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INSULATION

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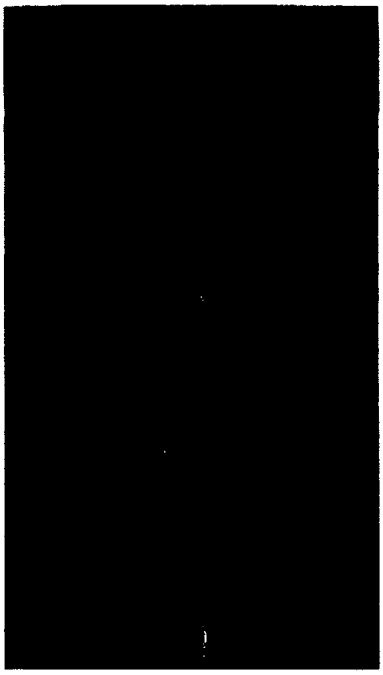
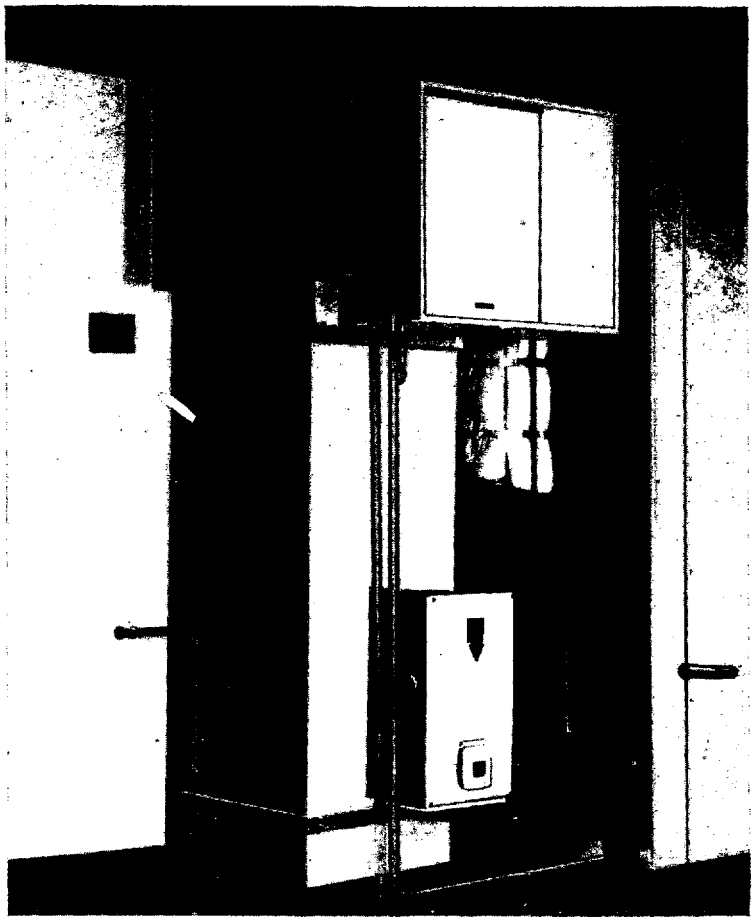
INSULATION





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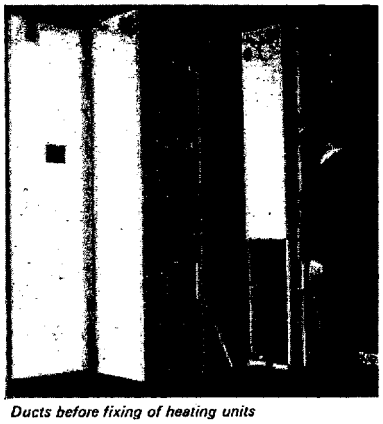

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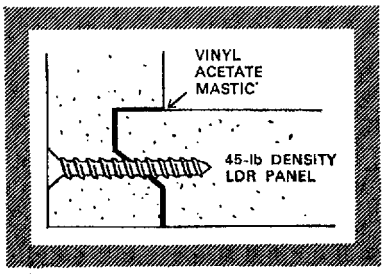

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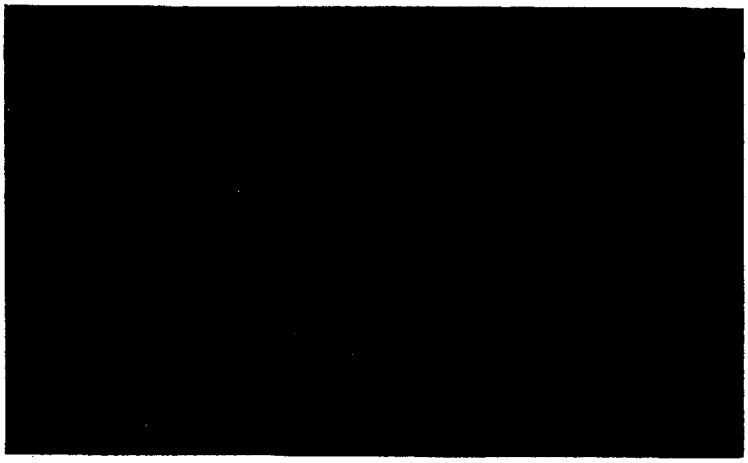

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T&N A TURNER & NEWALL COMPANY

ASBESTOS

ESTOS has been the subject of verse publicity in the last few due to the health r'sk involved its manufacture and installation. nobody would deny that these e present, there is an acute danger casual observer, and indeed the asual observer, might fail to see od for the trees. Asbestos is ble not only as a thermal r, fireproof and acoustic material uilding and insulation industries, as a brake lining material for or industry, and as a raw material manufacture of fireproof suits, as numerous other industrial tions involving safety. Current into the connection between s dust and cancer may cause an al outcry in certain sections of mmunity, but any connection ay be must be seen in true tive. While there are now cur- 29,000 deaths each year as a f lung cancer, less than 50 cases thelioma are being reported each t all of which have any relation- h asbestos. In 1966 there was of 64 deaths resulting from with asbestos, mostly from sis, but as asbestosis takes 15 to s to develop it is clear that most e cases developed while pre- s in the industry were not up to esent high standard.

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Asbestos fibre after first extraction from rock.

INTRODUCTION

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ough it is best known as a l which resists heat, asbestos number of other important ties which account for its wide- use today. Asbestos fibres igh tensile strength and are em- to reinforce materials like t and resins; those of sufficient and flexibility are valuable in ; grades with low electrical ctivity and high resistance to have a number of specialised and, of course, the thermal ties of asbestos are a vital factor in friction linings, insulating materials and fire protection products. For each of these purposes the material's fine fibrous structure means that it can be processed into an extremely varied range of physical shapes and forms.

What is asbestos? There are still people, some of them users of asbestos-based products, who imagine that is grows in plantations somewhere in tropical Africa. In fact, of course, it is a rock, a natural mineral, which occurs in fibrous form. Thus it possesses the characteristics both of rock (it cannot burn, for instance) and at the same time of a natural fibre, in that it can be spun and woven into cloth. It is indeed the strongest natural fibre known to man; hence its use as a reinforcing agent in asbestos-cement and in plastics.

It is misleading, however, to refer simple to "asbestos" since the term covers the whole group of asbestiform minerals, which vary a great deal in their chemical composition, mineralogical structure, properties and utility. Of the thirty or more known types most are of no commercial value while a few find only a limited and specialised application, the great bulk of production being confined to three main varieties—chrysotile, crocidolite and amosite.

Mineralogically, chrysotile is a fibrous form of the magnesium silicate mineral, serpentine, whilst crocidolite and amosite are fibrous forms of the amphibole silicate minerals riebeckite and grunerite respectively. The crys-

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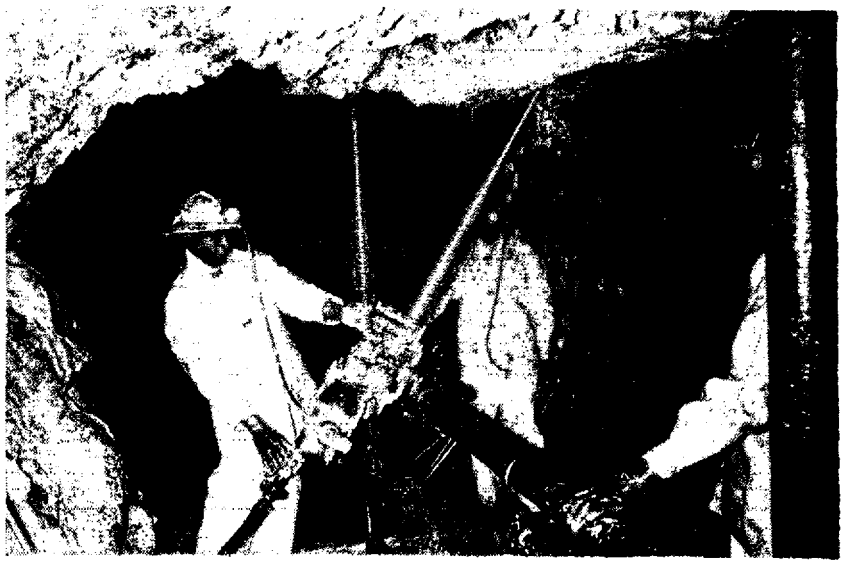

Pneumatic drilling prior to insertion of explosives during asbestos mining underground.

ASBESTOS

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Although it is best known as a aterial which resists heat, asbestos as a number of other important properties which account for its widespread use today. Asbestos fibres have high tensile strength and are employed to reinforce materials like cement and resins; those of sufficient length and flexibility are valuable in textiles; grades with low electrical conductivity and high resistance to acids have a number of specialised uses; and, of course, the thermal properties of asbestos are a vital factor in friction linings, insulating materials and fire protection products. For each of these purposes the material's fine fibrous structure means that it can be processed into an extremely varied range of physical shapes and forms.

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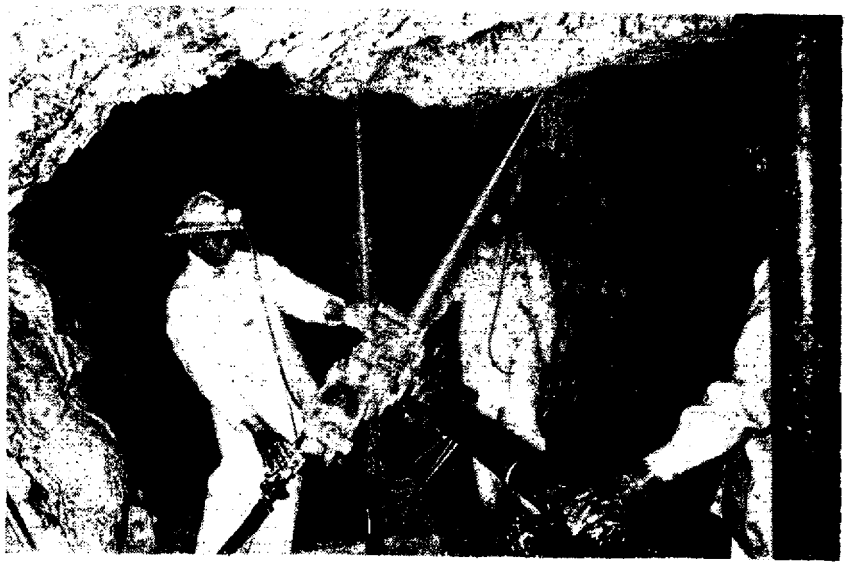

Pneumatic drilling prior to insertion of explosives during asbestos mining underground.

talline basis of all types of asbestos is a silicate lattice combined largely with magnesium as in chrysotile (and anthophyllite) or with calcium, magnesium, iron and sodium in varying amounts in the amphibole varieties.

Chrysotile asbestos

The most familiar and commercially significant variety is chrysotile or "white" asbestos, which represents about 90 per cent. of the world's output. Deposits are found chiefly in Canada, Rhodesia and Russia and they yield a strong, fine, flexible fibre which is resistant to heat and is a useful electrical insulator. It has a wide range of application including friction linings, asbestos, cement and textile products, some of which are used for insulation.

Chemical analysis of chrysotile would show around 42 per cent. magnesia, 40 per cent. silica, up to 5 per cent. oxides of iron and aluminium and 13 per cent. water. Chrysotile remains unaffected by heat up to 525-550deg.C but the residue does not fuse until temperatures around 1450-1500deg.C are reached. Chrysotile fibres are resistant to attack by alkalis, but the action of mineral acids is fairly rapid, and with strong solutions the fibres will ultimately dissolve completely.

Amphibole asbestos

The types of asbestos in the amphibole group differ from chrysotile in containing a larger percentage of silica, less water, and varying amounts of iron, magnesium, sodium and calcium. The best known amphibole variety is crocidolite, the "blue" asbestos mined principally in South Africa. The chemical composition of a typical crocidolite would be 50 per cent. silica, 35 per cent. iron oxide, 3 per cent. magnesia, 8 per cent. alkali oxides, 3 per cent. combined water.

Amosite, the last important variety, is found only in the Transvaal, and consists of long, spiky fibres which are well suited to thermal insulation because they trap larger pockets of air in the intersticial spaces. Amosite, like crocidolite, contains approximately 35 per cent. iron expressed as oxides, but mainly in the less oxidised, ferrous state. It contains greater percentages of magnesia (up to 65 per cent.) and alumina (up to 6 per cent.) and the alkali metals are present only in relatively small amounts. The combined water content is similar to that of crocidolite.

Turners aluminised asbestos cloth suits used for fire fighting. For further details quote **Ref. 4/12.**

Asbestos and Health

The various applications in which asbestos is used by the insulation industry will be described elsewhere in this issue. There is, however, one factor common to all the insulation uses of asbestos, and that is the way in which its application and removal should be controlled in order to minimise any risk to the health of men working with the material. Interest in this subject has recently been renewed by the drafting of revised Government regulations, prepared after consultation with the asbestos industry, to control its handling in factories and by industrial users.

Is is important to bring the possible risk to health associated with asbestos into perspective. In this connection it should be understood that a risk is present only if substantial amounts of airborne asbestos dust are inhaled. Only in extremely rare cases has there been any suggestion that incidental exposure to asbestos dust has been harmful, and proof has not been firmly established. The occupational risk, to people who work with asbestos, has been and is being increasingly controlled. Two diseases are involved, asbestosis (a fibrosis of the lung) and mesothelioma (a cancer of the pleura of peritoneum). Both of these are rare.

The Martindale Electric Company Ltd. has recently introduced a positive-pressure powered respirator. It has been designed to give protection against asbestos dust, but also has a wide variety of other industrial applications. Where other positive-pressure respirators use compressed air cylinders or a compressor, the Martindale unit has a small, battery-driven blower which supplies filtered air to a face-piece. The new respirator is small, compact, lightweight and completely self-contained. The power unit, which gives an eight hour continuous air supply, is energised by a six-volt, rechargeable cell battery and is supported at the waist by a light harness. For further details quote **Ref. 4/13.**

Successful Control of Asbestosis

The risks to health have been recognised in the asbestos industry for nearly 40 years, and the first Asbestos Industry Regulations were introduced in 1931. Since then British asbestos manufacturers have introduced comprehensive measures for the controlled handling of asbestos in their factories.

The Asbestosis Research Council

The Asbestosis Research Council was set up 9 years ago by the industry and has been responsible for important advances in medical knowledge relating to the effects of asbestos dust. A sum of £100,000 has been allocated to the Asbestosis Research Council for an expanded programme of research into means of prevention of risks to health over the next five years.

Asbestosis is caused by exposure to high concentrations of respirable asbestos dust for considerable periods. In other words occasional exposure to small amounts of asbestos dust does not cause asbestosis. Where dust concentrations have been reduced to low levels as in the principal asbestos factories there has been a corresponding reduction in the incidence of this disease.

An examination of the case histories of workers in the "scheduled occupations" in a large asbestos textile factory during this period has proved that preventive measures have reduced the mortality rates from all causes among asbestos workers to the normal levels expected among the total working population.

Rare Incidence of Mesothelioma

A new factor in the situation is the recent association between asbestos and the very rare form of cancer known as mesothelioma. The rarity of this disease is demonstrated by the fact that while there are now about 29,000 deaths annually in the UK from all forms of lung cancer, fewer than 50 cases of mesothelioma are being reported each year, not all of which have a history of association with asbestos.

has, however, been suggested that othelioma can be caused in certain s by quite limited exposure to stos and there is some evidence the main risk is associated with asbestos (crocidolite). Of the e main types of asbestos imported Britain last year, 83 per cent was te asbestos (chrysotile), 14½ per t. was amosite and 2½ per cent. was asbestos (crocidolite).

site

The risks of mesothelioma from the mmonly used types of asbestos—ite and amosite—are believed by ormed medical opinion to be negli-le or at any rate very much less than n blue.

Insulating materials made by Cape ulation Co. Ltd. under the trade mes of 'Caposite' and 'Caposil' ntain only amosite asbestos, and e never been associated with a single e of mesothelioma. In fact, pro-ed simple precautions are taken the rs of 'Caposite' and 'Caposil' terials will be safe from any other upational disease associated with estos. Asbestosis is only a risk health if substantial amounts of borne asbestos dust are inhaled r prolonged periods of time. The y occasion when 'Caposite' and posil' products are likely to produce nificantly large amounts of asbestos st are during the stripping of insula-n or during extensive cutting erations. To help reproduce the me conditions as occur in factories pe Insulation Ltd. has developed a rtable dust extraction unit which now available to its customers.

The recently set up Asbestos Inform-ion Committee is designed to keep e public informed of the health ks associated with asbestos. Further formation and copies of the codes of actice are available from the ommittee at 10 Wardour Street, ondon W.1.

ecommended Codes of Practice

The Asbestosis Research Council has far introduced two recommended odes of Practice which concern the ulation contracting industry. Both e available from the Secretary of the bestosis Research Council, P.O. ox 40, Rochdale, Lancs. The code handling asbestos products used in rmal insulation covers the proce-res to be adopted for working with rious types of product (e.g. loose ging, pre-formed materials, and rayed insulation), for stripping mat-ials containing asbestos, the use and e of respirators and the medical pervision of workers. The other code published so far (more are to follow), covers the handling, working and fixing of asbestos and asbestos-cement products in the building and construction industries. It describes the procedure which should be adopted under factory conditions and in confined spaces, as well as when handling and working under site conditions.

All these procedures will quite soon be covered by revised Ministry of Labour regulations, but in the meantime it is vital that everyone responsible for the employment of labour in the insulation industry should be familiar with the A.R.C. codes of practice and should insist on their rigid application.

Asbestos Information Committee.

Asbestos in Thermal Insulation

The Asbestosis Research Council

Present factory regulations recognise asbestosis as an industrial disease which could arise from the inhalation of asbestos dust, and stipulates rules for the protection of work people engaged in the manufacture of certain types of asbestos products. No regulations have yet been introduced relating to the handling of asbestos products for thermal insulation, although it is accepted that to eliminate the risk of asbestosis all practical steps should be taken to minimise the inhalation of asbestos dust. For this reason The Asbestosis Research Council set up a committee of doctors and engineers to consider what steps should be taken for the protection of workers in this branch of the asbestos industry. As a result of its work, the Committee has recommended that the industry should adopt the following code of practice.

Where asbestos products are used the following procedures should be adopted: Wherever possible preformed material rather than site mixed material should be used. Working with loose lagging material should be done in the wet state wherever practicable, rather than in the dry. Methods of transporting premixed wet compounds from segregated mixing areas should be used wherever possible. When dry mixing is being done respirators should be worn unless a machine with a properly designed ventilation system is available. Portable exhaust ventilation systems are already in use in certain shipyards. This procedure should be extended. Where the cutting of material containing asbestos takes place it should be done whenever possible in a segregated area where there is a free circulation of air. If continuous cutting of insulation

materials is being carried out a portable hopper should be used for the collection of fall-out waste. Machines are available for ensuring dust exhaust at a cutting bench.

In the case of spraying asbestos, the practice to be adopted will depend on the type of equipment used. The various types are defined in the Appendix. In all cases the asbestos fibre must not be removed from the dust-proof sacks in which it is supplied until it is fed into the machines in the prescribed manner. Care should be exercised in handling the sacks in order not to damage them. (a) The use of effective pre-treatment reduces the concentration of dust to the level obtainable by an efficient exhaust ventilation system. Where pre-treated fibre is used, spraying with any type of machine may proceed without limitations save that the operators must, during spraying operations and for a short period thereafter, wear approved masks. (b) Self-ventilating machines without pre-treatment equipment may be used in spaces where the volume of air per spray gun in action is not less than 25,000 cu. ft. provided that operators use approved masks during spraying and for 30 minutes thereafter. Other tradesmen not supplied with masks may not enter the room until 30 minutes after spraying has ceased. Normal ventilation by open windows is permitted. Where rooms are below 25,000 cu. ft. volume per gun mechanical ventilation must be provided to give two air changes per hour, and operators must wear approved masks during spraying and for at least 30 minutes thereafter. Other trades must not enter whilst spraying is in progress and for one hour thereafter. (c) Non-ventilated machines without pre-treatment equipment should only be used in spaces exceeding 50,000 cu. ft. volume per gun; operators and other workers approaching within 50 ft. of the machine and/or the gun must wear approved masks during spraying and for 15 minutes afterwards. Normal ventilation by open windows is permitted.

Stripping of Materials Containing Asbestos

The area in which stripping takes place should be classified as a segregated location and operatives engaged on such work should wear approved

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type respirators. (a) Where site location permits, protective sheeting (dust sheets/polythene shrouding etc.) should be used to localise or isolate the working area. (b) Wherever conditions permit i.e. on inside work—power stations, ships' engine rooms, piping and ducting inside buildings, portable industrial vacuum cleaners should be used during stripping operations and for cleaning-up purposes in the working area. (c) Where the lagging is receptive to such treatment, wetting prior to and during the removal of the material should be carried out.

Use and Care of Respirators

Where operations covering mixing, cutting and spraying are carried out and wherever dust can be inhaled, approved respirators should be used and maintained as set out below. Respirators should be worn by all employees at all times when:

(1) Spraying asbestos and feeding hoppers on sprayed asbestos work. Respirators should be worn by both operator and attendant during the full period that work is being carried out and by any employee remaining in the dusty atmosphere for a limited period after spraying operations have terminated.

(2) Carrying out the following operations which, wherever possible, should be carried out in open spaces where there is a free circulation of air: (a) The mixing of any material containing asbestos. (This operation must be carried out in segregated areas if possible). (b) The mixing of compositions and self-setting cements which have an asbestos content. (c) The cleaning and emptying of sacks or other containers which contain asbestos or an admixture of asbestos. Where the above operations are being carried out in confined spaces adequate arrangements must be made for ventilation.

(3) Carrying out the following operations: (a) The cutting of all insulation materials containing asbestos or an admixture of asbestos by hand in confined spaces. (b) The cutting of materials containing asbestos or an admixture of asbestos by portable or other power-driven saws or similar tools. (c) The breaking down for removal of lagging containing asbestos or an admixture of asbestos.

The approved respirator should be carefully maintained and adequate servicing arrangements should be made to ensure that this is done and that employees are not without respirators during maintenance.

Medical Supervision of Workers

All employees should be examined clinically and radiologically before employment or as soon as possible afterwards, certainly within three months, to avoid the employment of men who may be particularly susceptible to the hazard. Periodic examinations should be made thereafter, annually if possible. Notes on the Medical Examination of Workers in the Asbestos Industry are available as a guide to doctors concerned. New employees should be advised of the precautions necessary in the industry. A system of recording the employment history of workers entering the Thermal Insulation Industry or who have been employed in the insulation contracting industry would be beneficial.

Appendix — Definitions

(a) Pre-treatment Equipment

The pre-treatment equipment and media should be capable of restricting the amount of dust in the atmosphere during spraying to a level approximating to that achieved in a modern asbestos textile plant. Pre-treatment should be carried out in a segregated area, the operator wearing an approved mask. The equipment may consist of a closed rotating drum which throws a measured quantity of fibre across a finely atomised water spray which is projected along the axis of the drum. The action, which is improved by the addition of a wetting agent to the water, takes place over a period of time sufficient to produce a uniform dampening of the asbestos fibres to which the finer particles of asbestos adhere, even when passed through the spray machine and ejected from the gun. Spraying is carried out immediately after the dampening cycle is completed.

(b) Self-ventilating Machine

One in which the fan providing the air stream in which the fibre is conveyed through the hose to the gun draws its air supply via a path from the fibre hopper charging aperture, the charging of the hopper being carried out only whilst the spray machine fan is operating.

(c) Non-ventilated Machine

A machine in which the air stream for conveying the fibre is induced from a source outside the machine and which provides no air movement away from the operator's face when the machine is being charged with fibre.

December 1966. The Asbestosis Research Council, Secretary, Dr. S. Holmes, P.O. Box No. 40, Rochdale, Lancashire.

SPRAYED ASBESTOS

SPRAYED ASBESTOS is one of the most versatile methods of insulation on the market. It is used for the protection of both steel and concrete structures against fire, for thermal insulation, condensation control, noise reduction and acoustical correction. It requires no jointing and is easily applied to awkward corners, beams etc. There are very definite safety procedures involved in its use, and these are referred to in the "Code of Practice."

Application of sprayed asbestos; notice the use of a respirator.

Sprayed Asbestos at Expo 67

SPRAYED ASBESTOS plays a major part in the insulation and protection of buildings at Canada's international exhibition Expo 67. Applications of 'Limpet' sprayed asbestos, carried out by Atlas Asbestos Company, associates and sub-licensees of J. W. Roberts Ltd. cover thermal insulation, noise reduction, fire protection, condensation control and acoustical correction.

The British, Russian, Administration and Man in Control Pavilions are all protected from fire by sprayed 'Limpet' as also are the World Broadcasting Centre, Expo Theatre and the Gyrotron. This sprayed asbestos also provides thermal insulation to elevator shafts and passages in Habitat 67, condensation and noise control for the Automotive Stadium stands, and a decorative Acoustical correction in the Australian Pavilion.

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