

IS : 10667 • 1983

Indian Standard

GUIDE FOR
SELECTION OF INDUSTRIAL SAFETY
EQUIPMENT FOR PROTECTION OF
FOOT AND LEG

UDC 658'382'3'08:614'897



© *Copyright* 1984

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

Indian Standard

GUIDE FOR SELECTION OF INDUSTRIAL SAFETY EQUIPMENT FOR PROTECTION OF FOOT AND LEG

Industrial Safety Advisory Committee, ISAC

Chairman

DR S. S. RAMASWAMY

Representing

Directorate General Factory Advice Service and
Labour Institutes (Ministry of Labour),
Bombay

Members

SHRI P. R. SURENDRANATHAN (<i>Alternate to</i> Dr S. S. Ramaswamy)	Ministry of Shipping and Transport
SHRI V. K. ARORA	Ministry of Shipping and Transport
SHRI T. P. P. NAMBIAR (<i>Alternate</i>)	Hindustan Aeronautic Ltd, Bangalore
SHRI PREM BAVEJA	Hindustan Aeronautic Ltd, Bangalore
SHRI B. S. GROVER (<i>Alternate</i>)	Indian Cotton Mills' Federation, Bombay
SHRI S. P. BHATIA	Indian Cotton Mills' Federation, Bombay
SHRI CHARANJIT LAL	Chief Controllorate of Explosives, Nagpur
SHRI B. R. DAVE (<i>Alternate</i>)	Chief Controllorate of Explosives, Nagpur
SHRI N. CHAKRAVARTY	Indian National Trade Union Congress, New Delhi
SHRI KARAN SINGH (<i>Alternate</i>)	Indian National Trade Union Congress, New Delhi
SHRI P. K. CHAUDHURI	Indian Society of Engineers, Calcutta
DR D. K. NAG (<i>Alternate</i>)	Indian Society of Engineers, Calcutta
SHRI N. CHAWLA	Sandoz (India) Ltd, Thane
SHRI S. C. DEY	Sandoz (India) Ltd, Thane
SHRI S. M. PRASAD (<i>Alternate</i>)	Central Boilers Board, New Delhi
DIRECTOR (COMMERCIAL)	Central Boilers Board, New Delhi
DEPUTY DIRECTOR (COMMERCIAL) (<i>Alternate</i>)	Central Electricity Authority, New Delhi
DIRECTOR GENERAL OF MINES SAFETY	Central Electricity Authority, New Delhi
DIRECTOR, MINES SAFETY EQUIPMENT (<i>Alternate</i>)	Directorate General of Mines Safety, Dhanbad
SHRI DURGESH CHANDRA	Directorate General of Mines Safety, Dhanbad
SHRI JAYANT ADHIA (<i>Alternate</i>)	Directorate General of Mines Safety, Dhanbad
SHRI P. N. GHOSH	Century Rayon, Kalyan
SHRI K. C. GUPTA	Century Rayon, Kalyan
SHRI N. RAGHAVAN (<i>Alternate</i>)	Institution of Fire Engineers India, New Delhi
SHRI R. P. JHA	Institution of Fire Engineers India, New Delhi
	National Safety Council, Bombay
	National Safety Council, Bombay
	Indian Jute Mills Association, Calcutta

(Continued on page 2)

© Copyright 1984

INDIAN STANDARDS INSTITUTION

This publication is protected under the *Indian Copyright Act* (XIV of 1957) and reproduction in whole or in part by any means except with written permission of the publisher shall be deemed to be an infringement of copyright under the said Act.

(Continued from page 1)

<i>Members</i>	<i>Representing</i>
SHRI J. D. JIJINA	Indian Airlines Corporation, New Delhi
SHRI M. N. ARORA (<i>Alternate</i>)	
SHRI M. KANT	Safety Appliances Manufacturers' Association, Bombay
SHRI KIRIT MARU (<i>Alternate</i>)	
SHRI V. N. KHOLKUTE	Factory Inspectorate, Government of Maharashtra, Bombay
SHRI H. N. MIRASHI (<i>Alternate</i>)	
SHRI P. KRISHNAN NAIR	The Fertilizers and Chemicals Travancore Ltd, Udyogmandal
SHRI B. S. MATHUR	Standing Committee on Safety for the Steel Industry, Durgapur
SHRI A. K. DASGUPTA (<i>Alternate</i>)	
SHRI G. B. MENON	Standing Fire Advisory Council, Ministry of Home Affairs, New Delhi
SHRI M. K. MODWEL	Railway Board (Ministry of Railways)
SHRI R. N. MUKHOPADHYAY	Directorate General of Health Services, New Delhi
SHRI S. PURUSHOTHAMA	Loss Prevention Association of India Ltd, Bombay
SHRI T. V. MADHUMANI (<i>Alternate</i>)	
SHRI G. RAMAMURTHY	Ministry of Communications
SHRI Y. V. R. REDDY (<i>Alternate</i>)	
SHRI S. G. RANADE	Directorate General of Ordnance Factories, Calcutta
SHRI S. R. C. RAO	Steel Authority of India Ltd, New Delhi
SHRI R. N. DAS (<i>Alternate</i>)	
REPRESENTATIVE	Ministry of Defence (DGI)
SHRI Y. K. SAPRU	The Safety First Association of India, Bombay
SHRI A. A. JASDENVALA (<i>Alternate</i>)	
SHRI K. K. SARKHEL	The Project & Development (India) Ltd, Sindri
SHRI I. C. SARIN	Employees State Insurance Corporation, New Delhi
DR K. M. SAXENA (<i>Alternate</i>)	
SHRI P. SESHADRI	Ministry of Petroleum & Chemicals
SHRI JAGJIT SINGH (<i>Alternate</i>)	
DR B. SINGH	Central Mining Research Station (CSIR), Dhanbad
SHRI P. R. ROY (<i>Alternate</i>)	
SHRI D. K. SIRKAR	Indian Chemical Manufacturers' Association, Calcutta
SHRI S. J. SHARMA (<i>Alternate</i>)	
SHRI S. VENKASWAMY	Directorate General of Civil Aviation, New Delhi
SHRI S. P. VIDYARATHI	All India Manufacturers' Organization, Bombay
SHRI S. K. MATHUR, Director (Chem)	Director General, ISI (<i>Ex-officio Member</i>)

Secretary

SHRI K. K. TRIPATHI
Senior Deputy Director (Chem), ISI

(Continued on page 8)

Indian Standard

GUIDE FOR SELECTION OF INDUSTRIAL SAFETY EQUIPMENT FOR PROTECTION OF FOOT AND LEG

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 30 September 1983, after the draft finalized by the Industrial Safety Advisory Committee had been approved by the Executive Committee.

0.2 Foot injuries are caused due to: (a) Striking against stationary object, (b) Striking by moving object; (c) Stepping on hot objects, (d) Stepping on sharp objects, (e) Heat radiation and welding sparks, and (f) chemicals.

To protect the foot from hazards (a) to (f) above, leather safety boot should be used; for hazard (e) asbestos, safety boots should be used.

0.3 Main differences between the safety boot and the ordinary shoe are as follows:

<i>Safety Boot</i>	<i>Ordinary Shoe</i>
a) Provided with a carbon steel toe cap	Not provided with steel toe cap
b) Ankle height is 115 mm	No ankle height
c) Sole hardness is above 55 IRHD	Sole hardness is less than 55 IRHD

0.4 For foot protection it is also necessary for the employer to provide washrooms, showers, and locker facilities so that employees can conveniently bathe their feet and change into clean, dry footwear after the day's work.

0.5 In the formulation of this standard, assistance has been derived from the following publications:

DERKS M. BALDEVIN. A foot hold on safety. *Job Safety Health*, May 1976.

Conservation of Personal Protective Equipment, Safety Practices Pamphlet No. 106. National Safety Council, Chicago.

Protective Clothing, Safety Practice Pamphlet No. 16, National Safety Council, Chicago.

1. SCOPE

1.1 This standard provides guidance for selection, use and maintenance of safety boots, shoes and leg guards.

2. TYPES

2.0 The protective footwear should suit the job, that is, their construction and materials should provide adequate defence against all hazards the workers may encounter.

2.1 Safety shoes have the widest application in industry. The metal cap built into the shoe is meant to shield the toes from impact and compression. When there is a heavy lift truck traffic in a plant, or other added risk of injury to the toe/foot metatarsal guards offer additional protection.

2.2 Safety boots and rubber shoes offer protection against wet, cold or slippery conditions such as in outdoor work, refineries and food processing plants. If worn over safety shoes, overboots do not need any reinforcement in the toe area. If worn over bare feet shoes, overboots should have built-in toe caps.

2.3 Conductive shoes and over-shoes, worn round explosive gases or material, permit the static electricity that builds up in the body of the wearer to drain off harmlessly into a conductive, grounded floor. Employee should not be allowed to wear them outdoors because any accumulation of dirt impairs effectiveness of conductive shoes. Electrical resistance of the shoes should be tested periodically while they are in service.

2.4 Non-sparking shoes are used in hazardous locations such as in explosive operations or in the cleaning of tanks that have held gasoline or volatile hydrocarbons.

2.5 Shoes for protection from electrical hazards should not have any exposed metal; the toe box should be insulated from the shoe. Electrical hazard shoes can be depended on for protection when they are dry and in good condition; however, protection is diminished when they are wet from perspiration or rain.

2.6 Foundry safety boots for moulders and welders are used whenever there is a hazard from hot splashes, such as, in the pouring of molten metals, or flying sparks. They fit snugly and should be as easy as possible to remove in case a spark or hot metal gets inside. Instead of being closed by laces, they should have other suitable fasteners to hold the top of the shoe close to the ankle.

2.7 Leather Safety Boots and Shoes — In safety shoes the sole and steel toe are of prime importance. The sole leather used in safety shoes/boots shall conform to IS : 579 (Part 1)-1973*.

2.8 Asbestos Safety Shoes — They should have a flame treated leather lining as well as the sole. For heat as well as flame protection it is necessary that asbestos used in the production of such shoes is of suitable grade. Asbestos having close weave will reduce penetration of heat from outside to the inside. The laces of such shoes should be of leather or borax treated cotton laces. Plastic laces should never be used in this variety of shoes.

2.8.1 Sole — It is advisable that between the layers of sole glass wool is inserted for protection against heat.

2.9 PVC and Rubber Gumboots — There are two varieties in rubber gumboots that is general purposes and industrial. Only industrial gumboots should be employed for use when the hazard is handling stronger or mild acids, alkalies and corrosive chemicals. PVC half gumboots made from pure vinyl is also ideal for protection against acids and alkalies. Use of PVC apron along with PVC half gumboots is recommended for obtaining required frontal body protection.

3. LEG PROTECTION

3.1 Footguards that are added outside the shoe can provide significant protection where there are hazards from moving objects. Combination foot and shin guards can be used where there is danger from flying particles such as jack hammer work. Strap on wooden soled sandals can be used for protection against under foot hazards of heat, oil, acids, hot water, caustics and sharp objects.

3.2 Leg protection is also secured by various types of leggings, from waist length to those that reach only part way to the knees. The length and material to be used depend upon the hazards involved.

3.3 For protection against molten metal, leggings should be instantly removable in an emergency. They should also have large flares to protect the instep and heel and be free from projecting buckles and clamps.

3.4 Asbestos and leather are used where it is necessary to protect against molten metal, sparks and heat. Fire resisting duckmand wool may be used against light spatters and sparks. Leggings are known as 'spring' type because no fasteners are used to afford easy removal. These may be furnished with an inner fibre shield as protection against leg bruises and affording effective shedding of molten material. Others of metal construction are also used where the sole hazard is injurious to the shin through bumps and bruises.

*Specification for sole leather: Part 1 Vegetable tanned sole leather (second revision).

3.5 Where acids, alkalis and hot water are encountered, natural or synthetic rubber or any other synthetic material may be used, depending upon the hazard encountered.

3.6 Spats of leather, fire resisting duck, wool or asbestos are used by men whose ankles and shoe top may be exposed to molten metal or sparks. Welders find this equipment useful particularly in close work. Man so equipped should wear their trouser legs over the spats unless the latter are closely bound to prevent sparks or hot metal from entering at the top of the spat.

3.7 Knee pads of asbestos, fibre, felt or reinforced leather are used as protection against heat and sharp edges encountered in steel mills, glass plant operations, sheet metal plants, mines and similar industries. Knee pads of rubber construction are also furnished to workers who are required to remain on their knees for extended periods of time, such as cement finishers, etc.

3.8 Leg Guard — Leather leg guard of 225 mm size should be used by welders to protect the leg from welding sparks and to avoid entering of sparks inside the safety boots. Leg guard of 400 mm size should be used by workers engaged in loading the curled chips in the machine shop.

4. SELECTION, FITTING AND INSPECTION

4.1 Supervisors and employees should be advised to select the proper type of safety shoe for each job. Recommend the proper type shoe. For example, workers on wet slip floors may need non-slip sole shoes which will not be harmed by water or acid. For more severe exposures of this type, provide over-shoes, boots, wooden sole shoes or wooden or rubber mat sandals.

4.2 Select synthetic rubber or chrome leather soles for work on oily ground or floors because ordinary rubber or leather deteriorates under such exposure.

4.3 For excessively heated or sharp material on the floor, use sandal safety shoes or wooden sole shoes.

4.4 Furnish external toe or foot guards when there is need for additional protection because of heavy material handled or because of severe exposure to abrasion and sharp metal which otherwise would cut the leather uppers.

4.5 All employees buying shoes should understand the need for proper fitting. The workers feet will spread, especially if heavy loads are carried; hence measurement of length and width should be taken with the weight of the body on the feet.

4.6 Shoes that do not fit tempt the wearer to mutilate them in an effort to secure comfort.

5. CLEANING, DRESSING, STERILIZATION AND REPAIR

5.1 Encourage employees to clean and dress their shoes frequently.

5.2 Sterilize the shoes if required as per instructions of the manufacturer.

5.3 Do not allow shoes to wear or deteriorate beyond a condition suitable for repair, whether the repair is undertaken by the employee or employer.

5.4 Replace worn soles before wearing down the inner soles.

5.5 Replace run down heels before the weight of the wearer forces counters and other parts out of shape.

5.6 Conductive sole shoes, designed to prevent the accumulation of body static charges, as well as antispark and shock resistant types require special attention. Only repairmen thoroughly familiar with their construction and trained in approved methods of repairs should attempt this work. The advice of the manufacturer should be sought.

6. USE AND CARE

6.1 It should be ensured that employee gets a comfortable shoe; a good fitting will not cramp or chafe the feet on the job and it will wear longer.

6.2 Shoes should be kept in good repair. Worn out soles and run down heels are dangerous.

6.3 Clean the shoes frequently.

6.4 Keep shoes as dry as possible. If they get wet, dry them slowly. Wet leather will be damaged by heat greater than the hand can bear.

6.5 Wash the feet and change socks daily. Perspiration harms the leather and causes the lining to wear out and become rough.

6.6 Wear heavy cotton or woollen socks which absorb perspiration better and wear longer than thin nylon, silk or rayon socks.

6.7 Avoid stepping on or kicking against sharp metal; scraper other material which may damage shoes or may cause foot injury.

(Continued from page 2)

Safety Equipment Subcommittee, ISAC S : 2

<i>Convener</i>	<i>Representing</i>
SHRI B. S. MATHUR	Steel Authority of India (Durgapur Steel Plant), Durgapur
<i>Members</i>	
SHRI J. J. ADHIA	Century Rayon, Kalyan
SHRI M. V. RAO (<i>Alternate</i>)	
SHRI K. BARDHAN	Ministry of Defence (DGI)
SHRI J. P. AGARWAL (<i>Alternate</i>)	
SHRI R. N. BHATTACHARJEE	Central Coal Mines Rescue Stations Committee, Dhanbad
SHRI S. SANYAL (<i>Alternate</i>)	
SHRI K. N. BHATTACHARYA	The Safety First Association of India (Bihar Branch), Jamshedpur
SHRI N. K. SARAN (<i>Alternate</i>)	
SHRI CHARANJIT LAL	Chief Controllerate of Explosives, Nagpur
SHRI B. R. DAVE (<i>Alternate</i>)	
SHRI N. CHAWLA	Sandoz (India) Ltd, Thane
SHRI S. Y. PHONDGE (<i>Alternate</i>)	
DR A. K. GHOSH	Central Mining Research Station (CSIR), Dhanbad
SHRI P. R. ROY (<i>Alternate</i>)	
SHRI B. GUHA NEOGI	ReyrolleBurn Ltd, Howrah
SHRI P. BISWAS (<i>Alternate</i>)	
SHRI K. C. GUPTA	National Safety Council, Bombay
SHRI A. N. INDIRKAR	Mines Safety Appliances Ltd, Calcutta
SHRI M. MISHRA (<i>Alternate</i>)	
SHRI P. P. JAIN	Mines Service Corporation, Asansol
SHRI A. P. AGARWALA (<i>Alternate</i>)	
JOINT DIRECTOR OF MINES SAFETY	Directorate General of Mines Safety, Dhanbad
SHRI S. S. MAZUMDAR	Indian Oxygen Ltd, Calcutta
SHRI K. C. KARMAKAR (<i>Alternate</i>)	
DR O. P. MITTAL	Indian Chemical Manufacturers' Association, Calcutta
SHRI N. C. MUKHERJEE	National Safety Council, Bombay
SHRI N. RAGHAVAN (<i>Alternate</i>)	
SHRI C. PEREIRA	Joseph Leslie & Co, Bombay
SMT. C. LESLIE REY (<i>Alternate</i>)	
SHRI S. P. PURI	National Physical Laboratory (CSIR), New Delhi
SHRI S. G. RANADE	Directorate General of Ordnance Factories, Calcutta
SHRI S. S. SALODKAR	Coal India Ltd, Calcutta
SHRI S. D. SHROFF	Pradeep Safety Pvt Ltd, Bombay
SHRI M. D. SHROFF (<i>Alternate</i>)	
SHRI D. K. SIRKAR	Synthetics and Chemicals Ltd, Bareilly
SHRI P. R. SURENDRANATHAN	Directorate General Factory Advice Service and Labour Institutes (Ministry of Labour), Bombay
SHRI M. K. MALHOTRA (<i>Alternate</i>)	
SHRI FRANCIS LESLIE VAZ	Francis Leslie & Co, Bombay
SHRI HEATCLIFF VAZ (<i>Alternate</i>)	