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RECOMMENDATIONS FOR SAFETY AND HEALTH REQUIREMENTS RELATING TO OCCUPATIONAL EXPOSURE TO ASBESTOS

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Indian Standard

RECOMMENDATIONS FOR SAFETY AND HEALTH REQUIREMENTS RELATING TO OCCUPATIONAL EXPOSURE TO ASBESTOS

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(*Continued on page* 2)

(*Continued from page* 1)

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(*Continued on page* 13)

AMENDMENT NO. 1 SEPTEMBER 2005
TO
IS 11451 : 1986 RECOMMENDATIONS FOR SAFETY AND HEALTH REQUIREMENTS RELATING TO OCCUPATIONAL EXPOSURE TO ASBESTOS

(*Page* 4, *clause* **3.2**) — Substitute the following for the existing clause:

'**3.2 Asbestos** — The fibrous form of mineral silicates belonging to the serpentine and amphibole groups of rock forming materials; under serpentine group chrysotile variety and under amphibole group crocidolite, amosite, actinolite, anthophyllite and tremolite varieties are commercially used.'

[*Page* 5, *clause* **4.1**(a)] — Substitute the following for the existing:

'a) For 8 hours time-weighted average (TWA), the permissible exposure limit shall be 1 fibre/cc or as stipulated by competent regulatory authority.'

[*Page* 9, *clause* **4.2.4.3**(a)] — Substitute the following for the existing:

'a) Every worker, irrespective of his exposure profile shall have periodic medical examination done, as recommended by regulatory authority.'

(*Page* 10, *clause* **4.2.7**) — Substitute the following for the existing clause:

'**4.2.7** *Lung Function Evaluation* — The spirometer used to record FVC and FEV_1 should have a device which provides a tracing of volume-time or volume-flow curve. This tracing hard copy shall be stored and available for recall.

While recording FVC and FEV_1, the technique shall be properly demonstrated, and a minimum of three acceptable manoeuvers shall be performed, and a maximum value out of three shall be recorded.

Predicated values of lung function of that ethinic group for comparison is an approximation accepted in the absence of pre-employment and periodic medical examination observations.'

Amend No.1 to IS 14511 : 1986

(*Page* 10, *clause* **4.2.8,** *second para*) — Substitute the following for the existing:

'The records shall be maintained and stored for a period of 15 years following the termination of employment or for 40 years after first day of employment, whichever is later .'

(*Page* 12, *clause* **4..5.2.2**) — Substitute the following for the existing:

'**4.5.2.2** *Sampling frequency and patterns*

Sampling frequency shall be maintained as detailed in clause **D-2.5** of IS 11450 .'

(CED 53)

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RECOMMENDATIONS FOR SAFETY AND HEALTH REQUIREMENTS RELATING TO OCCUPATIONAL EXPOSURE TO ASBESTOS

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 22 January 1986, after the draft finalized by the Cement and Concrete Sectional Committee had been approved by the Civil Engineering Division Council.

0.2 In recent years, there has been a growing awareness about exposure to asbestos dust which can have harmful effects on the health of workers engaged in industries handling asbestos. Therefore, in order to give guidance on how the risk of exposure to asbestos dust can be prevented, controlled or minimized, it was felt neeessary to lay down standards regarding the safety in handling and use of asbestos in asbestos mines and factories producing asbestos based products. Though it is absolutely essential to control the level of concentration of airborne asbestos dust below the exposure limit by appropriate engineering controls and work practices in mines and factories dealing with asbestos, certain safety and health requirements are also to be followed and adopted. This standard lays down the recommendations for safety and health requirements of works exposed to asbestos dust.

0.3 In the formulation of this 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 this field in this country. This has been done by deriving assistance from ILO Codes of Practice: Safety in the use of asbestos, 1984, published by the International Labour Office (ILO), Geneva.

0.4 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS: 2 - 1960*. The number of significant places retained in the rounded off value should be the same as that of the specified values in this standard.

*Rules for rounding off numerical values (*revised*).

1. SCOPE

1.1 This standard lays down the recommendations for safety and health requirements of workers exposed to asbestos dust in mining and milling of asbestos, manufacture of products containing asbestos, and transportation, storage and handling of asbestos or products containing asbestos.

2. APPLICATION

2.1 The provisions of this standard shall apply to any operation involving a risk of occupational exposure to airborne asbestos dust like, mining and milling of asbestos, manufacture of products containing asbestos, and transportation, storage and handling of asbestos or products containing asbestos.

2.2 For occasional work that may involve short term intermittent occupational exposure to asbestos at all places where there is likelihood of exceeding the exposure limit, an approved respiratory equipment shall be used.

3. TERMINOLOGY

3.0 For the purpose of this standard, the following general definitions shall apply.

3.1 **Action Level** — The level of airborne particulate matter in the air which is distinctly below the exposure limit. Consequently exposures below the action level do not usually necessiatate application of all the preventive measures, for example, those of a medical nature often required for exposures exceeding the action level.

The action level will generally lie at or below half of the exposure limit, as decided by the competant authority.

3.2 **Asbestos** — The fibrous form of mineral silicates belonging to the serpentine and amphibole groups of rock-forming materials, including actinolite, amosite (brown asbestos, cummingtonite, grunnerite), anthophyllite, chrysotile (white asbestos), crocidolite (blue asbestos), termolite, or any mixture containing one or more of these, whether crude, crushed or opened.

3.3 **Asbestos Dust** — Airborne particles of asbestos or settled particles of asbestos which may become airborne in the working environment.

3.4 **Aspect Ratio** — Ratio of length of the fibre and its diameter.

3.5 Biologically Important Fibre — A fibre with a length more than 5 microns and a diameter less than 3 microns with an aspect ratio of 3 : 1 and more.

3.6 Ceiling Limit — The concentration of airborne asbestos particulate matter in the respiratory air which shall not be exceeded at any time.

3.7 Exposure Limit — The concentration of airborne asbestos particulate matter in the air which shall not cause adverse health effects, including long term effects, in workers who are exposed for 8 hours a day and 48 hours per week.

The exposure limit is not an absolute dividing line between harmless and harmful concentrations, but merely serves as a guide for the prevention of hazards.

3.8 Respirable Asbestos Fibre— A particle of asbestos with a diameter of less than 3 microns and of which the length is at least three times the diameter.

3.9 Respirable Dust — Fraction of the total dust which passes through a particle size selector having specific characteristics approaching those of the human respiratory tract.

3.10 Workplace — The place where workers need to be or need to go by reason of their work and which is also under the control of employer.

4. REQUIREMENTS

4.1 Environmental Levels — The concentration of airborne asbestos particulates in the working environment shall be controlled so that workers are not exposed to levels in excess of the following unless specified otherwise by the competent authority:

a) For 8 hours time-weighted average (TWA), the permissible exposure limit shall be 2 fibres per cm^3; and

b) For peak level sample, the permissible exposure limit shall be 10 fibres per cm^3.

4.1.1 The 8-h TWA (8 hours time-weighted average) is defined as the number of fibrous particulates collected in each individual sample taken, multiplied by the duration of the individual sampling period, summed for all the samples taken during an 8-h interval, and divided by total sampling time. It is calculated as follows:

$$\text{8-h TWA} = \frac{\Sigma\, c_1\, t_1}{\Sigma\, t_1}$$

where

c_i = number of fibrous particulates per cubic centimetre in the ith sample;

t_i = the time period over which the i th sample was collected; and

i = subscript denoting any one particular sample taken during the 8-hour interval of time to which 8-hour TWA applies.

4.1.1.1 If the single sample durations t_i given in **4.1.1** are of equal durations, then the equation given in **4.1.1** is simplified as follows:

$$\text{8-h TWA} = \frac{\Sigma c_i}{n} = \frac{c_1 + c_2 + \ldots\ldots + c_n}{n}$$

where

n = total number of samples

4.1.2 The peak is the highest concentration of fibrous particulates taken during a short sampling interval of 10 minutes or less.

4.1.3 The concentration of airborne asbestos fibre shall be determined as described in IS : 11450-1986*.

4.2 Medical Surveillance

4.2.1 *General*

4.2.1.1 All the workers potentially exposed to asbestos dust above the action level shall be provided with medical surveillance by the employer.

4.2.1.2 Medical surveillance shall be provided free of cost to the workers.

4.2.1.3 Medical surveillance shall be carried out by occupational physician or chest physician or a physician trained in occupational medicine.

4.2.1.4 The recommendations laid down in this standard serve only as basic medical guidelines. Occupational physicians may wish to supplement these standards to assist in proper evaluation of individual cases.

*Method for determination of airborne asbestos fibre concentration in work environment by light microscopy (Membrane filter method).

4.2.2 *Plan and Structure* — Medical surveillance programme shall consist of the following:

a) Pre-employment medical examination;

b) Periodic medical examination;

c) Medical examination at cessation of employment

d) Maintenance of medical records; and

e) Health education.

Every employee on his appointment for a job with a possibility of exposure to airborne asbestos, shall get the pre-employment medical examination done within 30 calender days of his employment, by the employer. The details of medicals surveillance programme are covered in **4.2.3** to **4.2.9.1**.

4.2.3 *Pre-employment Medical Examination*

4.2.3.1 *Objective* — The objectives of pre-employment medical examination are as follows:

a) To determine any condition which would be a contra-indication to occupational exposure to asbestos dust. For example, a worker with markedly reduced lung function than predicated values (FVC and FEV_1, percent) and a worker with a gross radiological lung abnormality shall be prevented from joining work entailing potential exposure to asbestos. A worker with chronic bronchitis, bronchiactasis gross cardiac impairment, gross chest wall abnormality, and active or inactive tuberculosis shall not be employed in a place where there is a potential exposure to asbestos dust. Persons below 18 years also shall not be employed;

b) To establish baseline records for the future surveillance of the health of workers; and

c) To educate and advise workers about the risks associated with the exposure to asbestos dust, the preventive measures provided by the employer and the precautions to be taken by the workers.

4.2.3.2 *Structure* — Pre-employment medical examination shall include the following:

a) A complete case history including personal, family and occupational histories.

Emphasis shall be given to respiratory system, smoking history and previous occupational exposures.

b) A general clinical examination, with an emphasis on respiratory system;

c) Lung function tests (spirometry) to record FVC (forced vital capacity) and FEV_1 (forced expiratory volume in one second); and

d) A full-sized postero-anterior chest radiograph, sufficient enough to include thoracic inlet and both costo-phrenic angles (film size 305 × 381 mm or 356 × 356 mm or 356 × 432 mm).

NOTE — In addition, lung function tests (spirometry) shall be done every year for first two consecutive years to establish a more reliable baseline data. In case any gross difference is observed in above two tests, a repeat test shall be done after six months of second test.

4.2.4 *Periodic Medical Examination*

4.2.4.1 *Objective* — The objectives of periodic medical examination are as follows:

a) To detect the earliest signs and symptoms of asbestos related diseases;

b) To detect the earliest signs and symptoms of a non-occupational illness which could present a similar picture of interstitial fibrosis, and advise accordingly;

c) To detect any significant change in health status relative to the baseline examination; and

d) To continue to educate and advise workers about health hazards in asbestos industry and to ensure that appropriate preventive measures are being taken to minimize risk.

4.2.4.2 *Structure* — Periodic medical examination for workers occupationally exposed to asbestos dust shall include the following:

a) A brief medical history, with an emphasis on respiratory system and smoking habits;

b) Job details that could allow reconstruction of exposure profiles for study;

c) A clinical examination, with an emphasis on the respiratory system;

d) A full-sized postero-anterior chest radiograph, sufficient enough to include thoracic inlet and both costophrenic angles (film size 305 × 381 mm or 356 × 356 mm or 356 × 432 mm);

e) Lung function tests (spirometry) to record FVC and FEV_1; and

f) Other relevant investigations which are deemed to be necessary by occupational physician in diagnosing asbestos-related disease.

4.2.4.3 *Frequency of medical examination* — Frequency of periodic medical examination shall be as follows:

a) Every worker, irrespective of his exposure profile, shall have his first periodic medical examination done, five years after pre-employment medical examination. Thereafter, workers who are occupationally exposed to asbestos dust level which is more than action level shall have periodic medical examination done every three years;

b) Exposure to asbestos dust levels below action level do not necessitate application of preventive measures of a medical nature according to ILO Code of Practice 'Occupational Exposure to Airborne Substances Harmful to Health, 1980'. However, as a matter of extra precautionary measure it is recommended that this category of workers shall get medical examination done every ten years; and

c) Periodic medical examination shall be conducted more frequently if the occupational physician deems it necessary, based on the findings of the previous medical examination. A more frequent medical examination is justified only to confirm a suspected case of asbestos-related disease.

4.2.5 *Medical Examination at Cessation of Employment* — Upon the cessation of employment, a full medical evaluation which shall include a review of all medical tests previously done, shall be performed within 30 days of cessation of employment. A decision shall 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 shall also be recommended.

4.2.5.1 Follow-up medical examination of the retired workers, who show suspicious signs of asbestos related diseases at the time of retirement shall be made by the employer according to decision taken under **4.2.5.**

4.2.6 *Radiographic Evaluation* — Radiographic evaluation shall be based on the 'ILO 1980 International Classification of Radiographs of Pneumoconioses' (or its subsequent revision).

The occupational physician may ask for additional views of the chest, like lateral or oblique, in selected cases, for further information. In case of any abnormality two more physicians shall be consulted.

4.2.7 *Lung Function Evaluation* — The spirometer used to record FVC and FEV_1 should have a device which provides a tracing of volume-time or volume-flow curve. This tracing shall be stored and available for recall.

While recording FVC and FEV_1, the technique shall be properly demonstrated, and a minimum of three acceptable manoeuvers shall be performed, and the maximum value out of three shall be recorded.

Predicated values of lung function of that ethinic group for comparison is an approximation accepted in the absence of pre-employment and periodic medical examination observations.

4.2.8 *Medical Records* — Medical examination record shall be maintained in accordance with good medical practice, recognizing the long latent period for asbestos related diseases.

The records shall be maintained and stored for a period of 10 years following the termination of employment, or for 40 years after first day of employment, whichever is later.

Medical records shall include the details of pre-employment examination, the periodic medical examinations, medical examination done at other times, if any and the medical examinations conducted at cessation of employment and further follow-up examinations, where done.

Records shall also be maintained of the individual employee's occupational exposure profile to asbestos, specific work practices, and preventive measures prescribed, if any.

4.2.9 *Health Education* — Every employer shall ensure that all workers (employees) on employment and periodically, get education and training in regard to sources of asbestos dust exposure, potential health effects, risk associated with asbestos dust exposure and smoking, and methods of prevention.

4.2.9.1 *Smoking precautions* — The employer shall apprise the employees of the synergistic effect on the hazards of smoking cigarettes, *beedies*, cigars and occupational exposure to asbestos.

4.3 Personal Protection — Respiratory equipment, protective clothing and proper hygienic facilities shall be provided to the workers likely to be exposed to asbestos dust exceeding exposure limit as given in the 'Indian Standard Recommendations for personal protection of workers engaged in handling asbestos' (*under preparation*).

4.4 Engineering Methods and Work Practices

4.4.1 *Engineering Methods*

4.4.1.1 *Engineering control* — Suitable engineering controls shall be

put into practice, such as (but not limited to) isolation, enclosure, exhaust ventilation, dust collection, etc, in order to maintain the working environment within the prescribed exposure limit.

4.4.1.2 *Tools* — Hand operated tools are recommended, as the use of equipment with low mechanical input and slow action (hand operated) will produce less airborne dust than equipment with high mechanical input and rapid action (power operated). If power operated tools are to be used they shall be provided with enclosures and exhaust ventilation.

4.4.2 *Work Practices* — Appropriate work practices shall be followed where materials or processes are used which may give rise to asbestos dust in the working environment. Such work practices shall include the following:

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 workplaces 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 wherever regulations so require;

e) Preventing asbestos dust discharged from exhaust apparatus from being drawn into the air of any workroom; and

f) Collection of asbestos bearing dust removed from any workroom by the exhaust system in suitable receptacles or filter bags which shall be isolated from all work areas.

4.5 Monitoring in the Workplace — Static and personal monitoring shall be carried out in order to identify the sources of asbestos dust emission and to determine the extent of asbestos dust exposure when asbestos or products containing asbestos are produced, handled or used in such a manner as to be liable to emit airborne dust.

4.5.1 *Static Monitoring* — Indications of the spatial and temporal distribution of airborne asbestos throughout the general atmosphere of the working area shall be obtained by taking air samples as follows:

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.

4.5.1.1 *Sampling frequency* — Sampling frequency shall be determined depending upon locations and the previous dust concentrations recorded. Sampling frequency is to be increased at locations where dust concentrations exceed the exposure limit, so that appropriate engineering controls are planned.

Sampling shall also be carried out after structural modification of the plant or any changes made in the process of product manufacture.

4.5.2 *Personal Monitoring* — Air samples shall be collected in the worker's breathing zone by means of personal samplers in order to evaluate the risk to the individual worker. Sampling shall be carried out while the work process is in operation.

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

4.5.2.2 *Sampling frequency and patterns* — Samples shall be of such frequency and pattern as to represent with reasonable accuracy the levels of exposure of the employees. Sampling shall be done at intervals of 3 to 6 months, for employees whose exposures to asbestos may reasonably be foreseen to exceed the permissible level. Personal sampling shall be carried out at various times throughout the work shift and, where necessary, shall be supplemented by short-term sampling during periods of peak emission.

4.6 Labelling of Risk Areas — All workplaces where asbestos dust may cause a hazard shall be clearly indicated as an asbestos dust exposure area through the use of a well-displayed sign which identifies the hazard and the associated health effects.

(*Continued from page* 2)

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(*Continued on page* 14)

(*Continued from page* 13)

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Peenya Industrial Area, 1st Stage Bangalore-Tumkur Road BANGALORE		839 4955
Commercial-cum-Office Complex, Opp Dushera Maidan, Arera Colony, Bittan Market, BHOPAL 462016		242 3452
62-63, Ganga Nagar, Unit VI, BHUBANESHWAR 751001		240 3139
5th Floor, Kovai Towers, 44 Bala Sundaram Road, COIMBATORE 641018		221 0141
SCO 21, Sector 12, Faridabad 121007		229 2175
Savitri Complex, 116 G T Road, GHAZIABAD 201001		286 1498
53/5 Ward No 29, R G Barua Road, 5th By-lane, Apurba Sinha Path, GUWAHATI 781003		245 6508
5-8-56C, L N Gupta Marg, Nampally Station Road, HYDERABAD 500001		2320 1084
Prithavi Raj Road, Opposite Bharat Overseas Bank, C-Scheme, JAIPUR 302001		222 3282
11/418 B, Sarvodaya Nagar, KANPUR 208005		223 3012
Sethi Bhawan, 2nd Floor, Behind Leela Cinema, Naval Kishore Road, LUCKNOW 226001		261 8923
H No 15, Sector-3, PARWANOO, Distt Solan (H P) 173220		235 436
Plot No A-20-21, Institutional Area, Sector 62, Goutam Budh Nagar, NOIDA 201307		240 2206
Patliputra Industrial Estate, PATNA 800013		226 2808
Plot Nos 657-660, Market Yard, Gultkdi, PUNE 411037		2427 4804
"Sahajanand House" 3rd Floor, Bhaktinagar Circle, 80 Feet Road, RAJKOT 360002		237 8251
T C No 2/275 (1 & 2), Near Food Corporation of India, Kesavadasapuram-Ulloor Road, Kesavadasapuram, THIRUVANANTHAPURAM 695004		255 7914
1st Floor, Udyog Bhavan, VUDA, Siripuram Junction, VISHAKHAPATNAM-03		271 2833
*Sales Office is at 5 Chowringhee Approach, P O Princep Street, KOLKATA 700072		2355 3243
†Sales Office (WRO) Plot No E-9, MIDC, Rd No 8, Behind Telephone Exchange, Andheri (East), Mumbai-400 0093		2832 9295

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