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IS 13295 (1992): Code of practice for manufacture of leather safety boots and shoes for workers in mines and heavy metal industry [CHD 19: Footwear]



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भारतीय मानक

खानों व भारी उद्योगों में कार्यरत श्रमिकों के लिये
चमड़े के सुरक्षा बूट एवं जूते बनाने की पद्धति

Indian Standard

**CODE OF PRACTICE FOR
MANUFACTURE OF SAFETY LEATHER
BOOTS AND SHOES FOR WORKERS IN THE
MINES AND HEAVY METAL INDUSTRIES**

UDC 685.314.3 [622+669.01] : 614.897.2

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BUREAU OF INDIAN STANDARDS
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NEW DELHI 110002

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Price Group 3

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Footwear Sectional Committee had been approved by the Chemical Division Council.

This code of practice has been formulated in order to assist the manufacturers in overcoming the practical difficulties faced by them in fabricating the safety leather boots and shoes for workers in the mines and heavy metal industries conforming to IS 1989 (Part 1) : 1986 'Specification for leather safety boots and shoes : Part 1 For miners (*fourth revision*)' and IS 1989 (Part 2) : 1986 'Specification for leather safety boots and shoes : Part 2 For heavy metal industries (*fourth revision*)'. The code of practice will also help in assisting the purchasing/distributing authorities in procuring quality safety boots and shoes. This standard is expected to play a significant role in devising a suitable system of production control, covering aspects like procurement of suitable raw materials, sequence of operation, inspection stages, permissible defects and acceptance criteria for achieving a given level of quality in these safety boots and shoes. This standard is further expected to provide adequate technical information on fabrication techniques and allied details.

Indian Standard

CODE OF PRACTICE FOR MANUFACTURE OF SAFETY LEATHER BOOTS AND SHOES FOR WORKERS IN THE MINES AND HEAVY METAL INDUSTRIES

1 SCOPE

This standard prescribes the code of practice for the manufacture of safety leather boots and shoes for workers in the mines and heavy metal industries.

2 REFERENCES

The Indian Standards listed below are necessary adjuncts to this standard:

<i>IS No.</i>	<i>Title</i>
1989 (Part 1) : 1986	Leather safety boots and shoes : Part 1 For miners (<i>fourth revision</i>)
1989 (Part 2) : 1986	Leather safety boots and shoes: Part 2 For heavy metal industries (<i>fourth revision</i>)
2050 : 1991	Glossary of terms relating to footwear (<i>first revision</i>)

3 TERMINOLOGY

For the purpose of this standard, the definitions given in IS 2050 : 1991 shall apply.

4 MANUFACTURING TECHNIQUES

4.1 Components

Each component of the safety boot or shoe shall conform to the thickness requirements as prescribed in Table 1 of IS 1989 (Part 1) : 1986 and IS 1989 (Part 2) : 1986. Thickness requirements only in terms of minimum thickness have been prescribed. It is essential that the thickness as prescribed for various components are followed in order to maintain the mass of the boot or shoe.

4.2 Design

The boot shall be ankle high or derby pattern with six eyelets, full vamp and shall be made on lasts as specified in 4.16. The vamp of boot shall be fully lined. The shoe shall be of derby design, with four eyelets or less, as specified by the purchaser and shall be made on lasts as specified in 4.16. The shoe shall be lined with leather throughout. The toe of the boot or shoe shall be reinforced with protective steel toe-cap and shall have a padded tongue. The boot or

shoe shall be fitted with sole either of normal vegetable tanned/water resistant vegetable tanned sole leather or solid moulded rubber sole and heel. The leather sole and heel may be fitted with rust free metal toe tips, heel tips and further reinforced with rust-proof hobnails, if required by the purchaser. The boot or shoe shall be fabricated by composite method of construction, that is, riveted, stitched and screwed.

4.3 Checking of Upper Leather

Check upper leather sides/pieces for colour, thickness, fullness of material, etc. Mark various defects like patches in finishing, holes, damages, flay cuts, wrinkles, etc, to avoid these defects while checking. All components shall be clicked with lines of tightness of leather in the heel to toe direction.

4.4 Sorting of Leather

Sort larger sides/pieces for larger sizes of cut components.

4.5 Clicking of Upper Components

Click components according to the location and thickness requirements as given in Table 1 of IS 1989 (Part 1) : 1986 and IS 1989 (Part 2) : 1986. Avoid excess cutting, overlapping, short cutting, etc, while clicking the components. Maintain regularity and uniformity of cut edges.

4.6 Clicking of Lining Components

Click vamp lining from lining leather in accordance with the requirements given in Table 1 of IS 1989 (Part 1) : 1986 and IS 1989 (Part 2) : 1986 following the principles as stated in 4.5. Click tongue lining from the woollen/flannel cloth.

4.7 Size Stamping/Colour Size Marking

To facilitate identification of components as per size, either stamp the size, lot number, fitting, etc, along the edge of the components or colour mark the edges with different colour pigments as per a predetermined colour chart.

4.8 Stitch Marking of Upper Components

Mark position of rows of stitching with white ink either on a stitch marking equipment or by hand as given in 4.8.1.

4.8.1 Two rows of stitch marks may be provided 3 mm apart, first row being 2 mm from the edge on toe cap and counter. For vamp and quarter joining, provide either two rows of stitch marking on the quarter side at 6 mm apart, first row being 2 mm from the edge or three rows of marking, 3 mm apart. At the quarter facing provide two rows of stitch marking 2 cm apart, the first row of marking being 3 mm from the edge of the quarter. Provide underlay marking on vamp wings at a distance of 11 mm. Provide similar stitch marking for eyelet fixing at a distance of 25 mm from the top line of the quarter for the first eyelet and a line, 10 mm from the facing edge, for other eyelets to be fixed at uniform distance on this line.

4.9 Upper Skiving

4.9.1 Vamp

Give underlay skive of 11 to 12 mm width along the vamp-wing portion and row edge skive not exceeding 3 mm width along the portion where tongue attachment has to be made.

4.9.2 Quarter

Provide row edge skive, not exceeding 3 mm width, along the back line of the quarter and the wing portion.

4.9.3 Leather Toe-Cap

Provide row edge skive along the top edge, not exceeding 3 mm in width. In case cap is thick, hard and rough, give 15 to 20 mm wide bevel skive along the lasting edge to make the lasting easy.

4.9.4 Counter

Provide 11 to 12 mm underlay skiving along the top end of the counter.

4.10 Back Strap

The leather strengthening piece for reinforcement of the quarter back top by a wide strap of leather of suitable length, depending on size, shall be provided.

4.10.1 Strengthening

Strengthening piece shall be clicked from a leather piece/side in accordance with the required dimensions.

4.11 Upper Stitching

All stitching shall be done on heavy lock stitch machine. All stitching shall be done with cotton thread as prescribed in IS 1989 (Part 1) : 1986 and IS 1989 (Part 2) : 1986.

4.12 Attachment of the Upper Components

4.12.1 Toe-cap to Vamp

Two rows of stitching, 3 mm apart, first row being 2 mm away from the edge shall be provided.

4.12.2 Vamp to Tongue

For boots, vamp lining is kept under the vamp with flesh side of both facing each other and the tongue fitted temporarily with the vamp with two steel tacks and then all the three shall be stitched together. For shoes, first the woollen cloth is cut to size of tongue and it is stitched with the vamp lining and then it is pasted and stitched with the tongue. In case the tongue and vamp are in two pieces, first the tongue is stitched with the vamp and then the woollen cloth, already attached with the vamp lining, is stitched with the tongue.

4.12.3 Quarter to Counter

Both quarters shall be joined along the skived edge at the back with one row of seam at a distance of 1.5 mm to 2 mm away from the edge. The back seam shall be reinforced by stitching a woven tape as specified with one row of seam on either side at a distance of 1 mm from the edge of the tape. Join counter to quarter with two rows of seams 3 mm apart, first row being 2 mm away from the edge. Stitch strengthening piece at the quarter back/seam top with one row of stitch at a distance of 1 mm along all the four sides. The counter of the boot shall be turned over to within 15 mm at the top of quarter back/leg so as to form a jug loop.

4.12.4 Full Below Tongue to Quarter

Stitch two rows of seams along the quarter facing joint to the full below tongue, 2 cm apart with the first row being 3 mm away from the edge.

4.12.5 Quarter to Vamp

Stitch two rows of seams along quarter wing at the joint with the vamp 6 mm apart or three rows 3 mm apart, with first row being 2 mm away from the edge.

4.12.6 Eyelet Fixing

Fix six eyelets for boots and four or less for shoes on each facing at equal spacing and clench without distortion. The top eyelet shall be at a distance of 25 mm for boot and 15 mm for shoe from the top line of the quarters and 10 mm from the edge of boot and shoe, respectively. The remaining eyelets may be 10 mm away from the facing edge at a uniform distance.

4.12.7 *Lacing the Tabs*

The upper shall be laced up tightly to the required eyelet from the bottom eyelet before lasting so that the quarters meet on the instep.

4.13 *Bottom Component Cutting*

4.13.1 *Checking of Sole Sides*

Check sole leather sides for thickness, fullness of material, grain structure, etc. Mark various defect like damaged surface, patches on surface, flay cuts, etc, to avoid these defects while cutting.

4.13.2 *Cutting of Bottom Components and Size Marking*

Cut different bottom components like soles, insoles, middle soles, stiffeners, heel lifts, split lifts, tip filling, etc, according to the requirements prescribed in Table 1 of IS 1989 (Part 1) : 1986 and IS 1989 (Part 2) : 1986. Stamp size and fitting on soles and insoles for identification. Cut edges shall be uniform and smooth.

4.13.3 *Preparation of Bottom Components*

4.13.3.1 *Splitting of components*

Split components on leather splitting machine in accordance with the requirement of thickness given in Table 1 of IS 1989 (Part 1) : 1986 and IS 1989 (Part 2) : 1986.

4.13.3.2 *Skiving of stiffeners*

Depending upon the substance of the stiffener, 15 to 20 mm bevel skive may be provided along the top edge of the stiffener so that the thickness at the edge is not more than 1 mm. The bottom edge of the stiffener shall be given a skive of 25 mm width.

4.13.3.3 *Insole Preparation*

Insoles shall be feathered all round neatly on the flesh shoe. The feathering may be done to a width of 3 mm and to a depth of two-third of the total thickness of the insole. Feathering shall be done at an angle of approximately 45°. Insoles shall be lightly snuffed on the grain side.

4.13.3.4 *Sole channeling*

The soles shall be grooved (open channel) from heel breast to heel breast on the grain side. The groove shall be about 2 mm wide and 2 mm deep. The groove shall be 12 ± 1 mm away from the edge of the sole uniformly.

4.13.3.5 *Sole piece*

In case of pieced sole, joint with sole pieces shall be 25 mm behind the breast of the heel. The pieced sole shall be of the same thickness as that of the sole. The joint of the sole and the sole piece shall not be less than 12 mm in width.

To obtain a good joint, both pieces shall be skived uniformly to a width of 12 mm.

4.14 *Heel Building and Heel Tip Fixing*

The heel shall be built up with sole lifts having not more than one split lift. The heel shall consist of whole lifts, two pieces lifts, one split lift and one top piece. Attach heel tip with rust free, 22 mm long, heel tip nails. The heads of heel tip nails shall fit flush in the holes provided in the heel tips. Attach tip filling with 19 mm spear pointed brass rivets. Ensure that tip filling is attached with 10 to 14 rivets depending upon sizes. The tip filling shall be fixed in a manner that it lies flush with the heel tip. Heels shall then preferably be put on heel compressing machine to obtain a consolidated heel.

4.15 *Lace Preparation*

Leather laces shall be cut from well fat liquored and well dubbined chrome tanned leather. The colour shall match with the colour of the boot. Leather laces shall be 85 ± 5 cm in length with a minimum breaking load of 20 kg. Sharp edges on the flesh side shall be neatly beveled to an extent of 1 mm so as to easily pass through the eyelets. Cotton laces for shoes, if coloured black, shall be free from sulphur dyes and shall conform to the length and breaking load as prescribed in IS 1989 (Part 1) : 1986 and IS 1989 (Part 2) : 1986.

4.16 *Lasting and Making*

4.16.1 *Attachment of Insole on Lasts*

Attach feathered insole on lasts with three panel pins of 12 to 15 mm length. In case of minor variations in the shape of insole with the last bottom, the excess portions shall be trimmed suitably.

4.16.2 *Stiffeners Insertion in Upper*

Stiffeners shall be reinforced with a hard setting glue/adhesive and shall be evenly applied on both sides before positioning the stiffeners at appropriate place in the closed upper.

4.17 *Drafting and Lasting*

Place upper on the last and give the first pull at the toe portion. Give second and third pulls at the two sides of toe-cap and fourth pull at the back of the boot/shoe. Fifth and sixth pull shall be given at the heel joint positions. All layers of upper and lining shall be pulled over before driving lasting tacks to avoid air pockets and gaps between the layers. Examine the positioning of the upper as to whether it is aligned and straight on the last. Remove tacks from the positions of second and third pulls. Place steel toe-cap in between the toe-cap and full vamp to the exact shape and contour of the last. Complete the lasting operation at the toe portion with the help of 12 mm lasting tacks (light hand

tacks). Complete lasting at heel seat portion with 10 mm lasting tacks (light hand tacks) ensuring that leg height conforms to the relevant requirement prescribed in IS 1989 (Part 1): 1986 and IS 1989 (Part 2): 1986. Ensure that lasting edge of stiffeners have come under the grip of lasting tacks. Complete lasting of fore-part and waist with 9 mm light hand tacks. Ensure that upper has embedded properly to the last at all places. Ensure that a clear lasting allowance of about 13 mm has been provided all round. Lasting tacks shall be uniformly spaced (7 tacks for 5 cm) in a neat row. Lasting tacks shall be uniformly 11 mm away from the feather edge. Hammer with plain flat file along the feather edge all round to obtain a definite feather line. Excess lasting allowance, beyond 13 mm, may be trimmed off uniformly.

4.17.1 Pounding of Leather Bottom

Lasted margin may be well pounded to obtain a flat lasted surface, particularly at heel seat and toe. In case of excessive creasing at toe and heel seat, the same may be trimmed/skived to obtain a flat surface. Remove all the three panel pins holding the insole to the last.

4.17.2 Shank Attachment

Attach shank at the breast/waist of insole either with light hand tacks or staples at either end. Ensure that one end of the shank comes under the heel to the extent of 12 mm. Ensure that the other end does not extend beyond 5 mm short of thread line in the insole.

4.17.3 Bottom Filling

Fill gaps on the insole at the fore-part, the heel portion and at both sides of the shank with tar/portumenised felt for boots and shoes for miners. Ensure after bottom filling that the filled surface is flush with the lasted margin and flat for the next operation. Introduce fire-proof cloth for the boot/shoe for workers in the heavy metal industries in the same way.

4.17.4 Middle Sole Attachment

Position middle sole on the lasted bottom and attach temporarily with these panel pins. Middle sole shall be riveted with spear pointed brass rivets. The rivets of 14 mm length shall be used at the toe and heel seat portion and 12 mm rivets for the remaining portion. 10 to 14 rivets shall be used per decimetre. Distance of rivets from the edge of the middle sole shall be 15 ± 1 mm uniformly. Ensure that all rivets are properly clenched with insole giving a smooth 'J shaped' clench. Remove the 3 temporary attachment panel pins.

4.17.5 Outer Sole Attachment and Stitching

4.17.5.1 Boot/shoe with leather sole

Position sole on the middle sole and attach sole temporarily with 3 panel pins. The sole shall be stitched with middle sole aloft in the groove provided on the sole with linen thread by lock stitch method. The difference between the top and the bottom thread shall not be more than 2 plies in any case. There shall be 16 to 20 stitches per decimetre. All loose ends of threads shall be suitably waxed before use. All loose ends of threads shall be properly secured. Remove the panel pins used for temporary attachment of out sole.

4.17.5.2 Boot/shoe with rubber sole

The inside surface of the rubber sole (unit type) shall be roughened. Roughen the leather middle sole. Apply a thin layer of suitable permanent bonding type adhesive (pressure sensitive type) on the roughened sole surface and the leather middle sole. After appropriate time interval, the rubber sole shall be stuck to the leather middle sole and put under pressure of cementing press. The rubber sole shall then be securely stitched with the middle sole in an open channel by the lock stitch method using thread as prescribed in IS 1989 (Part 1): 1986 and IS 1989 (Part 2): 1986. Number of stitches shall be 16 to 20 per decimetre. Loose ends of stitching threads shall be properly secured.

4.17.6 Screwing for Boot/Shoe with Leather Sole

The outer sole shall be screwed all round with brass screw wire and the distance between the two screws shall be not more than 25 cm. The screwing shall be done uniformly all round at a distance of 13 ± 1 mm from the sole edge. All screws shall penetrate through the outer sole, middle sole, upper lasted margin and inside without protruding.

4.17.7 Sole Levelling and Last Slipping for Boot/Shoe with Leather Sole

After screwing the soles, the same shall be thoroughly levelled either by hand or on a levelling machine to obtain a smooth sole surface to the contour of the last bottom. The boot/shoe shall remain on lasts long enough to ensure proper shape retention of upper and adequate hardening of stiffeners. Normally the boot/shoe should remain on lasts for at least 24 hours. The process could be hastened up by the use of heat setting equipment after the lasting operation. Cut temporary lacing on the last 4 eyelets. Slip last either on last slipping machine or on a lasting jack.

4.17.8 *Heel Attachment and Breasting*

4.17.8.1 *Boot/shoe with leather sole*

Heels shall be attached from inside with 12 to 14 heel pins as prescribed in IS 1989 (Part 1) : 1986 and IS 1989 (Part 2) : 1986. Ensure that heel rests flat on the ground and sole rests on the thread with appropriate toe spring so as to provide a balanced foot rest. Trim heel breast either by hand or on machine in a manner that heel breast line is aligned to the sole edge.

4.17.8.2 *Boot/shoe with rubber sole*

The rubber heel (lug type) shall be securely attached by machine from inside with the help of 12 heel pins, 29 mm long, as prescribed in IS 1989 (Part 1) : 1986 and IS 1989 (Part 2) : 1986. For reinforcement, 9 heel pins of 25 mm length shall be used from inside through the holes provided for the purpose. For hand attachment of heels, similar and same number of heel pins shall be used. The heel pins shall be attached first from outside and then reinforced from inside. A leather lift, if required, may be positioned between the rubber sole and the rubber heel prior to attachment.

4.18 *Finishing Operation*

4.18.1 *Sole Edge Trimming*

4.18.1.1 *Boot/shoe with leather sole*

Sole edge shall be trimmed on sole trimming machine or by hand with appropriate size cutters. Sole edges shall be trimmed in a manner that trimmed edge gives a balanced look and is perpendicular to the feather edge. Joint ball positions of sole edge shall be kept prominent. Trimmed edge from joint to joint shall run parallel to the boot/shoe upper edge.

4.18.1.2 *Boot/shoe with rubber sole*

Sole edge shall be scoured on a stone cutter, mounted on edge trimming machine or carried out manually with the help of abrasive paper. Ensure that sole edge is smooth and balanced when scoured. Ensure that sole edge is perpendicular to leather edge.

4.18.2 *Heel Edge Trimming for Boot/Shoe with Leather Sole*

Heel edges shall be scoured, first on rough abrasive paper of grit No. 80 or glass pieces. Thereafter, heel edges shall be scoured on fine abrasive paper of grit No. 100 or glass pieces. Scoured edge shall be perpendicular to the feather edge uniformly all round the heel.

4.18.3 *Sole and Heel Edge Colouring and Waxing for Boot/Shoe with Leather Sole*

Apply appropriate colour pigment, matching with the colour of upper, along the sole and

heel edge. Also ensure that colouring of the visible portion of the middle sole extends beyond the feather edge. After the pigment has dried, apply a thin coat of wax (heel ball) of suitable colour matching with the colour of the upper.

4.18.4 *Sole Edge Setting for Boot/Shoe with Leather Sole*

After waxing, sole edges shall be properly set with a hot setting iron of appropriate width. Ensure that wax has uniformly spread along the edges and has formed a thin film and gives a glossy appearance.

4.18.5 *Heel Edge Burnishing for Boot/Shoe with Leather Sole*

Heel edge shall be burnished/polished either on machine or by hand. Ensure that wax has spread uniformly over the edges and has formed a thin film and gives a glossy appearance.

4.18.6 *Fixing of Toe-plate and Hobnails on Boot/Shoe with Leather Sole*

Fix toe-plate at the toe end of the sole with the help of toe-plate nails as prescribed in IS 1989 (Part 1) : 1986 and IS 1989 (Part 2) : 1986. Heads of the toe-plate nails shall fit flush in the holes provided in the toe-plate. Fix 13 hobnails, of the size as prescribed in IS 1989 (Part 1) : 1986 and IS 1989 (Part 2) : 1986, at the fore-part of the sole. Hobnails shall be fixed, if desired, by the purchaser in 4 rows, beginning at the sole joint position, having 4 hob-nails in the first and second line, 3 on the third line and 2 at the last line, near the toe-plate edge.

4.18.7 *Sock Pasting*

Full sock as prescribed in IS 1989 (Part 1) : 1986 and IS 1989 (Part 2) : 1986 shall be provided with each boot and shoe. Full sock shall be placed and firmly pasted in position on the insole with suitable adhesive.

4.19 *Lacing*

Each pair of boot shall be provided with a pair of either leather laces or fabric laces as prescribed in IS 1989 (Part 1) : 1986 and IS 1989 (Part 2) : 1986. Similarly, each pair of shoes shall be provided with a pair of cotton laces.

4.20 *Appearance and Workmanship*

The boots and shoes shall conform to the general workmanship as detailed in the manufacturing manual of the individual manufacturer. General workmanship in all other respects, not defined in the manual for the boots and shoes, shall be comparable to the sample, previously supplied by the manufacturer and approved by the purchaser.

5 REQUIREMENTS

The leather safety boot/shoe for the miners and the workers in the heavy metal industries shall conform to the relevant material and performance requirements prescribed in IS 1989 (Part 1) : 1986 and IS 1989 (Part 2) : 1986.

6 PACKING AND MARKING

The boot or shoes shall be suitably packed as agreed to between the purchaser and the manufacturer. The size and fitting of the boots or shoes shall be legibly stamped on the waist of the leather/rubber sole as well as on waist of the full sock.

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