IS 1367 ( Part 10 ) : 2002
ISO 6157-2 : 1995

*भारतीय मानक*

# इस्पात के चूड़ीदार बंधकों की तकनीकी पूर्ति शर्तें

## भाग 10 सतह विच्छिन्नताएँ – ढिबरियाँ

*( तीसरा पुनरीक्षण )*

*Indian Standard*

# TECHNICAL SUPPLY CONDITIONS FOR THREADED STEEL FASTENERS

## PART 10 SURFACE DISCONTINUITIES — NUTS

*( Third Revision )*

ICS 21.060.20



**BUREAU OF INDIAN STANDARDS**
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*December* 2002

**Price Group 5**

NATIONAL FOREWORD

This Indian Standard ( Part 10 ) ( Third Revision ) which is identical with ISO 6157-2 : 1995 'Fasteners — Surface discontinuities — Part 2 : Nuts' issued by the International Organization for Standardization ( ISO ) was adopted by the Bureau of Indian Standards on the recommendation of the Bolts, Nuts and Fasteners Accessories Sectional Committee and approval of the Basic and Production Engineering Division Council.

The concerned Technical Committee has reviewed the Scope of this particular standard and decided that application of this standard may be extended to 'Product Grade C' products also.

This standard was originally published in 1961 and subsequently revised in 1967 and 1979. The last revision was based on ISO/DIS 6157/II-1979. Consequent upon revision of IS 6157-2 the Sectional Committee decided to revise this standard aligning with ISO 6157-2 : 1995 by adoption under dual numbering system.

The text of ISO Standard has been approved as suitable for publication as Indian Standard without deviations. Certain terminology and conventions are, however, not identical to those used in the Indian Standards. Attention is drawn especially to the following:

a) Wherever the words 'International Standard' appear referring to this standard, they should be read as 'Indian Standard'.

b) Comma ( , ) has been used as a decimal marker while in Indian Standards, the current practice is to use a point ( . ) as the decimal marker.

In this adopted standard, reference appears to certain International Standards for which Indian Standards also exist. The corresponding Indian Standards which are to be substituted in their places are listed below along with their degree of equivalence for the editions indicated:

| *International Standard* | *Corresponding Indian Standard* | *Degree of Equivalence* |
|---|---|---|
| ISO 468 : 1982 | IS 3073 : 1967 Assessment of surface roughness | Technically equivalent |
| ISO 898-2 : 1992 | IS 1367 ( Part 6 ) : 1994 Technical supply conditions for threaded steel fasteners : Part 6 Mechanical properties and test mothods for nuts with specified proof loads ( *third revision* ) | Identical |
| ISO 898-2 : 1994 | IS 13096 : 2000 Fasteners — Hexagon nuts with specified proof load values — Fine pitch thread — Mechanical properties ( *first revision* ) | do |
| ISO 2320 : 1983[1)] | IS 1367 ( Part 8 ) : 2002 Technical supply conditions for threaded steel fasteners : Part 8 Prevailing torque type steel hexagon nuts — Mechanical properties and performance properties ( *third revision* ) | do |
| ISO 3269 : 1988 | IS 1367 ( Part 17 ) : 1996 Industrial fasteners — Threaded steel fasteners — Technical supply condition : Part 17 Inspection, sampling and acceptance procedure ( *third revision* ) | do |

[1)] Since revised in 1997.

( *Continued on third cover* )

# *Indian Standard*

# TECHNICAL SUPPLY CONDITIONS FOR THREADED STEEL FASTENERS

## PART 10 SURFACE DISCONTINUITIES — NUTS

## *( Third Revision )*

## 1 Scope

This part of ISO 6157 establishes limits for various types of surface discontinuities on nuts.

It applies to nuts with

— nominal thread diameters from 5 mm up to and including 39 mm;

— product grades A and B;

— all property classes according to ISO 898-2 and ISO 898-6, unless otherwise specified in product standards or agreed between supplier and purchaser.

## 2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 6157. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 6157 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 468:1982, *Surface roughness — Parameters, their values and general rules for specifying requirements.*

ISO 898-2:1992, *Mechanical properties of fasteners — Part 2: Nuts with specified proof load values — Coarse thread.*

ISO 898-6:1994, *Mechanical properties of fasteners — Part 6: Nuts with specified proof load values — Fine pitch thread.*

ISO 2320:1983, *Prevailing torque type steel hexagon nuts — Mechanical and performance properties.*

ISO 3269:1988, *Fasteners — Acceptance inspection.*

ISO 10484:—[1], *Widening test on nuts.*

ISO 10485:1991, *Cone proof load test on nuts.*

1) To be published.

## 3 Types, causes, appearance and limits of surface discontinuities

Even if the permissible limits for surface discontinuities indicated in this clause occur, the minimum values for the mechanical and functional properties specified in ISO 898-2, ISO 898-6 and ISO 2320, as appropriate, shall still be met. In addition, the dimensional requirements of the appropriate product standard shall be satisfied.

NOTES

1 The figures in this clause are examples only; they also apply correspondingly to other types of nuts.

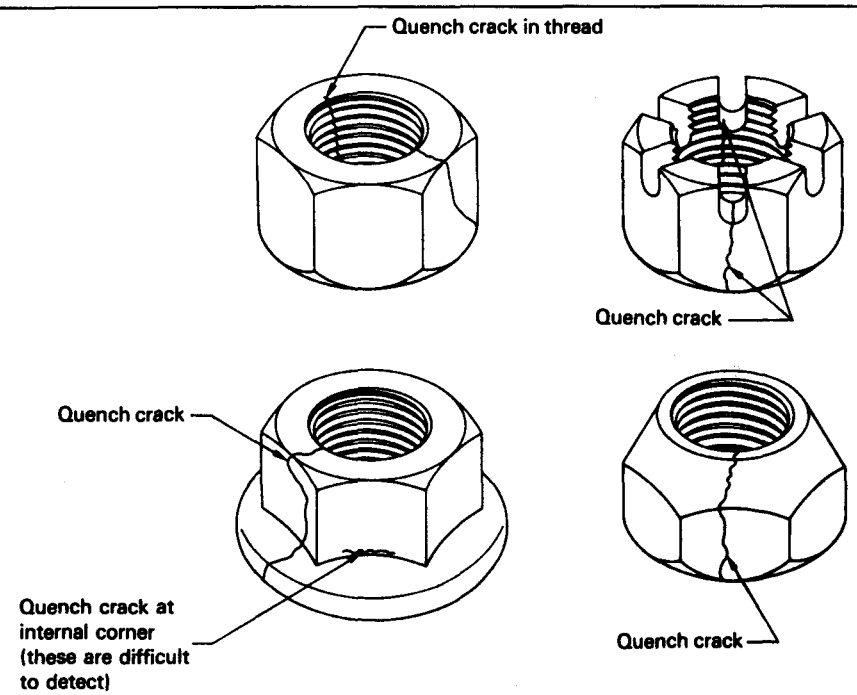
2 The individual figures show the surface discontinuities exaggerated in some cases for clarity.

### 3.1 Cracks

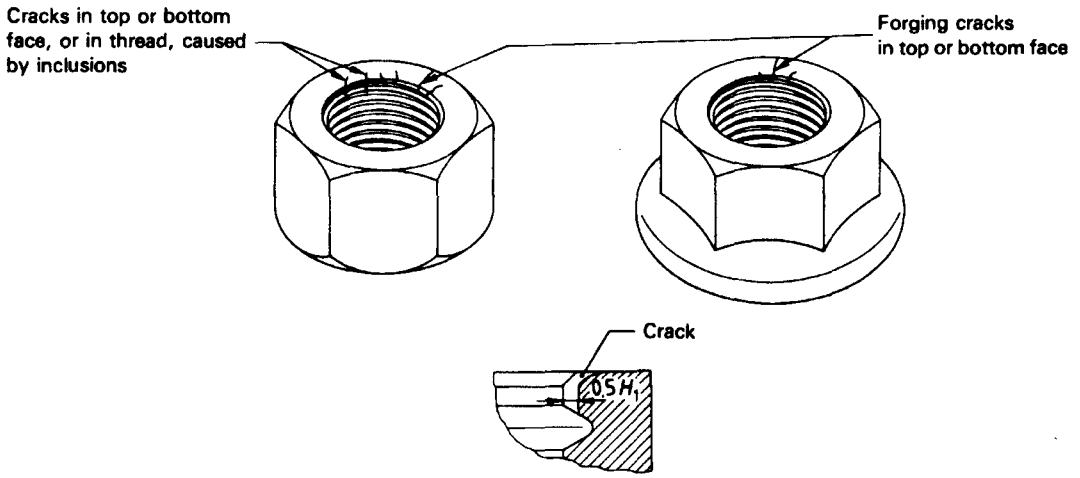
A crack is a clean (crystalline) fracture passing through or across the grain boundaries and may possibly follow inclusions of foreign elements. Cracks are normally caused by overstressing the metal during forging or other forming operations, or during heat treatment, or may have been present in the raw material.

Where parts are subjected to significant reheating, cracks are usually discoloured by scale.

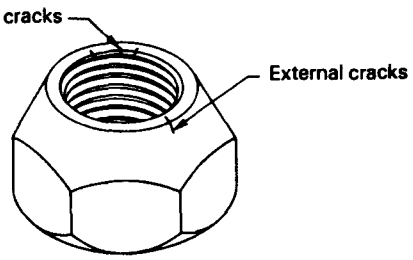
#### 3.1.1 Quench cracks

| | |
|---|---|
| **Cause** | Quench cracks may occur during hardening due to excessively high thermal and transformation stresses. Quench cracks usually follow an irregular and erratic course on the surface of the nut. |
| **Appearance** |  |
| **Limits** | Quench cracks of any depth, any length, or in any location shall not be permitted. |

### 3.1.2 Forging cracks and inclusion cracks

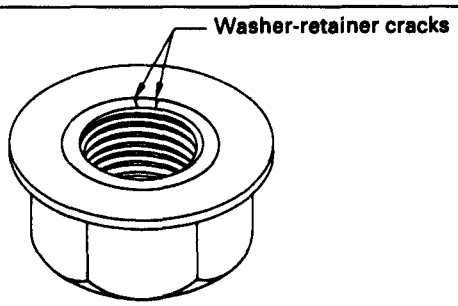
| | |
|---|---|
| **Cause** | Forging cracks may occur during the cut-off or forging operations and are located only in the top and bottom face of the nuts or in the intersection of the face and flat.<br><br>Inclusion cracks are caused by non-metallic inclusions inherent in the raw material. |
| **Appearance** |  |
| **Limits** | Cracks located in the top and bottom faces shall be permitted, provided that:<br><br>— there are not more than two forging cracks which extend across the full width of the bearing face, neither of which shall exceed a depth of 0,05$d$;<br><br>— no crack extends into the tapped hole beyond the first full thread;<br><br>— no crack in the first full thread exceeds a depth of 0,5$H_1$;<br><br>where<br><br>$d$ is the nominal thread diameter;<br><br>$d_w$ is the diameter of the bearing face;<br><br>$H_1$ is the effective thread height<br><br>$H_1 = 0{,}541P$<br><br>where $P$ is the pitch of the thread;<br><br>$s$ is the width across flats.<br><br>In the case of nuts with a flange, cracks in the area between $s$ and $d_w$ shall not be permitted. |

### 3.1.3 Cracks in the locking element of all-metal prevailing torque type nuts

| | |
|---|---|
| **Cause** | Cracks in the locking element of all-metal prevailing torque type nuts may occur during the cut-off, forging or deflecting process, and are either on the external or internal face. |
| **Appearance** |  |
| **Limits** | Cracks in the locking element resulting from the forging process shall be permitted, provided that all mechanical and functional requirements are met and that<br>— there are not more than two cracks which extend the full width of the crown circle, neither of which shall exceed a depth of $0{,}05d$;<br>— no crack extends into the tapped hole beyond the first full thread;<br>— no crack in the first full thread exceeds a depth of $0{,}5H_1$;<br>where<br>$d$ is the nominal thread diameter;<br>$H_1$ is as defined in 3.1.2.<br>Cracks in the locking element resulting from the deflecting process shall not be permitted. |

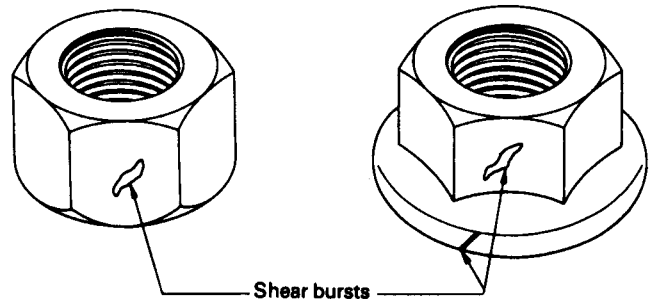
### 3.1.4 Cracks in the washer retainer of nuts with captive washers

A crack in the washer retainer is an opening in a lip or hub of metal used for securing a washer on a nut.

| | |
|---|---|
| **Cause** | Washer-retainer cracks may occur when pressure is applied to the lip or hub during assembly of the washer. |
| **Appearance** |  |
| **Limits** | Washer-retainer cracks are permissible if limited to the contour of the lip or hub used for retaining purposes, provided that the washer is securely held and able to rotate freely. |

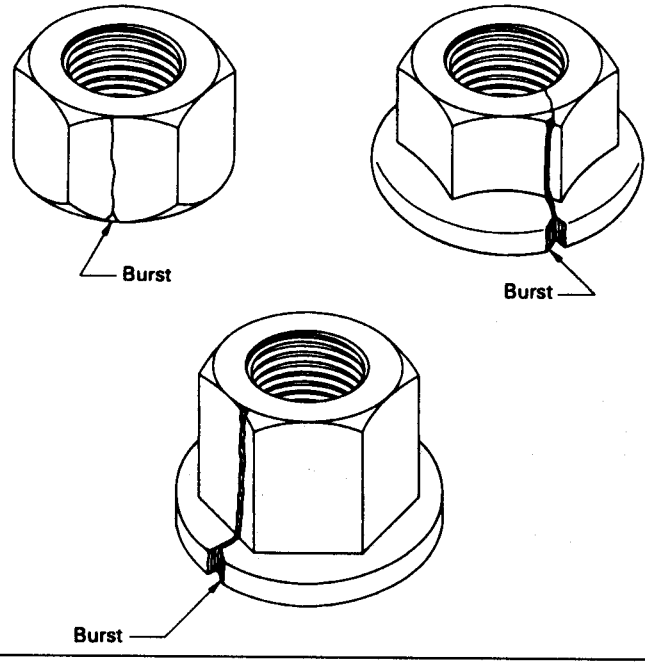
## 3.2 Shear bursts

Shear bursts are open breaks in the surface of the metal.

| | |
|---|---|
| **Cause** | Shear bursts occur, for example, during forging operations on the external surfaces of nuts and at the periphery of nuts with a flange. Shear bursts are located in a plane with an orientation of approximately 45° to the axis of the nut. |
| **Appearance** |  |
| **Limits** | No shear burst in the flats of hexagon nuts shall extend into the bearing faces of a nut or the crown circle of a nut with a flange. Shear bursts occurring at the intersection of two wrenching flats shall not reduce the width across corners below the specified minimum value.<br><br>Shear bursts at the periphery of the flange of nuts with a flange are allowed, providing they do not extend into the minimum diameter of the bearing face, $d_w$. |

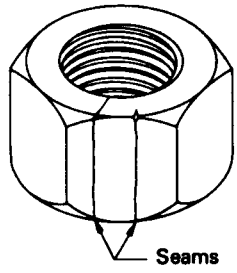
### 3.3 Bursts

Bursts are open breaks in the surface of the metal.

| | |
|---|---|
| **Cause** | Bursts may occur, for example, during forging operations on the external surfaces of nuts and at the periphery of nuts with a flange because of surface discontinuities in the raw material. |
| **Appearance** |  |
| **Limits** | If a burst occurs in connection with a seam resulting from the raw material, the seam may extend into the crown circle (see 3.4) but not the burst.<br><br>Bursts occurring at the intersection of two wrenching flats shall not reduce the width across corners below the specified minimum value.<br><br>No burst or shear burst located at the intersection of the top or bottom face with a wrenching flat shall have a width greater than $(0{,}25 + 0{,}02s)$ mm, where $s$ is the width across flats.<br><br>Bursts and shear bursts at the periphery of the flange of nuts with a flange are allowed, provided that they do not extend into the minimum diameter of the bearing face, $d_w$, and that the width of the burst does not exceed $0{,}08d_c$, where $d_c$ is the flange diameter. |

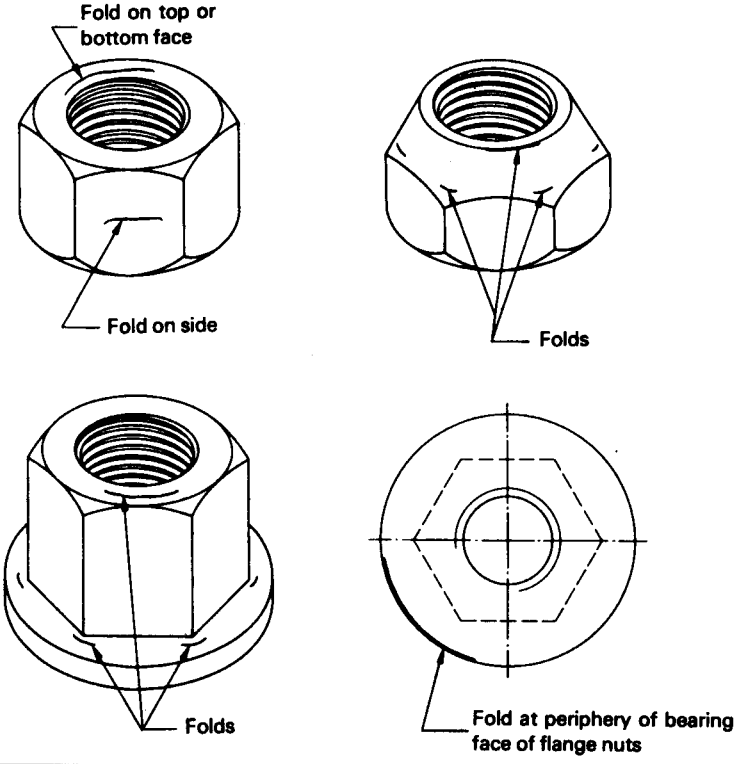
### 3.4 Seams

A seam is a longitudinal surface discontinuity in the form of an unwelded open fold in the material.

| | |
|---|---|
| **Cause** | Seams are usually inherent in the raw material from which fasteners are made. |
| **Appearance** |  |
| **Limits** | Seams shall be permitted, provided that a depth from the surface of 0,05$d$ for all thread sizes is not exceeded, where $d$ is the nominal thread diameter. |

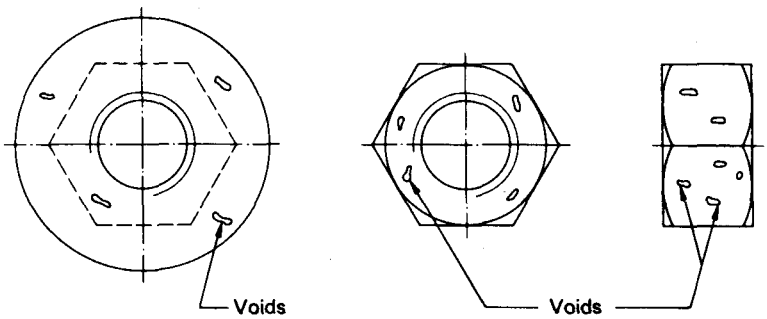
### 3.5 Folds

A fold is a doubling over of metal which occurs at the surface of the nut during forging.

| | |
|---|---|
| **Cause** | Folds may be produced by material displacements during forging operations on nuts at or near the intersection of diameter changes, or on the top or bottom face of the nut. |
| **Appearance** |  |
| **Limits** | Folds are permitted, but those located at the intersection of the flange periphery and bearing face of nuts with a flange shall not intrude into the bearing surface. |

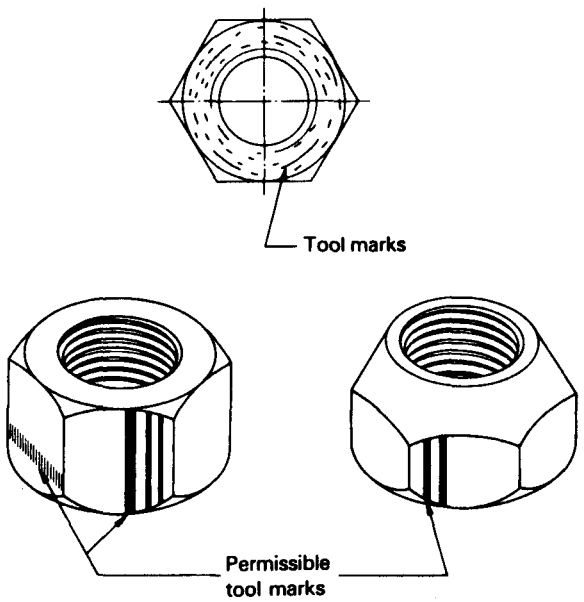
## 3.6 Voids

A void is a shallow pocket or hollow on the surface of a nut caused by non-filling of metal during forging or upsetting.

| | |
|---|---|
| **Cause** | Voids are produced by marks or impressions of chips (shear burrs) or by rust formation on the raw material. They are not planished during forging or upsetting operations. |
| **Appearance** |  |
| **Limits** | Depth, $h$, of voids:<br>$h \leqslant 0{,}02d$ but with 0,25 mm max.<br>where $d$ is the nominal thread diameter.<br>Area of all voids:<br>The combined surface area of all voids on the bearing face shall not exceed<br>5 % of the bearing surface, for nuts with nominal thread diameter $d \leqslant 24$ mm<br>10 % of the bearing surface, for nuts with nominal thread diameter $d > 24$ mm. |

### 3.7 Tool marks

Tool marks are longitudinal or circumferential grooves of shallow depth.

| | |
|---|---|
| **Cause** | Tool marks are produced by relative motions between the work piece and the manufacturing tool. |
| **Appearance** | Tool marks are most frequently elongated or circumferential.<br>  <br> |
| **Limits** | Tool marks on the bearing surface shall not exceed a surface roughness of $R_a = 3{,}2$ µm when tested in accordance with ISO 468. Tool marks on other surfaces are allowed. |

### 3.8 Damages

Damages are indentations of any surface of a nut.

| | |
|---|---|
| **Cause** | Damages, for example dents, scrapes, nicks and gouges, are produced by external actions during handling and transport. |
| **Appearance** | Damages have no precise geometrical shape, location or direction; they are identifiable as external action. |
| **Limits** | Damages as described above shall not cause rejection unless it can be shown that they impair usability. (See also the requirements given at the beginning of clause 3.)<br><br>If necessary, special packing and handling procedures may be used in order to avoid unacceptable damage during transport. |

## 4 Inspection and evaluation procedure

Sampling shall be carried out in accordance with ISO 3269, using the following procedures.

### 4.1 Routine acceptance inspection

For routine acceptance purposes, visual inspection procedures may be used to ensure that products conform to this part of ISO 6157.

### 4.2 Non-destructive testing

A representative sample shall be taken from the lot in accordance with ISO 3269 and subject to either × 10 magnification visual examination tests or other suitable tests, for example magnetic techniques or eddy current. If no unacceptable surface discontinuity is found, the lot shall be accepted. If a user requires 100 % examination, this shall be stated at the time of ordering.

### 4.3 Destructive testing

If, after removing the surface coating, surface discontinuities are found which are likely to exceed the allowable limits, parts with the most severe surface discontinuities shall be selected for destructive testing (see ISO 10484 and ISO 10485).

### 4.4 Referee test

For referee purposes, nuts shall satisfy the widening test in accordance with ISO 10484. The cone proof load test in accordance with ISO 10485 may be applied in addition to the widening test, on agreement between the manufacturer and user.

### 4.5 Evaluation

If on visual inspection any product is found with quench cracks or deflection cracks in the locking element, or discontinuities which exceed the dimensional limits, the lot shall be subject to rejection.

If any part fails the appropriate destructive tests specified in 4.3 and 4.4, the lot shall be subject to rejection.

( *Continued from second cover* )

The concerned Technical Committee has reviewed the provisions of following ISO Standards referred in this adopted standard and has decided that they are acceptable for use in conjunction with this standard:

| *ISO Standard* | *Title* |
|---|---|
| ISO 10484[1)] | Widening test on nuts |
| ISO 10485 : 1991 | Cone proof load test on nuts |

In reporting the results of a test or analysis made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS 2 : 1960 'Rules for rounding off numerical values ( *revised* )'.

[1)] To be published.

**Bureau of Indian Standards**

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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'.

This Indian Standard has been developed from Doc : No. BP 33 ( 0264 ).

**Amendments Issued Since Publication**

| Amend No. | Date of Issue | Text Affected |
|---|---|---|
| | | |
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