IS 12082-2 (2006): Control of Asbestos Emission - Recommendations, Part 2: Milling of Asbestos Ore [CED 53: Cement Matrix Products]

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भारतीय मानक

एस्बेस्टॉस उत्सर्जन का नियंत्रण — अनुशंसाएं

भाग 2 एस्बेस्टॉस अयस्क की मिलिंग

(पहला पुनरीक्षण)

Indian Standard

CONTROL OF ASBESTOS EMISSION — RECOMMENDATIONS

PART 2 MILLING OF ASBESTOS ORE

(First Revision)

ICS 13.040.40

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

February 2006

Price Group 3

FOREWORD

This Indian Standard (Part 2) (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Cement Matrix Products Sectional Committee had been approved by the Civil Engineering Division Council.

In recent years there has been a growing awareness that exposure to asbestos can have harmful effects on the health of workers. In order to give guidance on how the risk of exposure to asbestos dust can be prevented, controlled or minimized, it was felt necessary to lay down some standards regarding safe use of different products containing asbestos, improving conditions in workplaces, preventive measures, protection and supervision of the health of workers, packaging and transport, disposal of waste, etc. This standard lays down the recommendations for control of emission of airborne asbestos dust during milling operation of asbestos ore.

In the formulation of the standard, due weightage has been given to international co-ordination among the standards and practices prevailing in different countries in addition to relating it to the practices in the field in this country. This has been met by deriving assistance from the following publications:

ILO Codes of practice: Safety in the use of asbestos, 1984, published by the International Labour Office, Geneva

RAJHANS (GS) and BRAGG (GM) Engineering aspects of asbestos dust control. Ann Arbor Science Publishers, USA

This revision has incorporated the experience gained in the past and inputs from Mining Research Cell of Indian Bureau of Mines. It has incorporated/elaborated provisions of conveyance of asbestos containing mineral rocks, filtration through high efficiency filters, which can trap the dust up to 0.4 micron, and dust separation by cyclone discharge into water precipitator tank. A combination of approaches to control airborne asbestos dusts, including that of thick green barrier trees have been recommended.

This standard is one of a series of Indian Standards on safety in handling and use of asbestos. Other standards in the series are as follows:

IS No.	*Title*
11450 : 1986	Method for determination of airborne asbestos fibre concentration in work environment by light microscopy (membrane filter method)
11451 : 1986	Recommendations for safety and health requirements relating to occupational exposure to asbestos
11767 : 1986	Recommendations for cleaning of premises and plants using asbestos fibres
11768 : 1986	Recommendations for disposal of asbestos waste material
11769	Guidelines for safe use of products containing asbestos:
(Part 1) : 1986	Asbestos cement products
(Part 2) : 1987	Friction materials
(Part 3) : 1987	Non-cement asbestos products other than friction materials
11770	Recommendations for control of emission of asbestos dust in premises manufacturing products containing asbestos:
(Part 1) : 1987	Asbestos cement products
(Part 2) : 1987	Friction materials
(Part 3) : 1987	Non-cement asbestos products other than friction materials

(Continued on third cover)

Indian Standard

CONTROL OF ASBESTOS EMISSION — RECOMMENDATIONS

PART 2 MILLING OF ASBESTOS ORE

(First Revision)

1 SCOPE

This standard (Part 2) lays down the recommendations for control of airborne asbestos dust emission during milling operation of asbestos ore.

2 REFERENCES

The standards listed below contain provisions, which through reference in this text, constitute provisions of the standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standard indicated below:

IS No.	*Title*
11450 : 1986	Method for determination of airborne asbestos fibre concentration in work environment by light microscopy (membrane filter method)
11451 : 1986	Recommendations for safety and health requirements relating to occupational exposure to asbestos
11767 : 1986	Recommendations for cleaning of premises and plants using asbestos fibres
11768 : 1986	Recommendations for disposal of asbestos waste material
12079 : 1987	Recommendations for packaging, transport and storage of asbestos

3 OBJECT

The objectives of this standard are as follows:

a) To prevent or minimize the potential for exposure to airborne asbestos dust during milling operations of asbestos ore; and

b) To reduce the probability of release of airborne asbestos dust into the environment.

4 GENERAL

4.1 The asbestos fibre is usually found in the form of veins embedded in rock. It is released by successive stages of crushing to release the fibres, screening to remove the rock particles and dust, suction to carry away the fibres, cyclones to separate solids from air solid mix, and subsequent de-dusting, de-gritting, classification, grading, etc, to produce a commercial fibre. Conveying equipment like elevators, screw conveyors, belt conveyors form an essential part of mechanized milling. Large volumes of air are used to convey fibre and fibre rock concentrates as well as for de-dusting operations for the purposes of classification and other operations.

The types of equipment used vary widely, depending on trade and brand. But, generally speaking the crushers used are, depending on stage of crushing and circuit used, gyrocentric crushers, jaw crushers, cone crushers, impactors hammer mills, fibrezers, ball mills, edge runner mills, pulverisers, etc. Screens are generally gyrocentric but may also be of vibrating type. While multi-deck sifters are used in de-dusting operations of fibres, trommels are also used in de-dusting of fibre concentrators. Every stage of operation including material transfer points and tailing disposal points, involves generation of asbestos dust, and therefore, shall be handled properly to prevent the release of asbestos dust into the working environment.

4.2 The processing operations should be carried out in closed encasing for reduction of release of dust in work environment. Provision shall be made at all dust generating points of the mill to collect the dust laden air, which shall be filtered through high efficiency bag filters which can trap the dust of 0.4 microns and having higher filter efficiency up to 99.9 percent.

4.3 The dust generating points are generally associated with the following operations:

a) Material loading,

b) Conveying,

c) Crushing,

d) Screening,

e) Size reduction, and

f) Material transfer, bagging and other operations.

4.3.1 Design principles for material handling system layouts including transfer points enclosures are:

a) Exhaust hood to capture dust emission at the source,

b) Duct work to provide a channel for flow of contaminated exhaust air to the dust collection,

c) Air cleaner to remove dust from the contaminated air, and

d) A fan to provide necessary exhaust flow rates.

The exhaust hood is a critical part of any dust collection item. Properly designed hood ensure maximum efficiency of the system, minimum exhaust volume, unrestricted movement of the operator and free flow of material being processed. Conveyors, screens, sifters, trommels and elevators shall be completely enclosed and connected to dust extraction system. The loading points of conveyor shall be provided with rock boxes, where ore enters along the line of conveyor with reduced velocity on to the conveyor and reduces the dust generation. Figures 1, 2, 3 and 4 show typical examples of dust extraction systems, including location of rock box, enclosed conveyor and vibrating screens.

Exhaust fans shall be provided for pneumatically conveying the final dust particles to water precipitators for reduction of dust from the crusher/pulverizers units. For effective capture of the dust, it is important to have an adequate but not exhaustive volume. Adequate dust collection system shall be provided for all operations.

4.3.2 Dust particles become air-borne during the transfer of material, like points from bins to conveyors, from conveyors to conveyors, from conveyors to crushers and screens, conveyors to final discharge into bags, etc. These particles remain air-borne and effect the quality of the work environment. Dust control at the transfer points can be achieved by any one or combination of the following three approaches:

a) Prevention of dust by minimizing the impact of bulk material, attrition and air entertainment,

b) Dry dust collection, and

c) Dust separation using liquid spray.

Transfer points shall also be completely enclosed and connected to dust extraction system. Figure 5 shows one typical example of enclosing feeding point of jaw crushers.

A dust separation techniques using liquid can reduce air-borne dust, eliminate air-borne dust or separate dust at its source. The type of system can be classified as:

a) Water sprays, and

b) Water sprays with additives.

These wet dust separation techniques require a relatively low capital expenditure, limited maintenance and offer reasonable control.

4.3.3 Whenever bucket elevators are used for transporting the ore to fiberizer, the bucket elevator shall be completely enclosed and connected to a dust extractor.

4.3.4 The feeding point at the bucket elevator shall be provided with proper suction hood so that asbestos dust does not become air-borne.

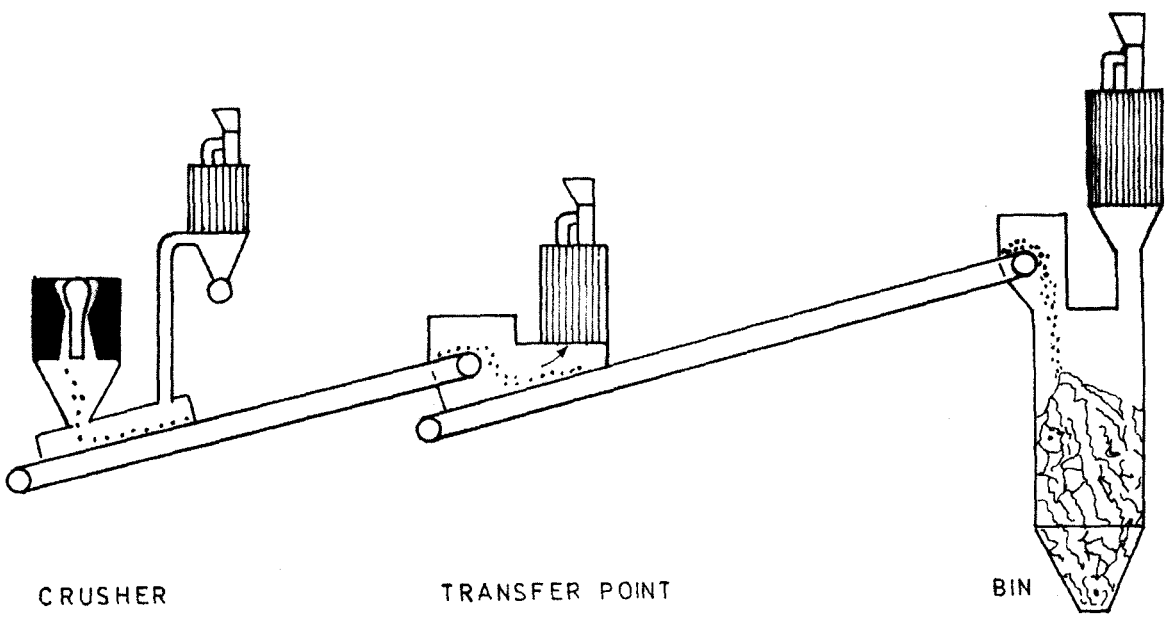

FIG. 1 DUST GENERATING POINTS IN HANDLING ASBESTOS ORE FROM THE CRUSHER

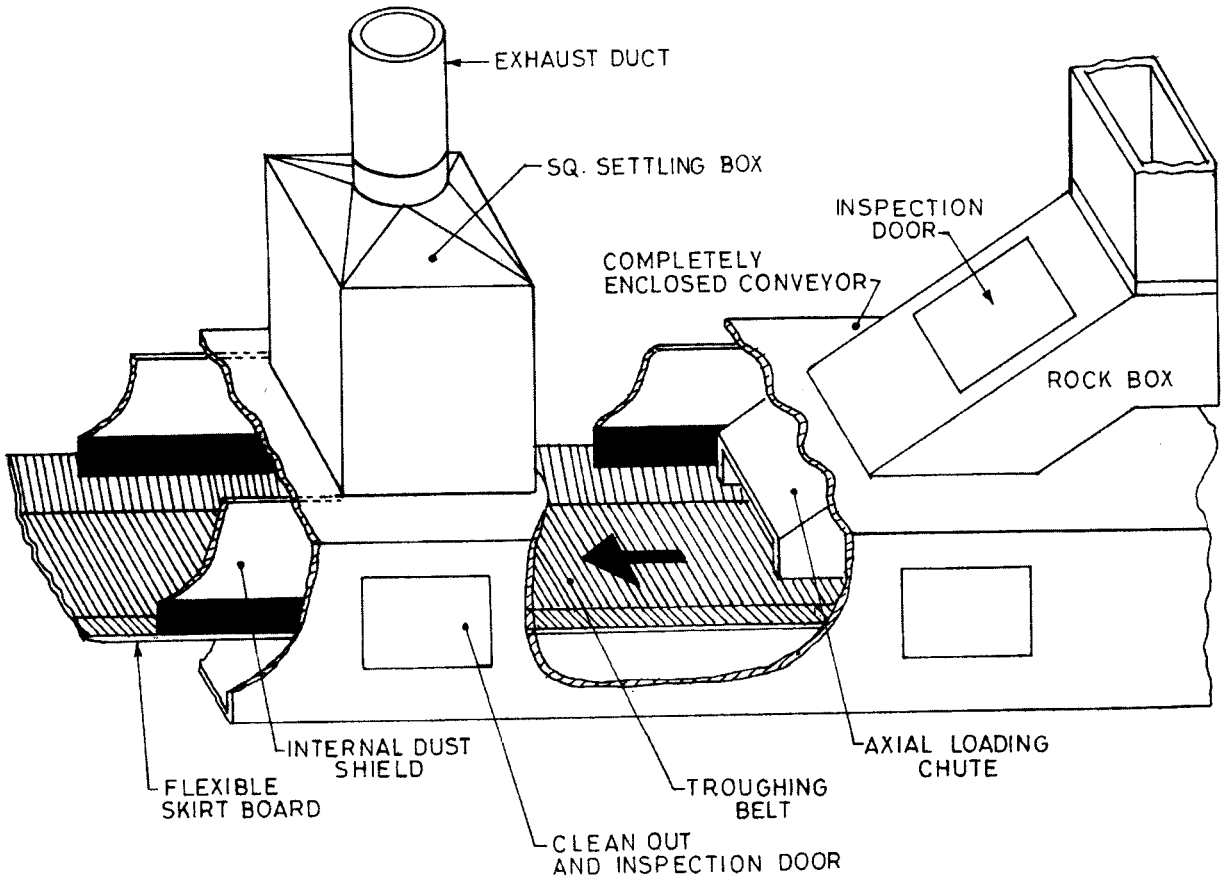

FIG. 2 CONVEYOR BELT ENCLOSURE IN THE LOADING REGION (THIS ARRANGEMENT IS INTENDED FOR ORE LOADING, AND IF FIBRE WERE BEING LOADED, THE ROCK BOX WOULD BE REMOVED)

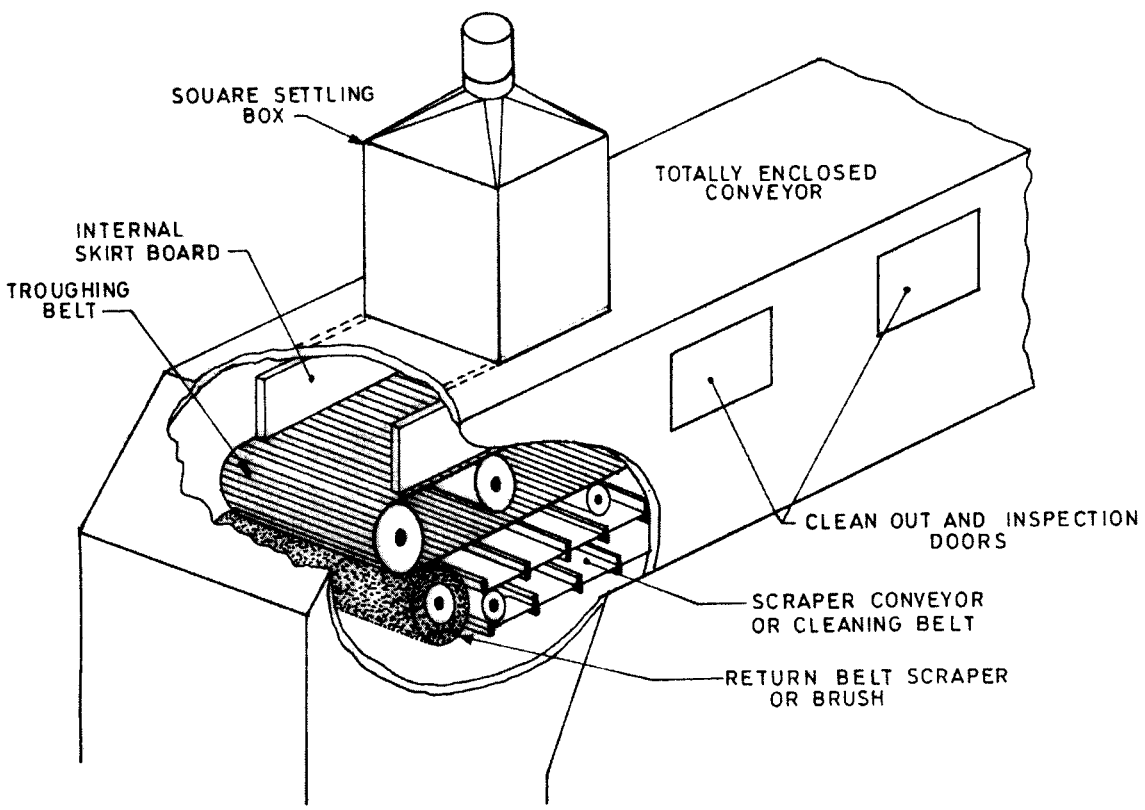

FIG. 3 CONVEYOR ENCLOSURE FOR CONVEYOR BELT DUMPING OR TRANSFER

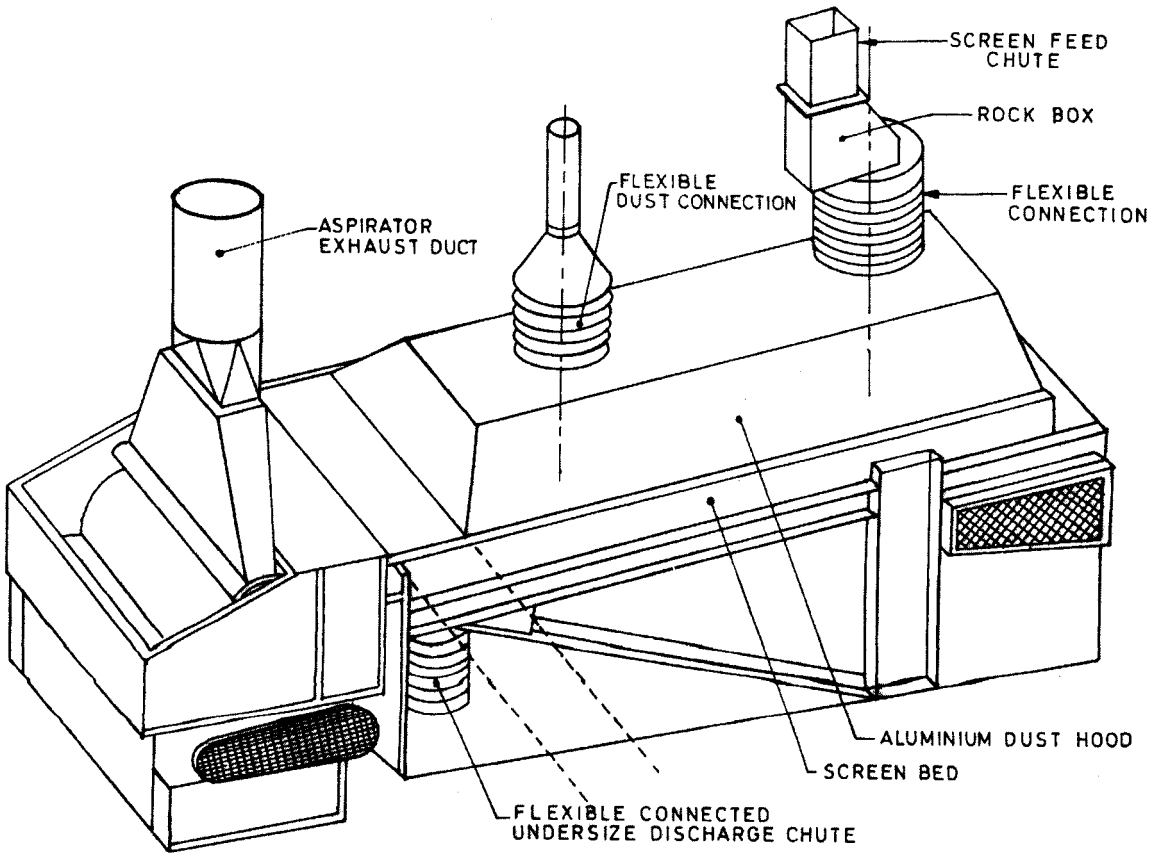

FIG. 4 GYRATORY FIBRE SCREEN AND ROTARY ASPIRATOR

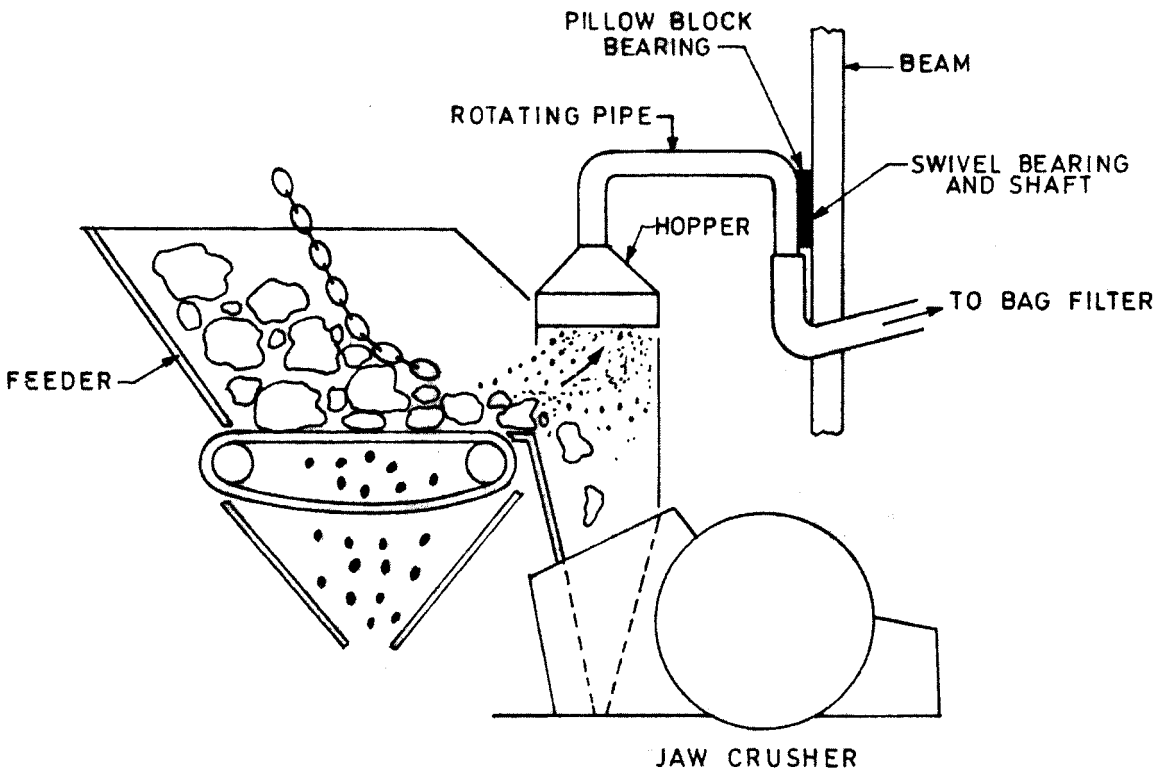

FIG. 5 DUST CONTROL FOR THE JAW CRUSHER

5 BAG HOUSE

5.1 The exhaust air from various dust generation points shall be passed to a bag house, preferably preceded by a cyclone separator with an air lock, where required.

5.2 The air used in aspiration and pneumatic conveying of fibre, often passing through cyclone collectors, shall also pass through the main bag house before it is let out into atmosphere.

5.3 If dampers are used in ducts and pipe-lines, it is preferable to use rotary dampers (butterfly type dampers) than slide dampers since they provide better sealing.

5.4 The filter bags of the unit shall be cleaned periodically by mechanical shaking to improve filtering efficiency. Other means of cleaning such as, reverse jet, pulse jet, etc, also may be used, provided they do not blow fine dust out due to more vigorous cleaning action.

5.5 Fabric filters to be used in bag house as filtering medium shall preferably be made of cotton satin cloth. It is both efficient and durable. Other suitable synthetic materials may also be used.

While selecting the filter cloth, appropriate air to cloth ratio shall be considered. Selection of improper filter cloth may lead to inefficient running of dust collection system or increase in emission of asbestos dust into atmosphere.

6 GENERAL MAINTENANCE OF CONVEYORS, PIPES AND DUCTS

The ducts and lines used for carrying dust laden air have to be maintained properly to prevent dust leaks and withstand wear. The maintenance personnel shall be issued his powered lights to locate dust leakage's when repairs are required. A system of patch marking shall be used for locating the leakage point. The detected leaks shall be repaired expeditiously. It is recommended to have the system under vacuum so that only in-leakage occur.

NOTE—The initiator of a work order shall mark the leakage point with fluorescent patch or other suitable identification mark and the maintenance man shall remove the patch identification mark and attach it to the work order when repairs are completed. The patch or identification colour shall be changed each week so that outstanding work can be spotted at a glance.

7 CONTROL OF ASBESTOS EXPOSURE IN SPECIFIC ACTIVITY

7.1 Loading, Crushing and Screening

7.1.1 *Material Loading*

The asbestos bearing rock feeding is one of the main dust generation activity in a processing plant. Where the asbestos bearing rock is fed directly to the runner machines (edge-runner, crusher or fiberizer), dust generation is high as compared to the plants having bucket elevator arrangement. The processing plant layout should have continuous material flow arrangement inside the plant to reduce the number of dust generations points in the plant and the manual feeding of asbestos bearing material in fast moving machines like edge-runner, crusher or fiberizer etc, should be totally avoided.

7.1.2 *Crushing and Screening*

7.1.2.1 Control of dust during ore crushing and screening shall be by exhaust ventilation to a cyclone and bag house.

7.1.2.2 Owing to their higher potential for dust generation, vibrating screens and grizzlies shall be in leak-proof enclosures with suitable flexible connections to the feed and outlet chutes exhaust vents.

7.2 Chutes

Chutes which feed belts, either from other belts or from other equipment, shall always be closed.

7.2.1 Chutes should feed axially, where practicable.

7.2.2 Long vertical drops which cause puffing of dust, shall be avoided.

7.2.3 Chute shall be run at angles exceeding the angle of repose of the materials to reduce the velocity of the materials fed to the conveyor.

7.2.4 Chutes shall have adequate cross-section and shall run at appropriate slopes so that it shall carry required material without plugging. Surge feed conditions shall be considered, wherever required.

7.2.5 Chute enclosures shall be leak-proof and yet allow ready access.

7.2.6 Access doors to chutes shall be of leak-proof design.

7.2.7 Where ore containing rocks are being conveyed and chutes of bolted construction are used, the joints shall be fitted with packing.

7.2.8 Where only fibre is conveyed, fully welded chutes may be used but the same shall be leak-proof.

7.3 Conveyors

7.3.1 All conveyors shall be totally enclosed.

7.3.2 Belt width and speed shall be adequate enough to

carry the material within the rubber skirting at each side, so that the material is not forced out of the width of conveyor belt. Provisions shall be made to accommodate surge feeds where appropriate. Enclosures shall have gasketed covers with toggles for easy inspection and maintenance. Adequate steps shall be taken in design to avoid condensations/congestions within lengthy enclosures.

7.3.3 The return belt shall in all cases be cleaned by scrapers or rotating brushes, which shall be housed inside the conveyor enclosure.

7.3.3.1 Where practicable, the return belt also shall be enclosed.

7.3.4 Dust exhaust connections shall be installed at some intervals along the belt conveyor enclosure.

7.3.5 Dust exhaust connections shall be provided, particularly at chute feeding points and conveyor junction points, since at such points air pressure is generated due to movement of material. The exhaust connection shall also be provided at exits from the conveyor enclosures, where dust would otherwise be pumped into the environment. Dust exhaust connections shall normally be attached to the conveyor enclosures by means of a settling box to reduce the exhaust velocity and to minimize the extraction of materials.

7.3.6 Screw conveyors are preferable to the bolt conveyors

7.3.7 Screw conveyors wherever in use for conveying asbestos fibre ore from fiberizer to vibrating screws, cyclones, packaging points, etc, shall be completely enclosed. Steps shall be taken to prevent any leakage or spillage from screw conveyors. All transfer points shall be completely enclosed and connected to dust extractors.

7.4 General Precautions

7.4.1 No person shall enter or remain in any place or work in a place where such operations are being undertaken unless such person is wearing approved type of respiratory equipment to prevent the inhalation of such dust.

7.4.2 To prevent the spreading of air-borne dust to the surrounding environment, a thick green barrier of minimum of three rows of tree, of species having fast growth and with dense canopy; of a minimum width of 10 m should surround these operations.

8 DUST MONITORING AND CONTROL

8.1 Air-borne asbestos dust shall be monitored in asbestos milling plant in several areas particularly close to conveyors, crushers and bagging points, in accordance with IS 11450.

8.2 Recommendations given in IS 11451 shall be followed for safety and health requirements of workers.

9 CLEANING AND WASTE DISPOSAL

9.1 The work premises shall be maintained in a clean state and free from asbestos waste. All machinery, plant and equipment together with all external surfaces of exhaust ventilation equipment and all internal surfaces of the building shall be kept free from dust. Cleaning shall be done in accordance with the provisions laid down in IS 11767.

9.2 All waste material shall be disposed of in accordance with the provisions laid down in IS 11768.

9.3 The dust laden air from the processing plants should be filtered before letting out by providing suitable dust extractors. To prevent the spread of air-borne fibre dust, a thick green barrier of a minimum of three rows of trees of species having fast growth and with dense canopy, of a minimum width of 10 m should be provided, surrounding the processing plant.

10 PACKAGING AND TRANSPORTATION

Once the fibre is extracted it shall be graded and packed in impermeable bags and transported to the destinations. For packaging and transportation the recommendations given in IS 12079 shall be followed.

11 DISPOSAL OF TAILINGS

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

11.2 Conveyor shall operate close to the dump to minimize wind borne dust. This may be facilitated by the use of swing conveyors.

11.3 High speed conveyor-flingers shall not be used.

11.4 Tailings shall be wetted at or before the point of deposit.

11.5 Bag house dust shall be disposed off as laid down in IS 11768.

11.6 The tailings discharged from vibrating screen shall be transported outside the plant by conveyor preferably the screw conveyors and disposed off as in **11.7**.

11.7 Tailings shall be disposed off in accordance with the provisions laid down in IS 11768.

(*Continued from second cover*)

IS No.	*Title*
12078 : 1987	Recommendations for personal protection of workers engaged in handling asbestos
12079 : 1987	Recommendations for packing, transport and storage of asbestos
12080 : 1987	Recommendations for local exhaust ventilation systems in premises manufacturing products containing asbestos
12081	Recommendations for pictorial warning signs and precautionary notices for asbestos and products containing asbestos:
(Part 1) : 1987	Workplaces
(Part 2) : 1987	Asbestos and its products
12082 (Part 1) : 1987	Recommendations for control of asbestos emission: Part 1 Mining of asbestos ore

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Review of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the latest issue of 'BIS Catalogue' and 'Standards : Monthly Additions'.

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Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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