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साइकिल चेन — विशिष्टि

(IS 15511 *का पहला पुनरीक्षण*)

Draft Indian Standard

Cycle Chains – Specification

(*First Revision of* IS 15511)

ICS 43.150

Transmission Device Sectional Committee, PGD 33	Last Date for Comments: **10-03-2025**

FOREWORD

(*Formal clause will be added later on*)

This Indian standard was first published in 2004. This first revision has been brought out to align with the latest technological developments and international practices.

The major changes in this revision are as follows:

a) New, 081C Type II chain has been included;
b) Hardness test has been included; and
c) Anti-corrosive treatment has been included.

In preparation of this standard, considerable assistance has been taken from 'ISO 9633:2001 'Cycle chains — Characteristics and test methods' issued by the International Organization for Standardization (ISO).

Not standing with what is stated in this standard, the applicable National, State, and Local bodies regulations shall apply. In the case of exports, corresponding regulations of exporting countries shall apply.

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 : 2022 'Rules for rounding off numerical values (second revision)'.

Draft Indian Standard

Cycle Chains – Specification

(*First Revision of* IS 15511)

1 SCOPE

This Standard specifies the requirements for cycle chains used for all bicycles including bicycles for young children. Chains covered in this standard are exclusively intended for use on cycles.

2 REFERENCES

The following standard contains provisions which through references in this text, constitute provisions of this 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 standards indicated below:

IS No.	Title
IS 2403 : 2024/ISO 606	Short-Pitch transmission precision roller and bush chains, attachments and associated chain sprockets (*fourth revision*)
IS 1570 (Part 2/Sec 1) : 1979	Schedules for wrought steels — Part 2: Carbon steels (Unalloyed Steels) — Section 1: Wrought products (Other Than Wires) with specified chemical composition and related properties (*first revision*)

3 TERMS AND DEFINITIONS

For the purposes of this standard, the definition given below shall apply:

3.1 Lateral Deviation - Condition when the actual centerline of the chain is not straight.

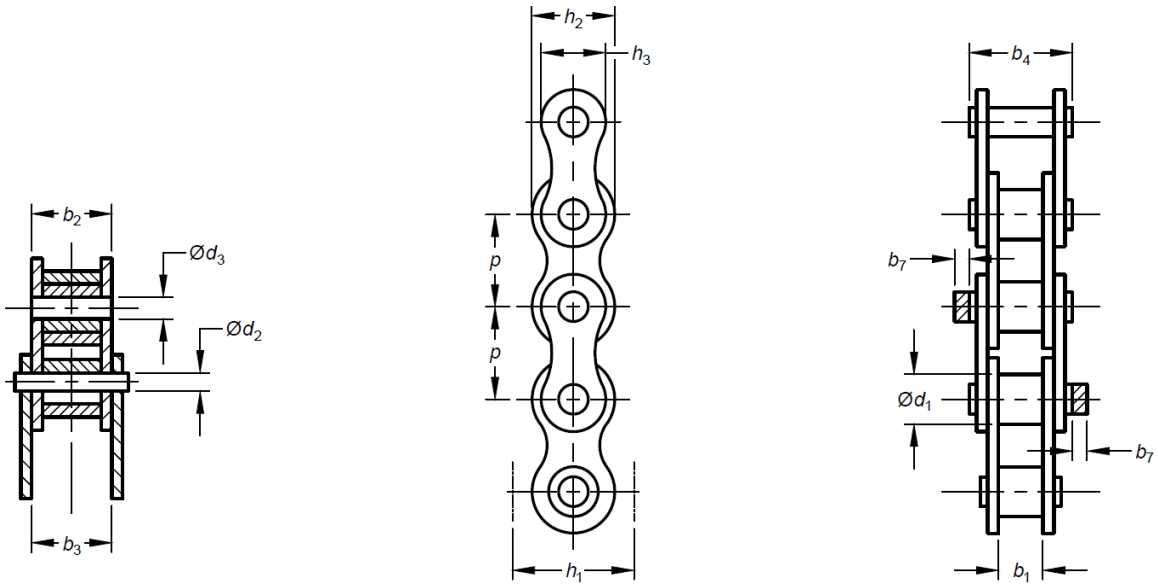
3.2 Side Bow - Condition characterized by the height of an arc assumed by the chain in a plane parallel to the plane of the chain pins, when the chain is laterally deflected to the maximum extent permitted by its internal tolerances.

3.3 Stiff Link - Condition when a chain link cannot be articulated smoothly through an angle of 60˚, to the right and to the left, from the alignment axis of the two adjacent links.

3.4 Twist - Condition when the axes of articulation of the chain links are not in the same plane.

4 DESIGNATION & TYPES

Cycle chains, denoted by the suffix C, shall be designated by Chain designation number i.e. 081 or 082. Each of these chains can either be Type I or Type II based on the construction. The details of these chains are given in Table 1.



Type l: Regular roller chain
Type ll: Non-bush chain

All Dimensions are in millimeters.

FIG. 1 CHAIN (*see* Table 1)

Table 1 Principal Dimensions, Measuring Forces, Push-Out Forces and Tensile Strengths of Chains (Fig. 1)
(*Clauses* 4, 5.1, 5.2, 5.3.3, 6.1.1, 6.1.2 and 6.2.3)

Sl No.	Chain Designation number	Chain structure	Pitch p	Roller diameter d_1 max.	Width between inner plates b_1 min.	Bearing pin body diameter d_2 max.	Bush bore d_3 min.	Chain path depth h_1 min.	Inner plate depth h_2 max.	Outer plate depth h_3 max.	Clearance between inner and outer link $b_3 - b_2$ min.	Width over bearing Pins[1] b_4 max.	Additional width for joint fastener[2] b_7 max.	Measuring force	Push-out force min.	Tensile Force min.
			mm											N		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
i)	081 C	Type I	12.7	7.75	3.30	3.66	3.69	10.2	9.9	9.9	0.05	10.2	1.5	125	—	8 000
ii)	081 C	Type II	12.7	7.75	3.30	3.66	3.69	9.0	8.7	8.7	0.10	7.4	1.5	125	—	8 000
iii)	082 C	Type I	12.7	7.75	2.38	3.66	3.69	10.2	9.9	9.9	0.10	8.2	—	125	780	8 000[3]
iv)	082 C	Type ll	12.7	7.75	2.38	3.66	3.69	9.0	8.7	8.7	0.05	7.4	—	125	780	8 000[3]

[1] The actual dimensions of 082 C chain will depend on the type of derailleur used but should not exceed the given dimension, details of which should be obtained by the purchaser from the manufacturer.

[2] The actual dimension will depend on the type of fastener used but should not exceed the given dimension, details of which should be obtained by the purchaser from the manufacturer.

[3] Chains having a higher minimum tensile strength may be supplied if agreed between the purchaser and manufacturer.

Notes:

1 Connecting links shall not be used for 082 C (Multispeed) chains
2 082C chain shall be used in Multi gear (8 Max.) transmission, inner plate width <2.38 mm shall be used in Multi gear (9 Min.) transmission

5 GENERAL REQUIREMENTS

5.1 Dimensions

Cycle chains shall comply with the dimensions as shown in Fig. 1 and as specified in Table 1. These dimensions ensure interchangeability of complete chains produced by different manufacturers.

5.2 Pre-Loading

Chains manufactured in accordance with this standard shall be pre-loaded by the application of a tensile force equivalent to one-third of the minimum tensile strength specified in Table 1.

5.3 Length Accuracy

5.3.1 The length of finished chains shall be measured after pre-loading (*see* **5.2**) but before lubricating or after degreasing.

5.3.2 The standard length for measurement shall be a minimum of 610 mm and the chain shall terminate with an inner link at each end.

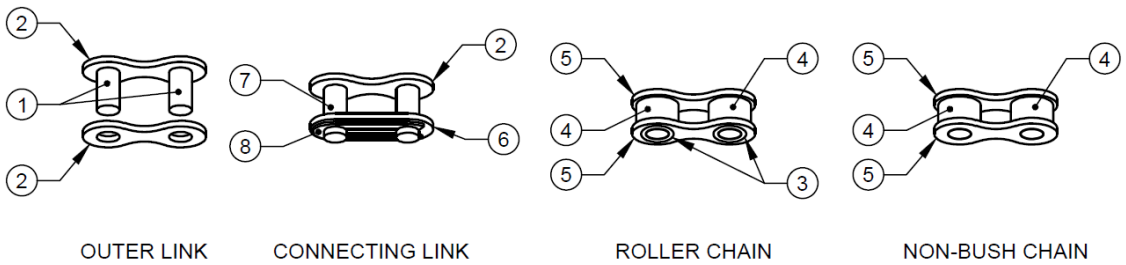
5.3.3 The chain shall be supported throughout its entire length and the measuring force given in Table 1 shall be applied. The measured length shall be the nominal length $\frac{+0.15}{-0}$ percent for 081 C chain and $\frac{+0.15}{-0.08}$ percent for chain 082 C.

5.4 Anticorrosive Treatment

Chains shall be treated with grease etc. for anti-corrosion.

5.5 Material

5.5.1 Chain links and sub-components are illustrated in Fig. 2. Chains may be manufactured from steel grades specified in the Table 2 or any other suitable material.



All Dimensions are in millimeters.

FIG. 2 CHAIN LINKS AND SUB COMPONENTS

Table 2 Materials (Informative) for Various Parts

(*Clause* 5.5.1)

Sl No.	Part name	Material (informative)	
		Steel designation*	Reference standard
(1)	(2)	(3)	(4)
i)	Pin	10C4	IS 1570 (Part 2/Sec 1)
ii)	Outer plate	45C8	IS 1570 (Part 2/Sec 1)
iii)	Bush	10C4	IS 1570 (Part 2/Sec 1)
iv)	Roller	20C8	IS 1570 (Part 2/Sec 1)
v)	Inner plate	45C8	IS 1570 (Part 2/Sec 1)
vi)	Connecting plate	45C8	IS 1570 (Part 2/Sec 1)
vii)	Spring clip connecting pin	10C4	IS 1570 (Part 2/Sec 1)
viii)	Clip	10C4	IS 1570 (Part 2/Sec 1)

*NOTE — Any suitable alternative material can be considered on merit.

5.6 Appearance

The chain surface shall be free from harmful scratches, rust, burrs and other defects detrimental for the chain use.

6 ACCEPTANCE TESTS

6.1 Tensile Test

6.1.1 The minimum tensile strength of each chain shall be as specified in Table 1. The values are only valid for the test lengths and conditions given at **6.1.2**.

6.1.2 A tensile force, not less than the minimum tensile strength specified in Table 1, shall be applied slowly to the ends of a chain length containing at least five free pitches, by means of shackles permitting free movement on both sides of the chain centerline in the normal plane of articulation.

6.1.3 Failure shall be considered to have occurred at the first point where increasing extension is no longer accompanied by increasing load, that is, the summit of the force/extension diagram.

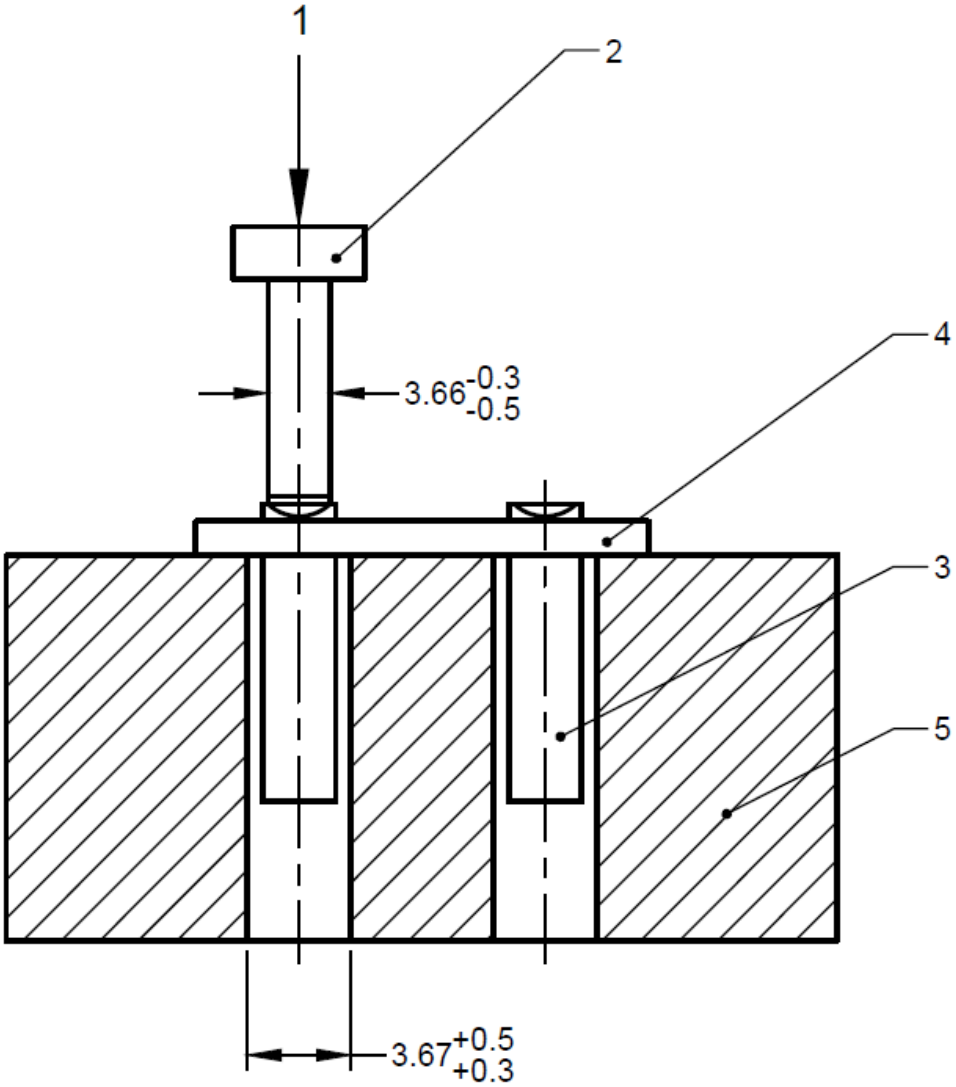
6.1.4 Tests in which failures occur adjacent to the shackles shall be disregarded.

6.1.5 The tensile test shall be considered a destructive test and the tested sample shall be discarded.

6.2 Push-Out Force

6.2.1 Select a pin link from a finished chain.

6.2.2 Place the pin link, consisting of an outer plate and two riveted pins, on the test apparatus as shown in Fig. 3.



All Dimensions are in millimeters.

FIG. 3 TEST APPARATUS FOR MEASUREMENT OF PIN PUSH-OUT RESISTANCE

Key

1 Load.
2 Pusher.
3 Bearing Pins (2).
4 Outer plate.
5 Tool.

6.2.3 The minimum load for pushing out a pin from an outer plate of 82 C chain shall be as specified in Table 1.

6.2.4 When taking a sample from a chain, care shall be taken to ensure that there is no extra strain between the outer plate and the two riveted pins.

6.3 Hardness

The hardness of each part of chain shall conform to Vickers hardness (HV) or Rockwell

hardness (HRA) as specified in Table 3.

Table 3 Hardness
(*Clause* 6.3)

Sl No.	Part	Finish	Vickers hardness HV	Rockwell hardness HRA/HRC	Case Harden Depth (mm)
(1)	(2)	(3)	(4)	(5)	(6)
i)	Pin	Self	424 min.	72 min. HRA	0.20 – 0.40
ii)	Bush	Self	348 min.	68 min. HRA	Through hard
iii)	Roller	Self	384 min.	70 min. HRA	0.20 – 0.40
iv)	Inner Plate	Blue/Black	434 min.	44 min. HRC	Through hard
v)	Outer Plate	Blue/Black	434 min.	44 min. HRC	Through hard
vi)	Clip/connecting plate	Blue/Black	434 min.	44 min. HRC	Through hard

6.4 Test for Determination of Twist

6.4.1 *Visual Detection of Twist*

To detect twist visually, suspend the chain by one end and observe the alignment of the links.

NOTE — This visual check detects localized faults, whereas the procedure described in **6.4.2** permits the determination of twist and gives an evaluation of the chains ability to be twisted.

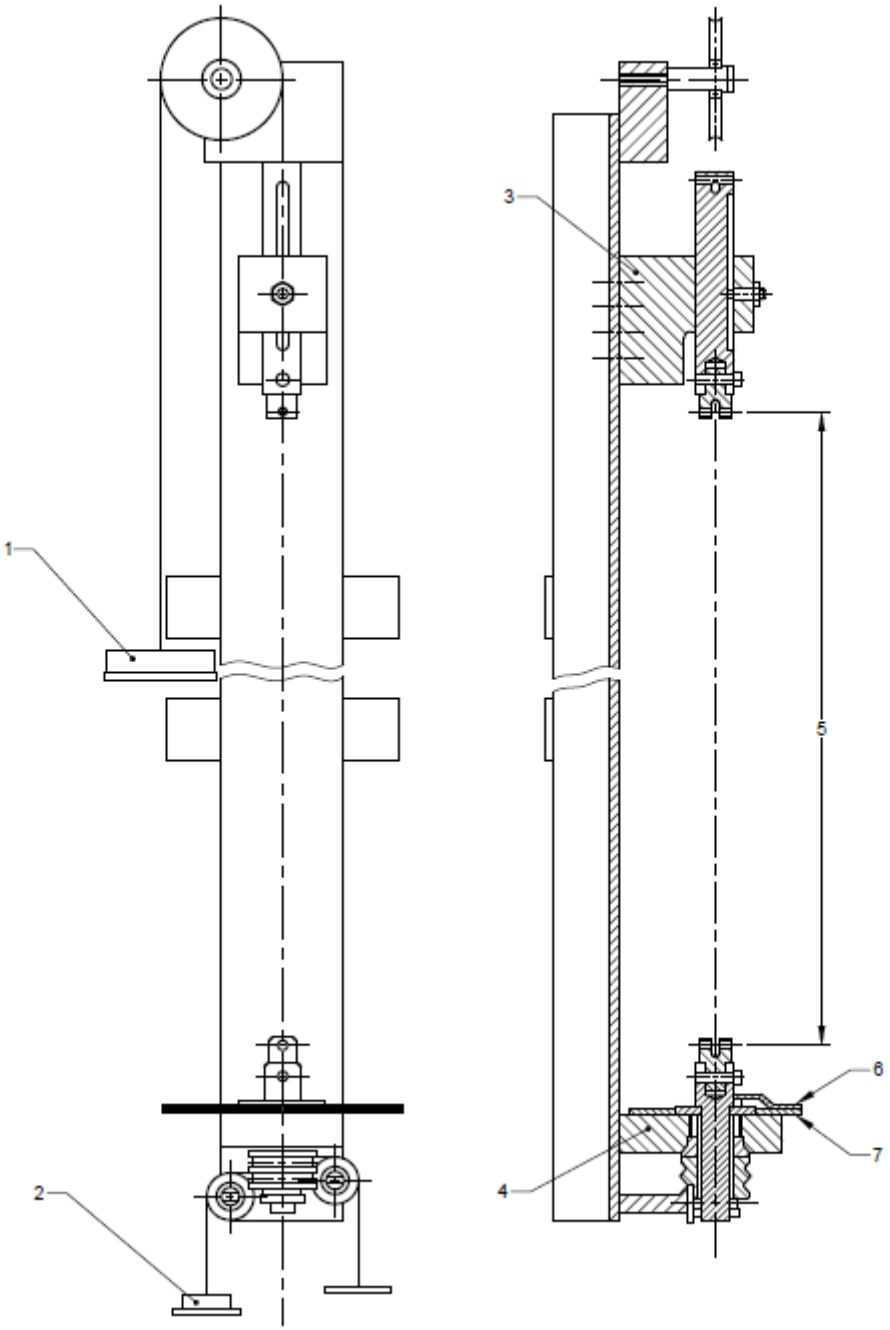
6.4.2 *Method of Me*
6.4.3 *asuring Twist*

6.4.2.1 *Apparatus*

The apparatus for measuring twist shall be as shown in Fig. 4 and shall meet the geometric requirements as demonstrated in Fig. 5.

6.4.2.2 *Test sample*

Choose a length of cycle chain 49 links long and free from grease, each end of which consists of an inner link.

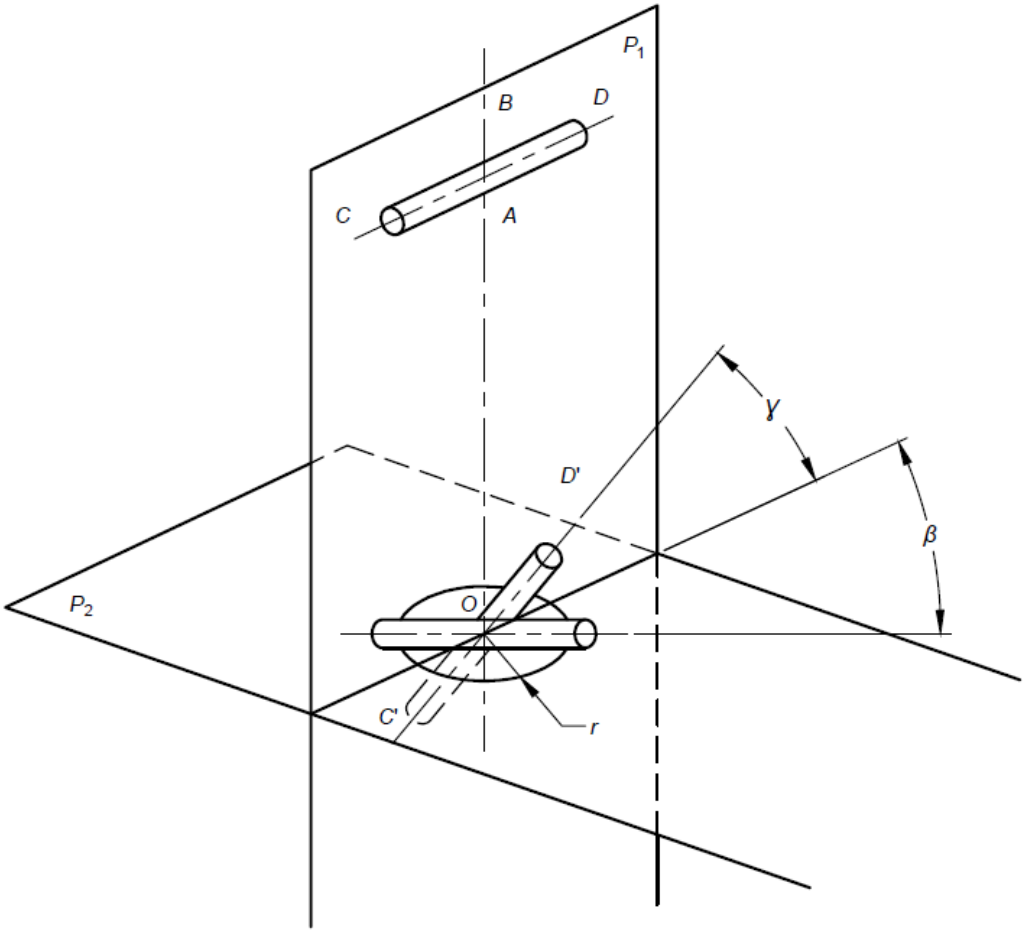


Key

1 Balancing weight.
2 Torque balance weight.
3 Sliding head.
4 Fixed shackle head.
5 49 links of 12.7 mm pitch.
6 Pointer.
7 Protractor scale.

All Dimensions are in millimeters.

FIG. 4 TEST APPARATUS FOR DETERMINATION OF TWIST



P1 is the vertical plane defined by the axis of displacement AB of the sliding head and the pin CD of the upper attachment of the chain.

NOTE — Pins CD and C'D' are not the end pins of the chain; they are the attachment pins of the test apparatus.

P2 is a horizontal plane perpendicular to P1.

O is the projection of the axis AB in the plane P2. It is origin and the point of intersection of axis AB and the line of intersection of P1 and P2.

O is the centrepoint of symmetry of pin C'D' of the lower attachment of the chain, It may
a) coincide with O.
b) lie on the line of intersection of P1 and P2 at a maximum distance r from O1 or
c) lie in P2 bul not on the line of intersection of P1 and P2 in that case, O' should not lie outside a circle of radius r, the centre of which coincides with O.

β is in P2 and is the angle through which pin C'D' can rotate in P2.

ד is in P1. If O' lies on the line of intersection of P1 and P2, is the angle through which pin C'D' can rotate in P1 : if O' does not lie on the line of intersection of P1 and P2, lies in any plane to P1 and crossing the area of the circle of radius and centre O in P2.

All Dimensions are in millimeters.

FIG. 5 GEOMETRY OF TEST APPARATUS AND GEOMETRIC REQUIREMENTS

6.4.3 *Test Sample Installation*

Suspend the chain by the upper pin CD of the attachment (*see* Fig. 5) by means of a shackle on the sliding head permitting free rotational movement on both sides of the chain centreline of 1° max.

The alignment of the attachment pins before commencement of the test shall be as follows:

$-1° \leq \beta \leq +1°$

$-1° \leq \gamma \leq +1°$

The inner link of the lower end of the test chain shall be gripped in the first shackle head.

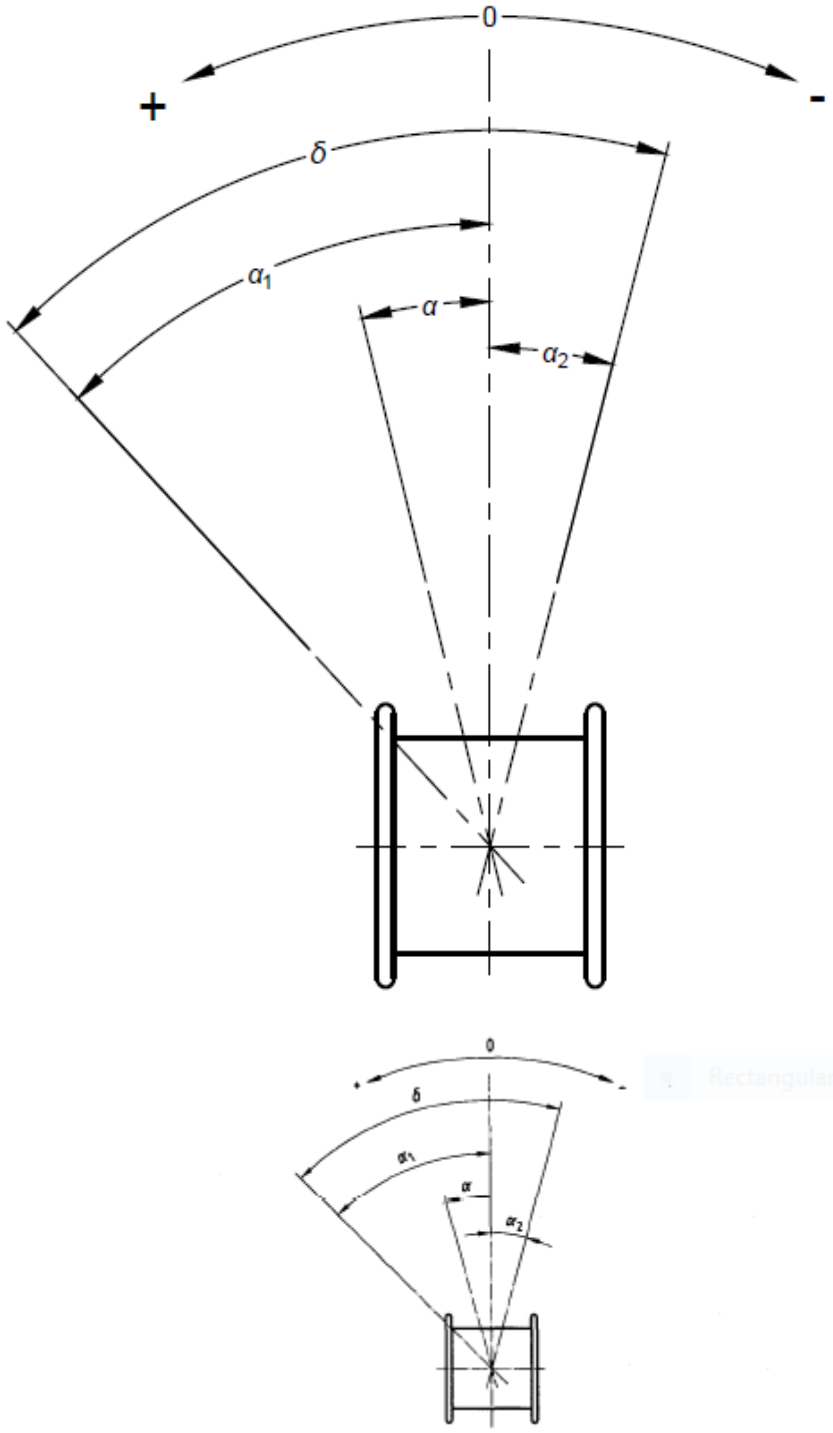
6.4.4 *Test procedure*

6.4.4.1 Apply a tensile force of 5 N to the lower end of the chain by setting the balance weight.

6.4.4.2 Apply a torque of 0.2 N-m to the lower 1ink of the chain, first in one angular direction then in the other.

6.4.4.3 Measure the angular displacement at both sides of the apparatus zero (*see* Fig. 6).

NOTE — Angle α is a measure of the net twist of the chain under test about the apparatus zero in a clockwise or anticlockwise direction. The angle α is in an anticlockwise direction from the apparatus zero, viewed from above, when positive, and is in a clockwise direction from the apparatus zero, viewed from above, when negative. The net twist value α is calculated as half the difference between α_1 and α_2 A negative value of α or T only indicates a net clockwise twist in the chain under test, viewed from above; it does not indicate a negative algebraic quantity. Examples of the calculation of the twist value are given in Annex A.



$$\alpha = \frac{\alpha_1 - \alpha_2}{2}$$

$$\tau = \frac{\alpha}{\delta}$$

Twist total value $\delta = \alpha_1 + \alpha_2$

All Dimensions are in millimeters.

FIG. 6 MEASUREMENT OF TWIST

6.4.5 *Acceptance Criteria*

The values of a and z shall be within the following limits:

$\alpha \leq \pm 15°$

where $\alpha = \frac{\alpha_1 - \alpha_2}{2}$

$\tau \leq \pm 0{,}17$

where $\tau = \frac{\alpha}{\delta}$ and $\delta = \alpha_1 + \alpha_2$

6.5 Determination of Lateral Deviation

6.5.1 *Visual detection of lateral deviation*

To visually detect any lateral deviation, suspend the chain by one end and observe the alignment of the links.

6.5.2 *Method of determining lateral deviation*

6.5.3 *Apparatus*

The apparatus for measuring lateral deviation shall comprise a straightedge (*see* Fig. 7), whose surfaces are ground to the dimensions specified in Table 4.

Table 4 Dimensions of straightedges (*see* Fig. 7)
(*Clause* 6.5.3)

Sl No.	Chain Designation Number	L ± 0.5	L' ± 0.2	l -0.02 -0.04	L' 0 — 0.1	h min
(1)	(2)	(3)	(4)	(5)	(6)	(7)
i)	081 C	355.6	6.3	3.70	2.8	3.17
ii)	082 C	355.6	6.3	2.28	1.8	2.28

NOTE –

1 Length corresponds to 28 chain links.

2 For convenience of handling, a straightedge for each size of chain may be incorporated into a holder (*see* Fig. 8).

6.5.4 *Test procedure*

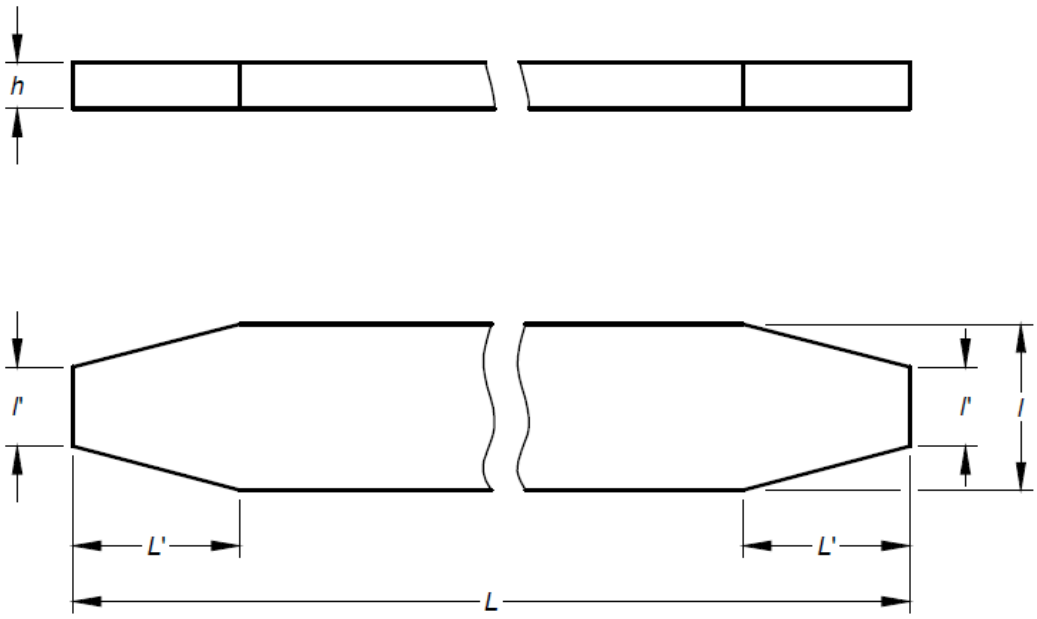
6.5.4.1 Place a sample chain comprising a minimum of 49 links in a horizontal plane with its axes horizontal and fix it at one of its ends. Apply a tensile force of 12.5 N at the other end (*see* Fig. 9).

6.5.4.2 From the fixing point of the chain, slide the measuring straightedge inside the inner plates of the chain over the whole length of the sample, to ensure that the chain is correctly located.

6.5.4.3 Increase the tensile force to 1 kN and, from the fixing point of the chain, again slide the straightedge along the plates of the inner links over the entire length of the sample chain.

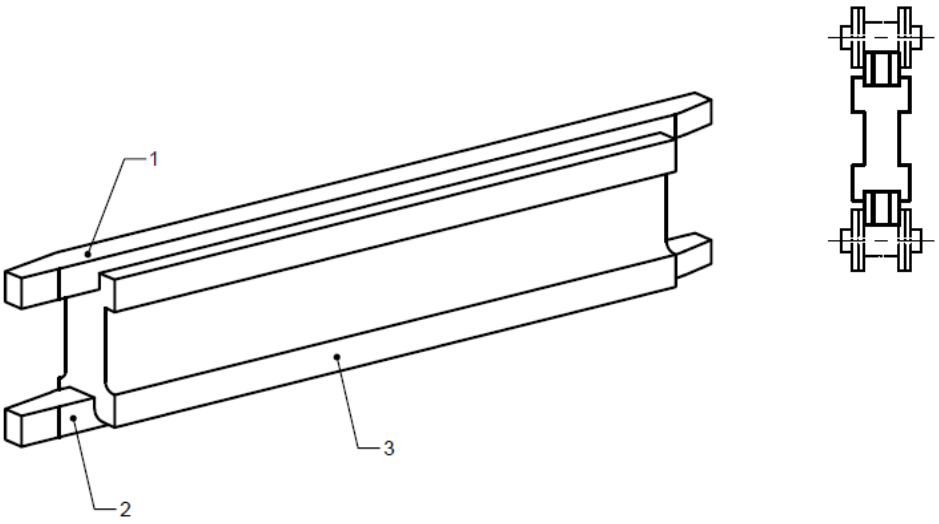
6.5.5 *Acceptance criteria*

If the straightedge can be moved freely over the entire length of the sample chain by a regular hand movement, the test is positive and the sample in passing.



All Dimensions are in millimeters.

FIG.7 STRAIGHTEDGE HOLDER ASSEMBLY

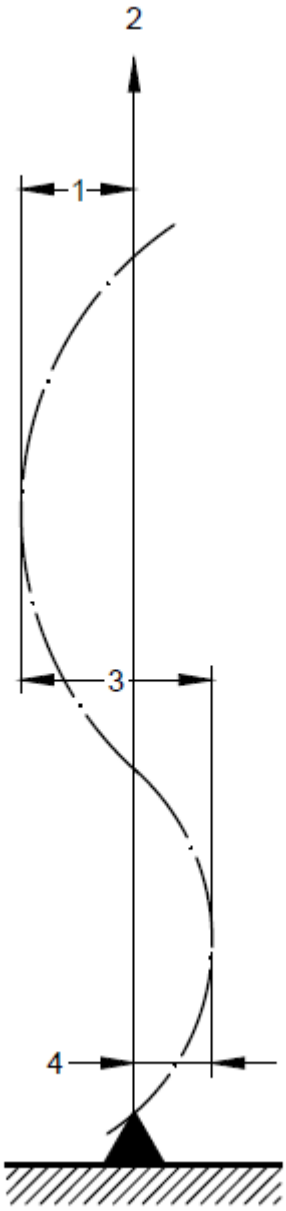


key

1 Straightedge for 081 C chain,
2 Straightedge for 082 chain, and
3 Holder.

All Dimensions are in millimeters.

FIG. 8 STRAIGHTEDGES



Key

1	Left-hand deviation.
2	Tension.
3	Total deviations.
4	Right-hand deviations.

All Dimensions are in millimeters.

FIG. 9 DIAGRAMMATIC PLAN OF LATERAL DEVIATION TEST

6.6 Test for Detection of a Stiff Link

6.6.1 *Test Procedure*

6.6.1.1 Lay a length of chain on a surface plate with the connecting pins parallel to the surface. Fix one end and move a 25.4 mm diameter test rod slowly and continuously beneath the whole length of the chain to its free end.

6.6.1.2 Turn the chain over and repeat **6.6.1.1.**

6.6.1.3 Any link in either test which does not fall back flat onto the surface shall be declared a stiff link. If the check result is doubtful, the chain should be degreased and the test should be repeated.

6.6.1 *Acceptance Criteria*

There shall be no stiff links in the chain.

6.7 Determination of Side Bow

6.7.1 *Method of Measuring Side Bow*

6.7.1.1 Lay a degreased chain length of 49 links, each end of which consists of an inner link, on a surface plate with the pins parallel to the surface, and apply a force of 3 N, as shown in Fig. 10.

6.7.1.2 Gradually release the force and measure the arc height *F*.

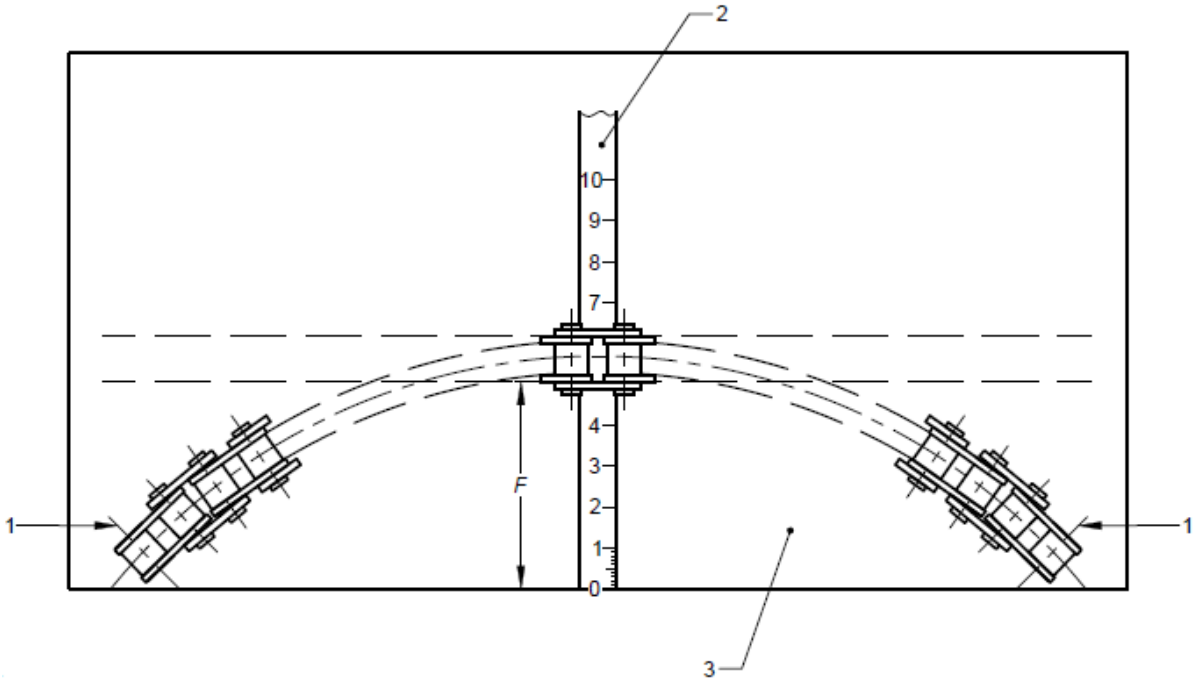
6.7.1.3 Turn the chain over and repeat **6.7.1.1** and the measurement as per **6.7.1.2.**

6.7.1.4 The smallest of these two measurements is considered as the side bow value *F* for this chain.

6.7.2 Acceptance criteria

6.7.2.1 The values of both measurements carried out according to **6.7.1.1** and **6.7.1.2.** shall be within the following limits:

$40 \text{ mm} \leq F \leq 120 \text{ mm}$



Key

1	Applied Force.
2	Measuring Rule.
3	Surface Plate.
F	Arc Height.

All Dimensions are in millimeters.

FIG.10 SIDE BOW MEASUREMENT

7 MARKING

7.1 Each cycle chain shall be marked visibly, legibly and indelibly with the following minimum particulars:

1) Manufacturers name, initials or trade-mark.
2) Batch/Lot number.
3) Date of manufacture.
4) Name of the country of origin and
5) Chain designation number.

8.2 The markings given at Sl No. 1 shall be visibly and permanently marked by punching of sufficient depth for easy reading or by printing on the chain. All the markings including those given on the chain shall be suitably indicated on the packing.

8.3 BIS Certification Marking

Each chain may also be marked with the Standard Mark.

8.3.1 The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the *Bureau of Indian Standards Act*, 2016 and the Rules and Regulations framed there under, and the products may be marked with the Standard Mark.

Annex A
(*Clause* 6.4.4.3)

EXAMPLES OF CALCULATION OF TWIST VALUE

A-1 Examples of calculation are given in Table 5

Table 5 Examples of Calculation of Twist Value
(*Clause* A-1)

Formulas	Case 1	Case 2	Case 3	Case 4
$\alpha = \frac{\alpha_1 - \alpha_2}{2}$	$a_1 = 80°$	$a_1 = 10°$	$a_1 = 45°$	$a_1 = 35°$
	$a_2 = 10°$	$a_2 = 80°$	$a_2 = 35°$	$a_2 = 45°$
	$a = 35°$	$a = -35°$	$a = 5°$	$a = -5°$
$a \leq \pm 15°^{a}$	$a > \pm 15°$	$a > \pm 15°$	$a < \pm 15°$	$a < \pm 15°$
$\delta = a_1 + a_2$	$\delta = 90°$	$\delta = 90°$	$\delta = 80°$	$\delta = 80°$
$\tau = \frac{\alpha}{\delta}$	$\tau = \frac{35°}{90°} = 0{,}39$	$\tau = \frac{-35°}{90°} = 0{,}39$	$\tau = \frac{5°}{80°} = 0{,}06$	$\tau = \frac{-5°}{80°} = 0{,}06$
$\tau \leq \pm 0{,}17^{a}$	$\tau > \pm 0{,}17$	$\tau > \pm 0{,}17$	$\tau < \pm 0{,}17$	$\tau < \pm 0{,}17$
	The Chain is outside the limits specified in 5,2,5	The chain is outside the limits specified in 5,2,5	The chain is within the limits specified in 5,2,5	The chain is within the limits specified in 5,2,5

[a] A negative sign indicates a net clockwise twist in the chain under test; it does not indicate a negative algebraic quantity; a_2 is a real measurement of the angle of twist in a clockwise direction; a is a real angle in clockwise direction on the test apparatus when shown positive and in an anticlockwise direction when shown negative.