outlet with the entry aperture of the hopper.

19.2.3. The card or group of cards between the fibre hopper and condenser should be interlocked with the working of the machine.

19.2.4. Dust should be collected wherever possible and not be allowed to escape into the card enclosure or into the general atmosphere. Negative pressure should be maintained within the enclosure through the exhaust ventilation system.

19.2.5. Where entry into the enclosure is required while the machines are running, appropriate respiratory protection should be worn.

19.2.6. Specific dust extraction points should be located close to the working surface of the card, particularly where pressure points are created by the carding action.

19.2.7. Where laps and rope lagging are being produced, the delivery conveyor from the doffer cylinder should deliver the material for subsequent processing and packing within an enclosed and ventilated chamber.

19.2.8. (1) Where rovings are produced, operators engaged in removing them from the card should be protected by ventilation directing the air away from them and into the card enclosure.

(2) This should be additional to the negative pressure within the enclosure.

19.2.9. Rovings should be transferred to the spinning section in a way which minimises dust generation.

19.2.10. Where it is necessary to remove dry waste from the roving package, this operation should be carried out under a ventilated hood.

19.2.11. Hand stripping of cards should not be permitted.

19.2.12. (1) Cards should be stripped by the use of a revolving cylindrical brush mounted on a traversing mechanism mounted on the cylinder grinding brackets.

(2) The brush should be connected to the dust extraction system, which should be of the low volume/high velocity type.

19.2.13. Small card rolls should be cleaned and ground on frames fitted with an enclosed hood provided with dust extraction.

19. 3. Spinning, doubling and winding

19.3.1. Where practicable the primary control of dust should be by wetting. This may be accomplished either (1) by wetting packages for the machine feed or (2) by applying moisture to the roving ends by passing them through water as they are fed to the spinner.

19.3.2. Dust extraction should also be employed for additional control.

19.3.3. Automatic stop spindles or other means should be used and dry waste removed by vacuum to minimise dust generation from broken or loose ends.

19.3.4. Where pot spinning frames are employed, the pot should be maintained under negative pressure.

19.3.5. Where flyer frames are used, low/speeds and good maintenance should be observed in addition to wetting and dust extraction.

19.3.6. Dust control of doubling operations should also be achieved by feeding wet packages or by applying moisture to yarn ends, together with dust extraction and the use of automatic stop spindles and dry waste removal by vacuum.

19.3.7. Cops should be wound wet by applying moisture to the yarn.

19.3.8. (1) Traverse winding and cheese winding equipment should be enclosed and fitted with dust extraction.

(2) Dust control in this operation should where practicable be made easier by the use of a temporary enclosure such as overlapping transparent plastic strips to cover the working entrance of the enclosure, thereby minimising the volume of air to be extracted while maintaining easy operator access and vision.

19.4. Weaving

19.4.1. Where practicable, control should be by both moisture and dust extraction.

19.4.2. Warp beaming should utilise heavy humidification by means of spray nozzles with wet feed packages as an addition or an alternative.

19.4.3. (1) Creel warping should also use wet packages where practicable.

(2) Where this process has to be carried out with dry materials, the creel should be partially enclosed by curtains.

(3) Local exhaust ventilation of the reed and winding point on the beam should be installed.

19.4.4. Fabric weaving should utilise wet packages, spray nozzles or wet rolls wherever practicable.

19.4.5. Dust extraction should also be employed.

19.4.6. Dust control in finishing processes, such as inspection, calendering and drying may be helped by the application of a dust suppressant treatment or finish to the material.

19.4.7. Violent manual or mechanical handling should be avoided.

19.4.8. Woven materials should be cut, not torn.

19.4.9. Dust extraction and, where practicable, water sprays should also be employed.

19.5. Braiding and plaiting

19.5.1. Wherever practicable moisture or dust suppressant treatment should be applied.

19.5.2. Where this is not possible the equipment should be enclosed.

19.5.3. A portion of the enclosure should be of transparent plastic to allow the operator to see the process.

19.6. Packaging

19.6.1. Rolls of cloth and coils of tape should be packaged by low-speed application of plastic wrapping.

19.6.2. Yarns, rope and rovings may be packed in cartons. These should be dust-tight with tape seals.

19.6.3. Where practicable, shrink-wrapping should be employed to give total encapsulation of individual units such as fabric or spools of yarn.

19.7 Fabrication using asbestos cloth

19.7.1. Where practicable, only cloth should be used which has been specially treated to reduce dust emission.

19.7.2. Handling of cloth and cut pieces should be reduced to a minimum.

19.7.3. All rolls of cloth, when not in use, should be stored in impermeable wrapping. Part-used rolls should be replaced in their wrapping when not in use.

19.7.4. After being unwrapped for use the rolls should have a mandrel inserted through the centre to facilitate handling.

19.7.5 (1) On the cutting table the mandrel should be mounted on brackets at the end clear of the table surface and the cloth should be unrolled from the top of the roll.

(2) Cloth should not be pulled from a free-standing roll across the surface of the table.

19.7.6. Backed cloth should be unrolled with the asbestos face downwards.

19.7.7 Working surfaces on which cloth is handled, cut or sewn should be smooth to minimise abrasion.

19.7.8. Asbestos cloth should be cut with shears, guillotine or mechanical cutter. It should not be torn or frayed.

19.7.9. Rotary cutters, if used, should be fitted with dust extraction equipment.

19.7.10. When cutting or sewing untreated cloth, the top surface should be well damped.

19.7.11. Off-cuts retained for later use should be stored in closed containers.

19.7.12. Finished products should be sealed in impermeable wrapping before despatch.

19.8. Mattress making

19.8.1. After marking out the mattress pattern, the cloth should be thoroughly damped in the areas to be cut.

19.8.2. Electrically operated rotary knives fitted with dust extraction equipment should be used where practicable.

19.8.3. Both cloth and yarn should be damped before stitching.

19.8.4. Stitched mattress covers should be housed in suitable closed receptacles during transfer to the filling area.

19.8.5. Asbestos fibre used for mattress filling should be dispensed within enclosures under exhaust ventilation.

19.8.6. (1) Operatives employed in filling mattresses with asbestos fibre should be equipped with protective clothing and respiratory equipment unless dust measurements indicate that the enclosure and extraction control the dust adequately.

(2) A transparent window in the exhaust hood will facilitate handling the fibre from outside the enclosure.

19.9. Insulation cladding

19.9.1. When asbestos cloth is used for insulation on site, special care should be taken to ensure that the procedures concerning handling of materials and collection of waste are followed.

19.9.2. Dust suppression by thorough damping before cutting and stitching should be employed wherever practicable.

19.9.3. When asbestos cloth is used extensively for lagging, protective clothing and respiratory equipment should be worn.

19.10. Rope lagging

19.10.1. Asbestos rope lagging which has been treated to reduce asbestos dust emission should be used whenever practicable.

19.10.2. (1) Rope lagging should be supplied, transported and stored in impermeable wrapping.

(2) Damaged bags should be repaired with adhesive tape or by over-slipping with new bags.

19.10.3. (1) Handling of rope lagging should be minimised where possible by planning in advance the number and length of pieces required for the work in hand.

(2) When lengths have been cut from a coil the rope ends should be re-sealed.

19.10.4. Partly used coils should be re-bagged and the bag securely sealed between working periods.

19.10.5. When cutting and pipe-wrapping, the laggers should wear protective clothing and respiratory equipment.

19.10.6. When extensive rope-lagging is being carried out, the work area should be separated from other areas or the work carried out at times when workers without respiratory protection are absent.

19.11. Waste

19.11.1. Waste material should not be allowed to accumulate. It should be placed in identified impermeable bags.

19.11.2. Controlled wetting of waste should also be employed where practicable to reduce asbestos dust emission during bag sealing or in case of bag rupture.

19.11.3. Bags should be sealed before removal from the work site for disposal.

19.11.4. Working areas should be kept clean by regular use of suitable vacuum equipment.

20. Encapsulation or removal of friable thermal and acoustic insulation

20.1. Identification

20.1.1. Before repair or replacement of thermal or acoustic insulation thought to contain asbestos is planned, the presence and type of asbestos should be positively identified.

20.2. Indications for removal

20.2.1. Asbestos insulation should be removed:

(1) When it is breaking away from the base or

(2) when the insulation is likely to be abraded or otherwise damaged or

(3) when the surface is very friable or

(4) when the resultant concentration of airborne asbestos dust is above exposure limit.

20.3 Enclosure of the working area

20.3.1 Where dust is liable to escape from the working areas all external openings from the working area, including windows and doors, should be adequately sealed with adhesive tape or isolated by sealed plastic sheeting to prevent the escape of asbestos dust.

20.3.2 Where the working area forms only part of the building it should be enclosed or isolated by impervious plastic sheeting of adequate strength and firmly supported.

20.3.3 Care should be taken to ensure that asbestos dust cannot escape at points where pipes and conduits pass out of the working area.

20.3.4 (1) Ventilation should be provided which maintains the whole working area under negative pressure to prevent asbestos dust leakage.

(2) The extracted air should pass through an appropriate filtration mechanism before being exhausted to atmosphere.

20.3.5 Exit/entry air locks should be constructed at points of access to the working enclosure.

20.3.6 All entry points should carry warning notices prominently displayed which forbid entry to anyone not wearing suitable protective equipment.

20.3.7 At the end of each work period, the air extraction equipment should remain in operation for at least 15 minutes after stripping has ceased.

20.4 Monitoring of dust and enclosure efficiency

20.4.1. Before stripping is begun a smoke generator should be used within the enclosure to test its effectiveness.

20.4.2. (1) A visual inspection of the enclosure should be carried out at the beginning of each working period.

(2) This should be confirmed at longer intervals by further smoke testing.

20.4.3. Any defect found on inspection or testing should be remedied immediately.

20.4.4. (1) Air monitoring for respirable asbestos fibre should be carried out just outside the working area.

(2) A first count should be taken before starting work to provide a base line and then between one and two hours after starting the asbestos stripping to test the effectiveness of the enclosure.

20.4.5. (1) Where visual examination of the enclosure indicates, or any one fibre count taken outside of the working area is found to exceed permitted exposure limits, stripping work should at once be stopped until any defect in the enclosure has been remedied.

(2) A further air sample should then be taken after the same interval following the resumption of work.

20.4.6. Further asbestos dust monitoring should be carried out at intervals as work proceeds, and following each move of the enclosure when this occupies only part of the total area to be stripped.

20.5 Hygiene

20.5.1. Provision should be made for decontamination which should include:

(1) protective clothing;

(2) shower facilities;

(3) storage for clean and contaminated clothing;

(4) provision for the collection and cleaning or disposal of contaminated clothing.

20.5.2. The decontamination unit should be sited immediately adjacent to the working site or as close as is reasonably practicable.

20.5.3. The decontamination unit should consist of a contaminated area, a shower area and a clean area.

20.5.4. The contaminated area should have provision for:

(1) vacuum dusting or hosing down contaminated clothing and footwear;

(2) storage of contaminated clothing and footwear;

(3) exhaust ventilation creating negative pressure.

20.5.5. The shower area should be heated (except where inappropriate) and should provide an adequate supply of warm water.

20.5.6. The clean area should have provision for:

(1) storage of clean clothing;

(2) ventilation under positive pressure.

20.5.7. Where the decontamination unit is at a distance from the worksite, and where walking between the two necessitates passing through a closed clean area, a further overall should be provided.

20.5.8. Neither food nor tobacco should be taken within the worksite.

20.6 Respiratory protection

20.6 .1. All persons entering the working site should wear approved respirators.

20.6 .2. Operators engaged in stripping by dry methods should, where practicable, use positive pressure respirators operated in the continuous flow mode.

20.6 .3. Positive pressure respirators should also be used by operators whose beard prevents an effective seal between face and mask.

20.7 Supervision

20. 7 .1 All operators should receive careful instruction in the maintenance of workplace cleanliness and personal hygiene and in the importance of adherence to decontamination procedure.

20. 7 .2 A competent supervisor should be designated who will be responsible for (1) ensuring that all dust control procedures are adhered to and (2) that air samples are taken as necessary to ensure that airborne asbestos fibre levels outside the worksite are below the prescribed exposure limits.

20.8 Encapsulation

20.8.1 Total enclosure and sealing of the site should be carried out

(1) where the surface is liable to cause airborne dust when the sealant is applied;

(2) where the surface has to be broken, e.g. to remove loose surface debris or to provide anchorage for new cladding.

20.8.2 The surfaces to be sealed should be cleaned with a vacuum cleaner fitted with a high efficiency filter to remove all debris and dust particles in order to ensure good adhesion of the coating to be applied.

20.8.3 All damaged areas should be repaired where necessary to ensure a suitable profile for the encapsulation system.

20.9 Site preparation

20.9.1 Before starting work suitable barriers and "no access" warning notices should be set up at a distance from the site.

20.9.2 Within the site, moveable equipment should be cleaned with vacuum equipment to prevent the transfer of loose asbestos and then moved outside the area.

20.9.3 Fixed plant should be vacuum cleaned and covered as far as practicable with impermeable sheeting sealed with tape.

20.9.4 Floors and walkways should be covered with impermeable sheeting sealed with tape to allow easy collection of loose asbestos and final cleaning.

20.10 Dry stripping

20.10.1 Dry stripping is associated with very high levels of asbestos dust. It should therefore only be used:

(1) where wet methods cannot be used;

(2) where live electrical apparatus might be made dangerous by contact with water;

(3) where hot metal is to be stripped, and the use of water may be damaging.

20.10.2 Where dry stripping is employed, a standard of separation as effective as possible between the working site and adjacent areas should be preserved to prevent asbestos dust escaping.

20.10.3 All workers within the separated area should be provided with and should use suitable respiratory equipment and protective clothing.

20.10.4 Surfaces from which the insulation has been removed should be sealed to prevent later release of remaining fibres to the air.

20.10.5 Waste should be removed as far as practicable in small pre-cut sections with as little disturbance as possible to minimise airborne asbestos.

20.10.6 Waste should be either placed immediately into suitable wetted containers, or removed with the aid of high-power vacuum suction.

20.10.7 Waste containers should be sealed and identifiable.

20.11 Wet stripping

20.11.1 Before removal is started, care should be taken that the asbestos material is saturated with water. This may be made easier by the addition of a water-wetting agent.

20.11.2 Where cladding has to be removed it should first, where practicable, be punctured and the asbestos containing material within the cladding thoroughly wetted; the cladding should then be removed carefully within the enclosure and surfaces vacuumed or sprayed with water.

20.11.3 The water saturated material should be removed in small sections, placed immediately in labelled containers and then sealed.

20.11.4 Any slurry produced should be contained and not discharged to drains without adequate filtration.

20.11.5 Slurry should not be permitted to dry out on surfaces, but should be fully removed while still wet.

20.11.6 Surfaces from which insulation has been removed should be sealed to prevent later release of remaining fibres to the air.

20.11.7 Electrical equipment in the area should be isolated from the entry of water.

20.11.8 At the end of the work a competent person should ensure that it is safe for the electrical supply to be restored.

20.11.9 Working areas should be separated.

20.11.10 All workers within the separated area should use suitable respiratory protective equipment and protective clothing.

20.12 Stripping by high-pressure water jets

20.12.1 This specialised method should only be carried out by trained personnel with all precautions relevant to the operation. Special safety precautions are required including:

20.12.2 The safety provisions concerning high pressure water jetting should be fully observed.

20.12.3 Warning notices marked: "Danger. High pressure spraying" should be displayed in addition to the other stripping warning notices.

20.12.4 The working area should be isolated as for other stripping techniques.

20.12.5 All electrical equipment should be isolated.

20.12.6 At the end of the work electrical supply should not be restored until passed as safe by a competent person.

20.12.7 (1) The slurry produced should be collected by pump into suitable containers for disposal.

(2) It should not be allowed to enter the drainage system.

20.13. Decontamination procedure

20.13.1. All loose fibre should be removed by vacuum cleaner from overalls, shoes and respirators.

20.13.2. All clothing should be removed and stored in lockers provided.

20.13.3. Operators should then pass through to the shower room, and shower thoroughly.

20.13.4. They should then pass through to the clean area, dry and dress and leave through the clean area door.

20.13.5. When starting work, operators should enter the clean end, remove all clothing and store them in lockers provided.

20.13.6. They should then fit a clean appropriate respirator and pass through the shower section to the contaminated area where overalls, footwear and gloves as appropriate should be put on.

20.13.7. Entry should then be made direct into the worksite.

20.13.8. Where the decontamination unit is situated at a distance from the worksite and passage through a clean zone is necessary, a two-stage airlock should be provided at the worksite.

20.13.9. When starting work, clean overalls (instead of work clothing) should be put on in the contaminated area.

20.13.10. These overalls should be removed on entry to the first (clean) airlock at the worksite and stored in lockers provided.

20.13.11. Operators should then pass through to the second (contaminated) air lock and put on work clothing, then pass on through to the worksite.

00821 20.13.12. Vacuum cleaning equipment for removing loose asbestos dust from clothing should be available for use after work in the contaminated section of the air lock at the worksite.

20.13.13. After vacuuming loose asbestos dust, all clothing and footwear should be removed and operators should then move to the clean section of the air lock and put on their overalls.

20.13.14. Operators should then return to the decontamination unit, entering through the contaminated area and following the procedure outlined above.

20.13.15. The decontamination unit and the double air lock, where this is required, should be regularly cleaned and serviced.

20.14 Waste disposal

20.14.1 Asbestos waste should be placed into suitable containers immediately on removal.

20.14.2 Waste should not be permitted to remain on floors or other surfaces of the workplace at the end of the working period.

20.14.3 Suitable containers should be impermeable.

20.14.4 When filled they should be sealed to prevent the escape of asbestos dust.

20.14.5 Before removal, the external surface should be cleaned and removed to an area set aside for such waste.

20.14.6 Either the bags or the separate storage area should be clearly identified as containing asbestos.

21. Friction materials

21.1 Fibre preparation and mixing

21.1.1 Raw fibre should only be supplied in closed containers, such as impermeable paper or plastic bags. Where practicable these should be opened by automatic means and discharged directly into closed mixing systems.

21.1.2 Where bags of fibre have to be opened manually this operation should only be carried out within a partial enclosure equipped with air extraction ventilation sufficient to control all asbestos dust emissions during bag opening.

21.1.3 Dry mixing operations should only be undertaken in enclosed systems under negative pressure.

21.1.4 Local exhaust ventilation (dust extraction) should be provided at feed points for additives and at discharge openings

21.1.5 Where wet mix or plasticised materials are used in open systems waste and dried out residues should be cleared by vacuum cleaning equipment or other dustless methods.

21.2 Transfer of mixed compound to moulding and forming

21.2.1 Wherever practicable, totally enclosed systems should be provided for transfer of compounds from the mixing area to processing machinery.

21.2.2 Where manual methods of transfer have to be employed, closed containers should be used and arrangements designed for coupling containers direct to processing machinery in a manner which eliminates dust emission.

21.2.3 If tipping or manual transfer of compounds from transit containers to process machinery is necessary, suitable dust extraction equipment should be provided to prevent the dispersion of fibre dust into the workroom.

21.3 Pre-forming, forming, curing and moulding machines

21.3.1 Automatic systems for dispensing fibre compounds to press moulding boxes should be used where practicable.

21.3.2 Suitable dust extraction equipment should be fitted to all points of possible asbestos dust emission.

21.3.3 Fettling of moulded components should only be carried out under local exhaust ventilation.

21.3.4 Goods in process in transit from one machine or section to another should be conveyed in closed systems or containers.

21.3.5 High pressure jet lubrication of moulding plates and tools in curing presses should be designed to minimise over-spray and air movement.

21.4 Finishing operations

21.4.1 Suitable dust extraction equipment should be fitted to all finishing machines which drill, bore, grind, finish or otherwise abrade friction components.

21.4.2 Wet pads or aerosol sprays should, where practicable, be used to remove or suppress dust adhering to components.

21.4.3 Finished components should, where practicable, be dipped or sprayed with a suitable dust suppressant.

21.4.4 Inspection of finished components for quality control purposes should be carried out on tables equipped with dust extraction.

21.4.5 Finished components should be shrink wrapped or otherwise sealed in dust-proof packaging before final dispatch.

21.5 Reclamation of materials

21.5.1 Disintegrators, milling machinery or grinding plant used to reclaim waste material should operate in an enclosed booth under negative pressure ventilation.

21.5.2 Reclaimed material should be transferred back into the process either automatically within an enclosed system or in sealed containers.

21.6 Processing friction materials in factory conditions

21.6.1 Asbestos dust generated by asbestos friction materials delivered in bulk should be removed by vacuum cleaning prior to handling.

21.6.2 Suitable dust extraction equipment should be fitted to every cutting, drilling or grinding machine. The extraction equipment should be of the low-volume high-velocity type.

21.7 Use of friction materials in workshop

21.7.1 Where practicable, friction materials should be supplied already cut, machined or drilled to requirements.

21.7.2 Hand or slow-running tools producing coarse dust or chips should be used where practicable rather than high-speed machines or those which cut by abrading the material.

21.7.3 Fixed working points or machines should have a suitable dust extraction system installed.

21.7.4 (1) Portable tools should be fitted with an inbuilt dust extraction unit.

(2) Low-volume high-velocity systems are usually the most appropriate for these applications.

21.7.5 Where linings, blocks and clutch facings are rivetted, dust extraction equipment should be installed.

21.7.6 (1) All exhaust ventilation equipment should be inspected and tested regularly by a competent person at regular intervals not exceeding seven days.

(2) A record of every inspection should be made and retained.

21.8 Servicing of brakes and clutches in garages and workshops

21.8.1 Compressed air or dry brushing should not be used to remove accumulated dust from brake and clutch assemblies when removing worn friction materials, except when this is carried out within an extraction box equipped with exhaust ventilation.

21.8.2 (1) Removal of dust should be by vacuum cleaner fitted with a high efficiency filter.

(2) If this is not available, dust should be removed with a damp cloth or one moistened with light mineral oil.

21.8.3 (1) Where practicable, friction material should be cut to length with shears.

(2) Power saws or abrasive discs should not be used unless exhaust ventilation is in operation.

21.8.4 Where products are machined, dust extraction equipment should be fitted.

21.8.5 (1) Before applying adhesive to bond segments to brake shoes, surface dust should be removed with a damp cloth, or one moistened with light mineral oil.

(2) Dust should not be removed by tapping or by compressed air.

21.8.6 (1) Loose swarf and dust should be removed from the workplace by vacuum cleaning.

(2) Where this is not practicable, the material should be thoroughly wetted before removal.

21.9 Waste disposal

00827 21.9.1 Loose swarf and dust collected from fabrication processes should be placed in an impermeable container, such as a plastic bag, and sealed.

21.9.2 The sealed bags should be disposed of in accordance with the provisions of this code of practice.

21.9.3 Broken and worn linings should be similarly disposed of.

22. Handling of asbestos fibre in ports and container terminals

22.1. Packaging

22.1.1. All asbestos fibre to be handled by waterside or terminal workers should be packed in airtight bags.

22.1.2. The packages should be made up into unitised loads securely fastened by banding.

22.1.3. The unitised loads should be securely fastened in packages on suitable pallets or straps which can be moved by hoist, fork-lift truck or other mechanical handling equipment without damage.

22.1.4. When standard international containers are used, the shipper should ensure that all projections inside the container are adequately shielded to avoid damage to the packages in transit.

22.2. Handling

22.2.1. Each shipment should be inspected before handling to ascertain if any breakages or spillages of asbestos have occurred in transit.

22.2.2. Hooks or other sharp equipment should not be used on bags or unitised loads.

22.2.3. Unitised loads should be lifted intact into and out of ships' holds and on and off land transport by hoists, fork-lift trucks or other mechanical handling equipment.

22.2.4. The equipment should be properly engaged in the pallets or other forms of joint packages.

22.2.5. Unstable loads should be stabilised before lifting.

22.2.6. Stacking of loaded pallets should be carried out without damage to the pallets.

22.2.7. Except where the packages of asbestos are carried in sealed containers, suitable vacuum cleaning equipment of sufficient capacity should be available on site at all times when asbestos is being handled.

22.3. Spillages

22.3.1. Suitable adhesive tape should be available for the repair of damaged loads.

22.3.2. Damaged bags which are not part of unitised loads should be repaired with adhesive tape.

22.3.3. Unitised loads which have been damaged to a minor extent should be sealed with adhesive tape where this is practicable.

22.3.4. Where extensive damage to a unitised load has occurred, it should be broken down, the damaged bags repaired and repacked and the pallet should then be restowed.

22.3.5. All spilt material should be cleaned up by vacuum equipment.

22.3.6. Collected waste should be placed in impermeable bags for disposal.

22.3.7. Containers, cargo holds, decks, vehicles and storage areas which may have been contaminated by spillage should be cleaned by vacuum or other dustless method.

22.3.8. All workers engaged in the collection and rebagging of loose asbestos resulting from spillage should be provided with protective clothing and appropriate respirators.

22.3.9. Overalls or other protective clothing should be used for one shift only and changing facilities should be provided.

22.3.10. Facilities should be available to ensure that protective clothing is suitably cleaned and laundered, and that respirators are properly maintained and serviced.

23. Construction

23.1. All material to be used on site and containing asbestos should be labelled in such way as to alert the user to the potential health hazards involved, and the appropriate precautions.

23.2. (1) Where a large amount of work has to be carried out on asbestos containing materials, this should be on a portion of the site set aside for the purpose.

(2) Where practicable, a shed or a separate part of a building should be allocated for this work.

23.3. The provisions of this Code should be followed for all work on asbestos cement materials, and also on all other asbestos containing products such as asbestos boards and tiles.

23.4. Materials containing asbestos in bonded form, such as caulking compounds and bituminous damp coursing, should, when sanded or otherwise abraded, be subject to appropriate precautions.

23.5. At regular intervals, and at the end of each work period, the provisions on waste disposal of this Code should be followed.

24. Demolition and alterations

24.1. Demolition and alterations of buildings or fixed or moveable structures (e.g. ships), where it has been previously identified that they contain substantial amounts of asbestos-containing insulation materials liable to become airborne, should be performed only by persons or bodies acceptable to the competent authority in accordance with national practices. Where it is subsequently discovered that those asbestos materials are present or where it is of a limited nature, then specialised contractors should undertake that part of the work.

24.2. It should be the responsibility of these authorised persons or bodies to identify asbestos containing insulation or lagging before demolition commences and ensure the safe removal and disposal of the material in accordance with the provisions of the national regulations.

24.3. All sprayed thermal or acoustic insulation, lagging and loose insulation of a fibrous nature should be regarded as containing asbestos until otherwise established.

24.4. (1) For positive identification the samples should be analysed in a suitably equipped laboratory.

(2) The result of material identification should be reported to the competent authority with a report detailing the proposed removal programme where the material has been identified as containing asbestos.

24.5. The authorised persons or bodies to perform the demolition or alteration work should ensure that the requirements of the competent authority have been fully satisfied before proceeding with demolition or alteration.

24.6. All workers engaged in the work of demolition or alteration should be informed of any areas where asbestos based insulation remains and the authorised persons or bodies should ensure that this material is not accidentally disturbed.

24.7. All workers engaged in the work of demolition or alteration should be made aware of the health hazards and that the work should be performed in accordance with the prescribed safety and health regulations.

PART C: APPENDICES

I. Exposure limits in various countries

II. Principles of the membrane filter method for the determination of airborne asbestos fibre concentration by light microscopy

III. Principles of the gravimetric method of measuring airborne dust containing asbestos at the workplace

IV. Recommendations concerning medical examinations

APPENDIX I

EXPOSURE LIMITS IN VARIOUS COUNTRIES

(as at October 1983)

;NTRY	REGULATIONS	LIMIT VALUES	REMARKS
.tralia	National Health and Medical Research Council	Amosite 1 f/ml Chrysotile 1 f/ml Crocidolite 0.1 f/ml	
stria	July 1980	1,250 particles/cm^3 (dust containing < 2.5% asbestos) 600 particles/cm^3 (dust containing 2.5-15% asbestos) 300 particles/cm^3 (dust containing 15-50% asbestos) 150 particles/cm^3 (dust containing > 50% asbestos)	
lgium	January 1980	Amosite 2 f/ml Chrysotile 2 f/ml Crocidolite 0.2 f/ml	
ınada	Special regulation in each province	The Province of Ontario adopted in 1982 Amosite 0.5 f/ml Chrysotile 1 f/ml Crocidolite 0.2 f/ml	Other provinces including Quebec still have a TWA of "less or equal" to 2 f/ml for asbestos in genera

COUNTRY	REGULATIONS	LIMIT VALUES	REMARKS
Cyprus	Amendment 1981, No. 1705	2 f/ml for all types of asbestos	
Denmark		Crocidolite 0.1 f/ml 1 f/ml all other types	
Finland	23 September 1976	2 f/ml - for all types of asbestos	
France	Decree No. 77-949, 17 September	2 f/ml - for all types of asbestos	
Federal Republic of Germany	1 July 1982	1 f/ml - for all types of asbestos	
India	Model Rule 123-A under section 112 of the Factories Act	Amosite 0.5 f/ml Chrysotile 2 f/ml Crocidolite 0.2 f/ml Other forms 2 f/ml	
Indonesia		4 f/ml - for all types of asbestos 1 f/ml for Amosite and Chrysotile	Crocidolite given no standard but understood to be banned
Ireland	1972, 1975	2 f/ml - for Chrysotile and Amosite 0.2 f/ml for Crocidolite	
Israel	January 1980 March 1982	1 f/ml - for all types of asbestos	

COUNTRY	REGULATIONS	LIMIT VALUES	REMARKS
Italy		2 f/ml - for all types of asbestos	
Japan	Japan Industrial Health Society, 1981	0.2 f/ml for Crocidolite 2 f/ml - for other types of asbestos	
Netherlands	October 1983	Chrysotile 2 f/ml Crocidolite forbidden	
Nigeria	Draft Code of Practice	2 f/ml - for all types of asbestos	
New Zealand	24 August 1981	Actinolite, Amosite, Anthophyllite, Chrysotile, Tremolite: (a) 1 f/ml over any 4 hours' exposure (b) 6 f/ml over any 10 minutes' exposure Crocidolite: 0.2 f/ml over any 10 minutes' exposure	
Norway	May 1983	Amosite and Tremolite 0.5 f/ml Crocidolite 0.2 f/ml All other asbestos 2.0 f/ml	
Spain	August 1982	2 f/ml - for all types of asbestos	

COUNTRY	REGULATIONS	LIMIT VALUES	REMARKS
Sweden		1 f/ml - for all types of asbestos (except Crocidolite)	
United Kingdom	1 January 1984	Chrysotile 0.5 f/ml Crocidolite 0.2 f/ml Amosite 0.2 f/ml as from 1 August 1984	
USA	1 July 1976 OSHA	2 f/ml - for all types of asbestos (currently under revision)	TVLs recommended by ACGIH (American Conference of Governmental Industrial Hygienists), 1982: Amosite 0.5 f/ml Chrysotile 2 f/ml Crocidolite 0.2 f/ml Other forms 2 f/ml
USSR	GOST 12-1-005-76	Dust containing over 10% asbestos 2 mg/m^3 Asbestos-cement 6 mg/m^3 Asbestos-bakelite 8 mg/m^3	
ZAMBIA is adopting the following:	1 January 1984	Chrysotile 0.5 f/ml [Crocidolite 0.2 f/ml] Amosite 0.2 f/ml Other types of asbestos 1 f/ml	Crocidolite is not imported into Zambia

APPENDIX II

Principles of the membrane filter method for the determination of airborne asbestos fibre concentrations by light microscopy

1. A sample is collected by drawing a measured quantity of air through a membrane filter by means of a battery-powered sampling pump. The filter is later transformed from an opaque membrane into a transparent optically homogeneous specimen. The fibres are then sized and counted using a phase contrast microscope. The result is expressed as fibres per millilitre of air, calculated from the number of fibres on the filter and the measured volume of air sampled.
2. Personal samples are taken within the workers' breathing zone, i.e. within a hemisphere of 300 mm radius extending in front of the face and measured from a line bisecting the ears.
3. An open-faced filter holder fitted with a cylindrical cowl is fastened to the jacket lapel of the worker with the cowl pointing downwards.
4. Static samples are taken at fixed locations.
5. Membrane filters (mixed esters of cellulose or cellulose nitrate) of 1.2 micrometer pore size with printed grids and a diameter of 25 mm should be used.
6. A portable battery-operated pump - for personal sampling carried on the worker's belt or in a pocket - must be used. The flowrate should be adjusted to 1.0 l/min $\pm$ 5 per cent, i.e. approximately 4 cm/s face velocity. The difference of the flowrates before and after sampling should not be greater than 10 per cent.

7. The minimum filter loading should exceed 50 fibres/mm^2 (i.e. approximately 40 fibres/100 Walton-Beckett graticule areas).
8. The maximum filter loading should normally not exceed 5 fibres/graticule area (average value for all counted fields), but never 10 fibres/graticule area.
9. Sampling time should be measured accurately.
10. Mounting of the total filter is preferred on a microscope slide using the acetone-triacetine method.
11. A binocular microscope in phase-contrast should be used for counting and should be assessed by means of "Detection Limit Test Slides" (UK Health and Safety Executive Test Slide Block 5 should be achieved).
12. The microscope should have the following features:
    - Koehler illumination;
    - Abbe or achromatic phase-contrast condenser incorporated into a substage unit;
    - built-in mechanical specimen stage fitted with slide clamps and X-Y displacement;
    - rotating nose-piece fitted with 10 x and 40 x parfocal phase-contrast achromatic objectives. The 40 x objective must have a numerical aperture (NA) of 0.65, achromatic. The phase ring absorption should be in the range 65-85 per cent. Either positive or negative phase-contrast is suitable;
    - binocular eyepieces of the compensating type giving a total magnification of between 450 x and 500 x, preferably 500 x. At least one eyepiece must permit

the insertion of a graticule and be of the focusing type;

- a Walton-Beckett circular eyepiece graticule with an actual diameter - when using the 40 x phase objective and an appropriate eyepiece - of 100 micrometer ± 2 micrometer checked against a stage micrometer.

13. Counting and sizing fibres:

- a countable fibre is any object having a diameter less than 3 micrometer and a length greater than 5 micrometer and a length to diameter ratio greater than 3:1, and which does not appear to touch any particle with a diameter greater than 3 micrometer;
- a countable fibre with both ends within the graticule area shall count as one fibre; a fibre with only one end within the area shall count as half a fibre;
- graticule areas for counting shall be chosen at random within the exposed area of the filter;
- an agglomerate of fibres which at one or more points on its length appears to be solid and undivided but which at other points appears to divide into separate strands (a split fibre) is regarded as a single countable fibre if it meets the definition in indent 1 of this paragraph, the diameter being measured across the undivided part, not the split part;
- in any other agglomerate in which fibres touch or cross one another (a bundle), these fibres shall be counted individually if they can be distinguished sufficiently

to determine that they meet the definition in indent 1 of this paragraph. If no individual fibres meeting the definition can be distinguished, the bundle is a countable fibre if the bundle as a whole meets the definition in indent 1;

- if more than one-eighth of graticule area is covered by an agglomerate of fibres and/or particles, the graticule area must be rejected and another counted;
- at least 100 fibres shall be counted with a minimum of 20 graticule areas examined; no more than 100 graticule areas need to be examined.

14. The mean number of fibres per graticule is calculated by dividing the number of fibres counted by the number of graticule areas examined.

15. The contribution to the count due to contamination shall be kept below 3 fibres/100 graticule areas or 10 per cent of the actual sample fibre count/100 graticule areas and shall be assessed using blank - unused - filters.

16. Concentration in air (fibres/ml) = [effective filter area (mm^2) x mean number of fibres per graticule area] / [graticule area (mm^2) x volume of air collected (ml)].

17. All calculated values less than 0.1 f/ml should be reported only as "less than 0.1 f/ml". All higher values should be rounded off to the first decimal place.

For practical purposes, it is recommended to consider further details which may be obtained from:

Asbestos International Association
Health and Safety Publication
Recommended Technical Method No. 1 (RTM1) January 1982

- REFERENCE METHOD FOR THE DETERMINATION OF AIRBORNE ASBESTOS FIBRE CONCENTRATIONS AT WORKPLACES BY LIGHT MICROSCOPY (Membrane filter method)

APPENDIX III

Principles of the gravimetric method of measuring airborne dust containing asbestos at the workplace

1. General

1.1. Airborne dust concentrations should be measured in the vicinity of various items of equipment.

1.2. Airborne dust concentration measurements must be effected in the breathing zone, account being taken of the main technical processes which could produce such asbestos-containing dust. In making such measurements, samples are to be taken at a height of 1.5 m from the floor or the ground.

1.3. Airborne dust samples are taken by drawing air through an analysis filter. Two samples are simultaneously taken at each point of measurement. The filters should be placed vertically or slightly inclined.

1.4. Where a team of workers are employed in an area where airborne dust concentrations are being monitored, a sufficient number of samples must be taken to enable an accurate determination of the airborne dust to be made, i.e. at least five samples.

1.5. Measurements of airborne dust concentrations should be accompanied by measurements of environmental temperature, relative humidity and air flow rate. Five sets of measurements should be taken in a working day.

1.6. When airborne concentrations of dust at workplaces are monitored periodically, one sample may be taken at each workplace in order to determine the overall maximum concentration. In such cases, the sampling period should not exceed 30 minutes.

1.7. Where air flow rates are in excess of 3 m/s, as may occur when monitoring airborne dust concentrations in factories, quarries, etc., special nozzles should be used to ensure equal air velocities and rates of aspiration. Deviations should not exceed ± 20 per cent.

1.8. Measurements shall be considered to be correct if the difference in airborne dust concentrations between two samples taken at the same time and the difference between the average characteristics of any two samples taken during a given working day do not exceed 25 per cent. Should the variation be greater, additional measurements shall be taken in order to determine the reasons for such variations.

2. Materials and equipment for measuring airborne dust concentration

2.1. In gravimetric monitoring of airborne dust, synthetic or glass fibre filters are used. Membrane and ash-free paper filters may also be used. Preferably, filters with a moisture content not in excess of 0.5 per cent should be used. Analysis filters should retain at least 95 per cent of the dust. The margin of error in measurements of the air volume sampled should not exceed ± 10 per cent.

2.2. The instruments used for monitoring should enable concentrations of airborne dust to be determined with a precision of 0.3 of the permitted concentration, sampling time not being limited.

2.3. Instruments used for monitoring airborne dust concentration shall meet the following requirements:

- errors in the measurement of dust collected on the analysis filter shall not exceed ± 10 per cent;
- errors in measurements of the quantity of air passing through the filter shall not exceed ± 10 per cent;
- the total error in the measurement of airborne dust containing asbestos shall not exceed ± 25 per cent.

2.4. Other instruments used for monitoring shall meet the following requirements:

- error in determining temperature shall not exceed $\pm$ 0.5°C;
- error in determining relative humidity shall not exceed $\pm$ 5 per cent of the sampling time up to five minutes;
- error in determining air flow rates shall not exceed $\pm$ 0.05 m/s when measured indoors and $\pm$ 0.5 m/s when measured out-of-doors.

3. Order in which measurements shall be taken

3.1. The weight of a clean filter should be ascertained and the volume of air passing through the filters should be adjusted to the maximum in accordance with the manufacturers' recommendations.

3.2. Analysis filters should be numbered. The weight of each filter, before and after sampling, shall be entered in the laboratory registers. The registers should also show the mass of the airborne dust deposited on the filter.

3.3. Analytical filters, properly weighed, shall be kept in smooth paper envelopes or special cassettes.

3.4. Once the filters have been inserted, the aspirator is connected and the rate of air flow for each filter is set. An even rate should be maintained throughout the sampling process. At the same time temperature, relative humidity and the velocity of the air at the sampling point should be measured. Having completed the sampling, the filter should be folded in half (with the dust deposit inside) and placed in an envelope or a cassette.

3.5. The mass of the airborne dust collected on the filter should not be less than 1.5 mg, if the total weighing error does not exceed $\pm$ 0.15 mg and, if the total weighing error is $\pm$ 0.05 mg, the weight of the dust collected should be at least 0.7 mg/m^3.

3.6. The method of dust sampling should always be so selected as to enable the weight of dust collected to be in excess of the minimum. The sampling time should not exceed 30 minutes and the airborne dust concentration should be 50 per cent of the permitted maximum. Minimum air sampling time should be five minutes.

Comment: Aspirators with an air flow of 20 l/min may be used. When the minimum weight of the dust collected is 1.5 mg, the airborne dust concentration will be $\geqslant$ 5 mg/m^3. When the minimum weight of the dust collected is 0.7 mg, the airborne dust concentration will be $\geqslant$ 2 mg/m^3.

The most suitable aspirators are those with an air flow of 50 l/min. or more, as these enable airborne dust concentrations to be measured over a wide range with a sampling time of not more than 30 minutes.

4. Calculation of airborne dust concentration

4.1. Airborne dust concentration is calculated using the following formula:

$$C = \frac{(m_1 - m_o)\ 1{,}000}{V} \quad mg/m^3$$

where m_o and m_1 in milligramns represent the mass of the filter before and after sampling, and where V in l/min. represents the quantity of air sampled.

4.2. Before effecting the analysis, all of the results of the airborne dust concentration monitoring have to be converted to normal conditions, i.e.:

- air temperature 20°C;
- relative humidity 50 per cent; and
- barometric pressure 103 kPa.

4.3. The results obtained from airborne dust concentration measurement shall be analysed to obtain average and maximum values for a given workplace, a given work area and a given operation.

4.4. For measuring the size and number of asbestos fibres the rate of aspiration should be of 1 l/min. The filters shall firstly be mounted using the "acetone-triacetone" method. The fibres shall then be measured using optical microscopy followed by counting.

APPENDIX IV

Recommendations concerning medical examinations

1. General

1.1 The recommendations of this appendix are intended as medical guide-lines. Occupational physicians may wish to supplement these provisions to meet local needs and to assist in proper evaluation of individual cases.

1.2 The health personnel responsible for health examination of workers shall have free access to their workplaces and to the data on monitoring of the level and duration of exposure to asbestos dust. When necessary, they may require additional measurement of exposure.

2. Structure of the medical examination

2.1 Pre-assignment medical examination of workers for asbestos dust exposure should include:

(a) a case history to include occupational history with an emphasis on the respiratory system, previous occupational exposures, and smoking history;[1]

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[1] The ILO publication entitled Respiratory Function Tests in Pneumoconioses, Occupational Safety and Health Series No. 6 1966, provides a copy of the MRC (United Kingdom, Medical Research Council) Short Questionnaire on Respiratory Symptoms; which remains a useful questionnaire with which to assess respiratory symptoms, occupational history and smoking history.

(b) a general physical examination, with an emphasis on the respiratory system; and

(c) a full-sized postero-anterior chest radiograph to be obtained and interpreted using the most recent ILO guide-lines;[1]

(d) spirometry, in order to obtain representative forced vital capacity (FVC) measurements and forced expiratory volume in one second (FEV_1);

(e) additional test as necessary for diagnostic purposes, particularly in high-risk groups of workers.

2.2 Periodic medical examination for asbestos dust exposure should include:

(a) a brief medical and occupational history including smoking habit;

(b) a physical examination, with an emphasis on the respiratory evaluation;

(c) a full-sized postero anterior chest radiograph to be obtained and interpreted using the most recent ILO guide-lines;

(d) spirometry to obtain a representative FVC and FEV_1;

(e) additional tests as necessary for diagnostic purposes, particularly in high-risk groups of workers.

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[1] The ILO 1980 International Classification of Radiographs of the Pneumoconioses, Occupational Safety and Health Series No. 22 (Rev. 80), provides a detailed description of the international classification, standard films, guidance notes on radiographic equipment and technology, and a suggested reading sheet.

2.3 Medical examinations following sickness will depend largely upon the nature of the sickness. Should the sickness be thought to be possibly work-related, further documentation is indicated.

2.4 Upon the cessation of employment, a full medical evaluation, which would include a review of all medical tests previously obtained, should be performed. A decision should be made whether further follow-up of the health conditions of the worker is advisable, taking into account the duration and level of the past asbestos dust exposure and the health conditions of the worker. If so, the frequency of examinations should also be recommended.

2.5 Workers who have developed possible asbestos-related disease should, if appropriate, be referred to medical specialists for detailed diagnostic evaluation, assessment of the work-relatedness of the disease, and assessment of health impairment.

2.6 The competent authority should establish a registry to which all cases of asbestos-related diseases should be reported.

3. Frequency of medical examinations

3.1. The frequency of periodic medical examinations should be established by the competent authority, according to national practices, taking into account the duration and level of asbestos dust exposure and health status. In the absence of established national practice, the competent authority should draw up a medical surveillance programme based on the most recent medical knowledge.

4. Results and interpretation

4.1. The results of all medical examinations and supplementary examinations and tests should be placed in the individual worker's medical file and be held in medical confidence.

4.2. Fitness for any particular job should be certified by a suitable certificate containing no medical data.

4.3. Under certain circumstances, it may be desirable to prescribe appropriate measures or conditions in order to certify the worker's fitness for a particular job.

5. Radiographic evaluation

5.1. Radiographic evaluation of the asbestos dust exposed worker should be based on the ILO 1980 International Classifications of Radiographs of the Pneumoconioses, or any subsequent revision.

5.2. Additional radiographic examination may be required for diagnosis in individual cases.

6. Pulmonary function evaluation

6.1. A device used to record FVC and FEV_1 is recommended, which provide a tracing of volume-time or volume-flow during the entire forced expiration. The tracing should be stored and available for recall.

6.2. Additional examination of respiratory function may be necessary for appropriate diagnosis, particularly in subjects with evidence of respiratory symptoms or functional impairment on spirometry.

PART D: GLOSSARY

In this Code of practice the following terms have the meaning shown:

Adequate or suitable: quantitatively or qualitatively appropriate method used to protect the worker.

Competent authority: minister, official service or any other public authority having the power to issue, approve or implement decrees, orders, regulations or other provisions having the force of law concerning the prevention of airborne asbestos in the working environment.

Contamination: the air pollution of the working environment by a harmful substance or agent.

Dust: airborne sholid particulate matter, the particle size being greater than a fume; dusts are usually produced by the mechanical cutting, abrasion or erosion of a solid.

Asbestos dust: airborne or settled fibrous particles which may become airborne.

Total dust: all types of airborne dust particles which are collected during sampling.

Respirable dust: the fraction of the total inspirable dust which can enter the respiratory tract.

Respirable fibres: any organic or inorganic structure with a geometric diameter less than three um and of which the length is at least three times the diameter.

Exposure Limit: In this code the term exposure limit is that concentration in air, commonly expressed in terms of 8 hours/ days and 40 hours/week, which is considered acceptable by the competent authority responsible for setting such limits and is considered to minimise or avoid the hazard to health. The exposure limit does not constitute an absolute dividing line between harmless and harmful concentrations. This term covers the various expressions employed in the national lists such as "maximum allowable concentration", "threshold limit value", "permissible level", "limit value","average limit value", "permissible limit", "time-weighted average",etc.

Forced expiratory volume in one second (FEV_1): volume of gas which can be exhaled from the lungs in one second by forced expiratory effort starting from a position of full inspiration.

Forced vital capacity (FVC): volume of gas which is exhaled during a forced expiration starting from a position of full inspiration and ending at complete expiration.

Hazard: probability of impairment to health following exposure to a harmful substance or agent.

Health: state of complete physical, mental and social well-being and not merely an absence of disease or disablement.

Monitoring: systematic surveillance of the hazards to which workers are exposed; it may be carried out by measuring certain parameters of the working environment, particularly the concentrations of airborne toxic substances, or by measuring biological parameters.

Static monitoring: samples taken at fixed locations.

Occupational hazard: probability of impairment to health following exposure to a harmful substance or agent in the working environment.

Scientific body: a public or private research institute or specialised laboratory.

Spirometer: instrument for measuring the vital capacity of lungs and its subdivisions.

Waste: solid or liquid residue from industrial, commercial, research, or any other activities.

Screening has been defined as the presumptive identification of unrecognised disease or defect by the application of tests, examinations or other procedures which can be applied rapidly. Screening helps to identify apparently healthy individuals who have a disease or some defect from those who probably do not have it. It may be used selectively for a special purpose (e.g. chest radiography) or for special groups (age, occupation, etc.).

Mass screening means examining or testing a large number at one time or from time to time, or where the tests are undertaken in series over a longer or shorter period of time.

Epidemiology is the study of the distribution and determinants of health status, or, more restrictively of diseases in human populations. The epidemiological approach to health and diseases can contribute to the identification of hazards in the working environment, as well as the health effects of changes in the working environment.

Works clothing:	the clothing put on by the worker on arriving at the factory and taken off on leaving;
Protective clothing:	the additional special clothing required for particular jobs;
Asbestosis:	a fibrosis (thickening and scarring) of the lung tissue which develops slowly, usually after many years of exposure;
Lung cancer:	(cancer of the bronchial tubes): this is a similar type of cancer to that associated with cigarette smoking and there is evidence to suggest that the two factors of asbestos exposure and cigarette smoking are synergistic;
Mesothelioma:	this is a cancer of the pleura or peritoneum which, while rare in the general population, is much more common among asbestos workers after a latency period of 20 to 40 years or longer. No relationship has been found between mesothelioma and the smoking habit.

Pleural changes: the development of diffuse thickening of the pleura sometimes associated with impairment of lung function or circumscribed pleural plaques which may become calcified and are unlikely to have adverse health effects in themselves.