

SLS 1979

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~~SRIS~~ SRI LANKA STANDARD SPECIFICATION FOR
BICYCLE HUB ASSEMBLIES

BUREAU OF CEYLON STANDARDS

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~~SRI~~ SRI LANKA STANDARD SPECIFICATION FOR BICYCLE

HUB ASSEMBLIES

FOREWORD

This Sri Lanka Standard Specification has been prepared by the Drafting Committee of the Bureau on Bicycles and Bicycle Components. It was approved by the Mechanical Engineering Divisional Committee of the Bureau of Ceylon Standards and was authorised for adoption and publication by the Council of the Bureau on.....

This standard is one of the series of Sri Lanka Standards on bicycles and bicycle components. The other standards in this series are:

- CS 127:1972 - Specification for bicycle tubes;
- CS 224:1973 - Specification for bicycle tyres;
- SIS 237:1973 - Specification for bicycle cotter pins, washers and nuts.
- SIS 375:1976 - Specification for bicycle brake shoe assemblies
- SIS 444:1978 - Specification for bicycle rims.
- * SIS - Specification for bicycle bottom bracket components.
- * SIS..... - Specification for bicycles.

The hub assemblies covered in this standard are intended for fitting in the popular sizes of bicycles produced in the country.

The ISO Metric Screw Threads which are coming into use internationally have been adopted in this standard and is covered in SIS 268:1974^{**}. Provision is also made for the use of cycle threads which is presently used in the bicycle industry. The cycle thread is given as an interim measure which will be withdrawn as and when the industry is able to adopt the metric threads.

SI units have been adopted^{in this standard} with alternate metric units within brackets where relevant.

This standard makes reference to the following Sri Lanka Standards:

- CS 146:1972 - Method for Brinell hardness test.
- CS 122:1971 - Vickers hardness test.
- CS 12:1968 - Method of tensile testing of steel products other than sheet, strip, wire and tube.
- CS 93:1970 - Method of simple bend testing of steel sheet and strip.
- SIS 268:1974 - Specification for ISO metric screw threads.

* Under preparation

** SIS 268:1974 - Sri Lanka standard specification for ISO metric screw threads

For the purpose of deciding whether a particular requirement of this standard is complied with the final value observed or calculated expressing the results of a test or observation shall be rounded off in accordance with CS 102:1971*. The number of figures to be retained in the rounded off value shall be the same as that of the specified value in this standard.

The assistance gained from the publications of the Indian Standards Institution and the Japanese Standards Association in the preparation of this standard is gratefully acknowledged.

1. SCOPE

This standard covers the requirements for front and rear hub assemblies suitable for fitting in popular sizes of bicycles in use in the country.

2. REQUIREMENTS

2.1 Material

2.1.1 Hub Shell

The hub shell shall be made from cold-rolled steel strip, mild steel tube, a suitable die-cast alloy or from white heart malleable iron casting. Hub shell cast from white heart malleable iron shall conform to requirements given in clause 2.1.1.1. The hardness in this case shall not be greater than 217 HB** or 228 HV*** (with 50 N (5kgf) load), where, at locations relevant to ball race the hardness given in clause 2.1.3 shall apply.

2.1.1.1 White Heart Malleable Iron

(a) Phosphorus content - Not greater than 0.15 per cent.

(b) Tensile properties:

Tensile Strength	0.5 Per cent Proof Stress	Percentage Elongation (Gauge Length=3 Dia.)
Min	Min	Min
350 MPa (36 kgf/mm ²)	200 MPa (20 kgf/mm ²)	10

To be determined on the appropriate tensile test piece specified in column 3 of Table 2 and according to CS 12:1968****.

* CS 102:1971 - Sri Lanka standard presentation of numerical values

** To CS 146:1972 - Sri Lanka standard method for Brinell hardness test

*** To CS 122:1971 - Sri Lanka standard Vickers hardness test

**** CS 12 : 1968 - Sri Lanka standard method of tensile testing of steel products other than sheet, strip, wire and tube

(c) Bend Test

To withstand without showing cracks or flaws, the bend test according to CS 13* : 1968 when bent cold round a mandrel of diameter 45 mm and through an angle of 90°. The test piece being the appropriate one specified in column 6 of Table 2.

2.1.2 Hub Spindle, Cone and Nut

The hub spindle, cone and nut shall be made from steel that conforms to the requirements given in clauses 2.1.2.1 to 2.1.2.3. The cone shall be case hardened in the finished condition to a depth of at least 0.25 mm and have a minimum hardness of 600 HV** (with 50 N (5kgf) load).

2.1.2.1 Chemical composition

<u>Element</u>	<u>Per Cent Max</u>
Carbon	0.28
Sulphur	0.060
Phosphorus	0.060

2.1.2.2 Tensile Properties

<u>Tensile Strength</u>	<u>Yield Strength</u>	<u>Percentage Elongation</u> (Gauge Length = 5.65/Area)
	<u>Min</u>	<u>Min</u>
410 - 530 MPa (42-54 kgf/mm ²)	240 MPa (24kgf/mm ²)	23

To be determined on appropriate tensile test piece specified in column 3 of Table 2 and according to CS 12*** 1968.

* CS 13 : 1968 - Sri Lanka standard method of bend testing of steel products other than sheet strip wire and tube

** To CS 122 : 1971 - Sri Lanka standard Vickers hardness test

*** CS.12 : 1968 - Sri Lanka standard method of tensile testing of steel products other than sheet strip wire and tube

2.1.2.3 Bend Test

To withstand without showing cracks or flaws the bend test according to CS 13* : 1968^{when} bent cold through 180° until the internal diameter of bend is not greater than twice the diameter of test piece. The test piece being the appropriate one specified in column 6 of Table 2.

2.1.3 Ball Race

The material of the ball race shall be as given in clause 2.1.1 as in the case of the hub flange or shall be made from steel sheet or bar that conforms to the relevant requirements given in clauses 2.1.3.1 to 2.1.3.3 or be of alloy steel suitably heat treated. The Ball Race located either as part of the hub flange (as in Fig 1 and 2) or as an independent fixture (as adopted in some cases) shall have been case hardened to a minimum depth of 0.20 mm and have a minimum hardness of 700 HV** (with a 50 N (5 kgf) load).

2.1.3.1 Chemical composition

Element	Per Cent Max	
	Steel sheet	Steel bar
Carbon	0.18	0.20
Sulphur	0.060	0.060
Phosphorus	0.060	0.060

2.1.3.2 Bend Test

To withstand without showing cracks or flaws the bend test according to CS 93*** : 1970 or CS 13* : 1968 whichever is relevant^{when} bent cold through 180° until the internal diameter of bend is equal to the thickness or diameter of the test piece. The test piece being the appropriate one specified in column 6 of Table 2.

* CS 13 : 1968 - Sri Lanka standard method of bend testing of steel products other than sheet, strip, wire and tube

** To CS 122 : 1972 - Sri Lanka standard Vickers hardness test

*** CS 93 : 1970 - Sri Lanka standard method for simple bend testing of steel sheet and strip

2.1.3.3 Tensile Properties of steel bar

<u>Tensile Strength</u>	<u>Yield Strength</u>	<u>Percentage Elongation</u> (Gauge Length = 5.65/√Area)
410-530 MPa (42-54 kgf/mm ²)	Min 240 MPa (24 kgf/mm ²)	Min 23

To be determined on appropriate tensile test piece specified in column 3 of Table 2 and according to CS 12*: 1968.

2.1.4 Ball

The ball shall be made of high grade chrome alloy steel conforming to the chemical composition given in clause 2.1.4.1 and heat treated to a minimum hardness of 800 HV** (with 50N(5kgf) load).

2.1.4.1 Chemical composition

<u>Element</u>	<u>Per Cent</u>
Carbon	0.90 - 1.20
Silicon	0.10 - 0.35
Manganese	0.20 - 0.40
Chromium	1.00 - 1.60

NOTE: In addition to the minimum properties specified, the materials may have other metallurgical properties which would make them suitable for fabrication in accordance with good manufacturing practice.

2.2 Dimensions

The dimensions of the front and rear hub assemblies shall be as given in Fig. 1 and 2 respectively***. The dimensions of metric threads specified shall conform to SLS 268:1974 with the exception of dimensions of M 35 x 1 threads which shall conform to Appendix 1. The dimensions of cycle threads specified shall conform to Appendix 2.

NOTE: The dimensions where tolerances are not given are given for purposes of guidance only.

* CS 12 : 1969 - Sri Lanka standard method of tensile testing of steel products other than sheet, strip, wire and tube

** To CS 122 : 1971 - Sri Lanka standard Vickers hardness test

*** SLS 268 : 1974 - Sri Lanka standard specification for ISO metric screw threads

2.3 Manufacture

- 2.3.1 The hub flanges shall be provided with spoke holes, the number and diameter of which shall be as indicated in Fig. 1 and 2. The holes shall be staggered on the two flanges and shall be countersunk alternatively on both sides of each flange for freely accommodating the spoke heads.
- 2.3.2 Suitable provision shall be made on the hub assemblies for proper lubrication.
- 2.3.3 The hub shall be manufactured in such a way as to prevent access of foreign matter into the hubs.

2.4 Finish

- 2.4.1 The hub spindle shall have a smooth finish and shall be chemically coloured or plated.
- 2.4.2 The inside of ball races shall be smooth finished to ensure free running of balls.
- 2.4.3 The cones shall be smooth finished and chemically coloured.
- 2.4.4 The spindle nuts shall be plated or shall be chemically coloured.
- 2.4.5 The hub shells shall be plated with nickel and chromium, the minimum thickness of coating being 0.015 mm in the case of nickel and 0.0003 mm in the case of chromium.

NOTE: In view of the shape of the components, a uniform thickness of plating could not be expected. In order to ensure that the thickness of nickel plating at any point is not less than that specified, an appropriately higher plating thickness would have to be aimed at.

2.5 Deflection Test

- 2.5.1 The front and rear hub assemblies shall be revolved on their spindles. The concentricity of hub shell and ball race, when gauged at the periphery of the flange, shall not be more than 0.3 mm.

M 8x1 ISO METRIC SCREW THREADS
 SIS 268:1974*
 (OR 7.94x0.98 CYCLE THREADS
 TO APPENDIX 2)
 OR
 M 10x1.25 ISO METRIC SCREW
 THREADS TO SIS 268:1974*
 (OR 9.52x0.98 CYCLE THREADS
 TO APPENDIX 2)

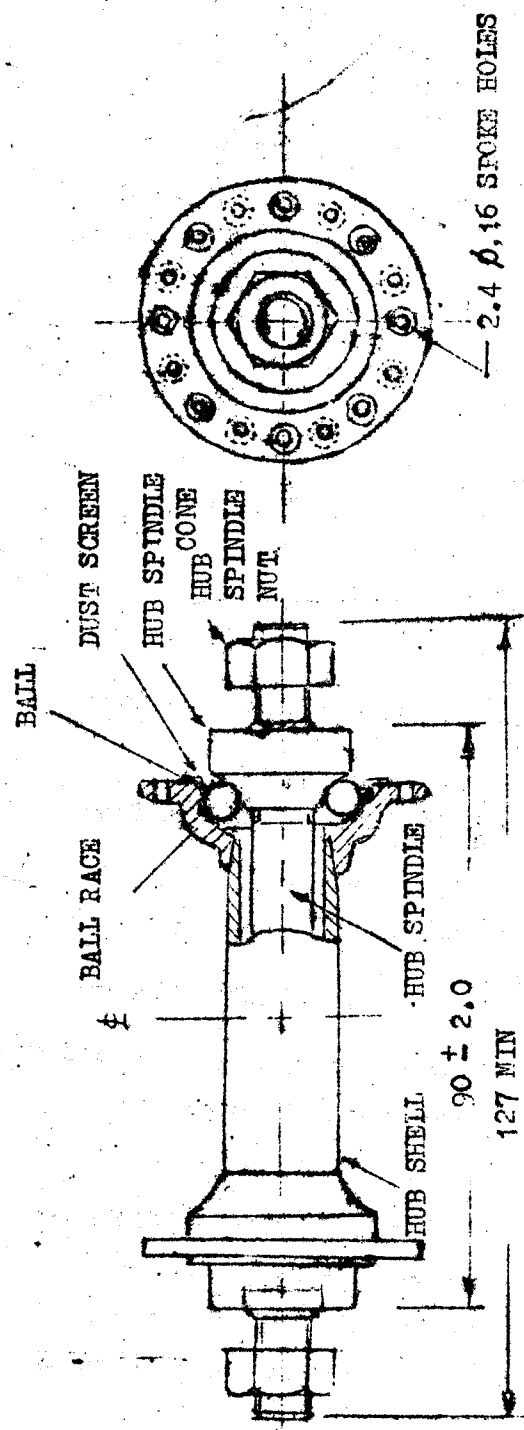


FIG. 1 FRONT HUB ASSEMBLY (SCHEMATIC)

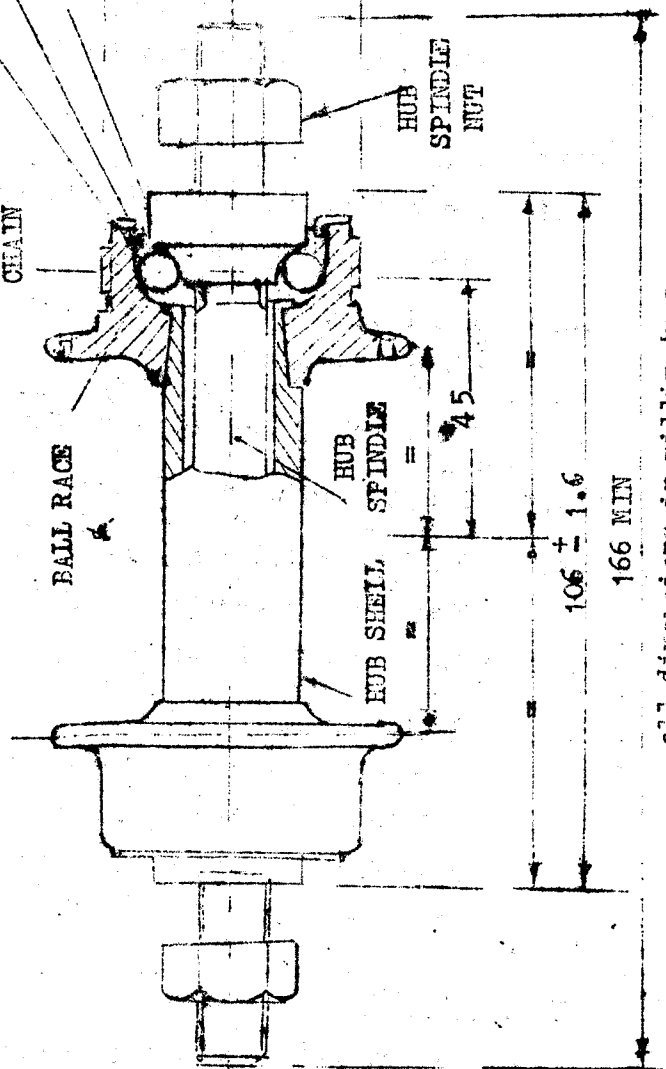
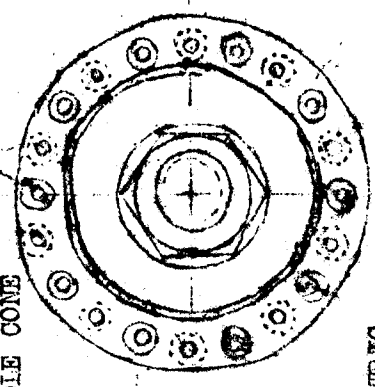
BALL

2.4 ϕ , 16 SPOKE HOLES

2.4 ϕ , 20 SPOKE HOLES

DUST SCREEN

HUB SPINDLE CONE



M 8x1 ISO METRIC
 SCREW THREADS TO
 SIS 268:1974*
 (OR 7.94x0.98 CYCLE
 THREADS TO
 APPENDIX 2)
 OR
 M 10x1.25 ISO
 METRIC SCREW THREADS
 TO SIS 268:1974*
 (OR 9.52x0.98 CYCLE
 THREADS TO APPENDIX 2)

all dimensions in millimetres

FIG. 2 REAR HUB ASSEMBLY (SCHEMATIC)

* SIS 268:1974 - SRI LANKA standard specification for ISO metric screw threads

2.5.2 The rear hub assembly shall be revolved on its spindle. When gauged at the periphery of the threaded portion the concentricity shall not be more than 0.3 mm.

3. MARKING

Hub assemblies shall bear the manufacturer's name, initials or trade-mark.

4. SAMPLING

4.1 Lot

In any consignment all hub assemblies of one size, manufactured under similar processes of production and materials shall be grouped together to constitute a lot.

4.2 Each lot shall be considered separately for ascertaining conformity of lot to the relevant requirements of this standard. The number of hub assemblies to be selected for this purpose shall depend on the size of the lot and shall be in accordance with Columns 1 and 2 of Table 1. Hub assemblies shall be selected at random from the lot, to ensure randomness of selection use shall be made of random number tables.

4.3 If the hub assemblies in the lot are packed in different boxes/cases a suitable number of boxes/cases (not less than 20 per cent of the total in the lot subject to a minimum of 2) shall be chosen at random. From each of the boxes/cases so chosen, an approximately equal number of hub assemblies shall be picked up from different parts so as to obtain the required number of hub assemblies specified in Column 2 of Table 1.

TABLE I

Lot Size (Total No. of Hub Assemblies)	Sample Size (No. of Hub Assemblies to be Examined)	Permissible No. of Defective Hub Assemblies
(1)	(2)	(3)
Up to 15	2	0
16 to 25	3	0
26 to 100	5	0
101 to 300	8	0
301 to 500	13	1
501 to 1000	20	1
Over 1000	32	2

4.4 Supply of Raw Material Test Pieces

4.4.1 Subject to the provisions in Clause 4.5.2, the manufacturer shall ensure the availability of the necessary sample test pieces of the relevant raw materials used, along with the consignment of the finished product, for the purpose of inspection according to Clause 4.5.2 and re-test specified therein.

- 4.4.2 One set of test pieces necessary for determining conformity of the hub assemblies to the requirements of this standard with respect to material shall be supplied for each lot of hub assemblies as defined in Clause 4.1.
- 4.4.3 Test pieces supplied in respect of the materials of the relevant hub assembly components for the purpose of testing according to Clause 4.5.2 shall be representative of the material that constitute the respective hub assembly components of the lot.
- 4.4.4 Cast test pieces shall be cast separately. Cast test pieces which represents castings which are heat treated, shall have been suitably heat treated along with the castings they represent. The edges of the cast bend test pieces may be rounded to a radius not exceeding 1.5 mm.
- 4.4.5 Test pieces representing materials of the respective hub assembly components of the lot, made from stock rolled steel materials, shall have been cut from these stock materials and supplied as rolled form. Bend test pieces of sheet materials shall have been cut so that the axis of the bend is parallel to the direction of rolling.
- 4.4.6 Test pieces shall be cut in such a manner that deformation is avoided as far as possible. If guillotining or flame cutting is employed, an adequate allowance shall be left for removal by machining.
- 4.4.7 All test pieces shall be marked by labelling or by any other means that does not effect in any way their performance, so as to easily identify the component of the hub assembly whose material it represents. They shall be packed so that they are suitably protected against corrosion and damage in transit.

4.5 Number of Tests and Criteria for Conformity

- 4.5.1 All hub assemblies selected as in Clauses 4.2 and 4.3 shall be examined for hardness, chemical composition, dimensions, manufacture, finish and reflection. Any hub assembly which fails in any one of the requirements shall be considered defective. The lot shall be considered as conforming to the requirements of the characteristics mentioned above, if the number of defective hub assemblies in the sample does not exceed the number given in Column 3 of Table 1.

5.2 The lot having been found conforming to Clause 4.5.1 shall be tested for material. For this purpose test pieces made available according to Clause 4.4 shall be tested according to Table 2. Any test piece failing in any one of the tests in Table 2 shall be declared a defective test piece. The lot shall be considered as conforming to the requirements of material, if no test piece is found to be defective. In the case of failure of any test piece pertaining to hub shells to any one of the tests, two more appropriate test pieces shall be subjected to the same test and no defective shall be found.

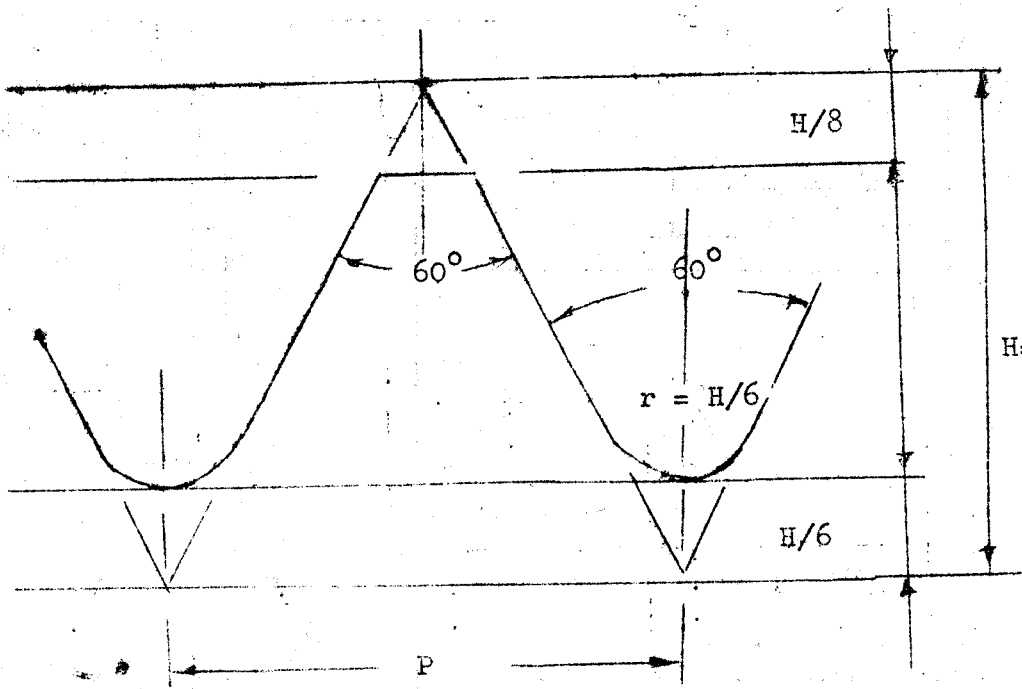
In the case of adequate quality control of all raw materials to the satisfaction of the purchaser or the inspecting officer has been maintained by the manufacturers and the quality was found to be satisfactory as evidenced by suitable certificates accompanying the lot, no test may be required with respect to raw material specification laid down in this clause and no raw material test pieces need be supplied.

TABLE - 2 SCHEME FOR INSPECTION OF MATERIALS

Item(s) whose patent material is marked for testing	Tensile Test			Clause No.	Inspection on Test Pieces (Clause 4.5.2)	Bend Test		Clause No.	Chemical Composition	
	Test piece (See Clause 4.4)	No. of tests/ test pieces for all lot sizes	Clause No.			Test piece (See Clause 4.4)	No. of tests/ test pieces for all lot sizes		Clause No.	No. of tests for all lot sizes
Hub shell or part there of made of malleable iron casting	2.1.1.1 (b)	Test piece of dimensions complying with Appendix 3	1**	2.1.1.1 (a)	Test piece as bar size 100 x 25 x 6 mm	1**	2.1.1.1 (a)	1**		
Hub spindle cone and nut	2.1.2.2	Test piece cut from stock steel bar used of length sufficient to carry out the test for each item separately as relevant	1 for each item	2.1.2.5	Test piece cut from stock steel bar used of length sufficient to carry out the test for each item separately as relevant	1 for each item	2.1.2.1	1 for each item		
Bell rece made from steel sheet or bar and not as integral part of hub flange	2.1.3.3	Test piece cut from stock steel bar used of length sufficient to carry out the test as relevant	1	2.1.3.2	Test piece of width 20 ± 0.5 mm cut from stock steel sheet used (if stock material of smaller width then full length test piece cut from stock steel bar used of length sufficient to carry out the test as relevant)	1	2.1.3.1	1		

* Test shall be carried out on test piece used for tensile or bend test of the item.
 ** For re-test see clause 4.5.2.

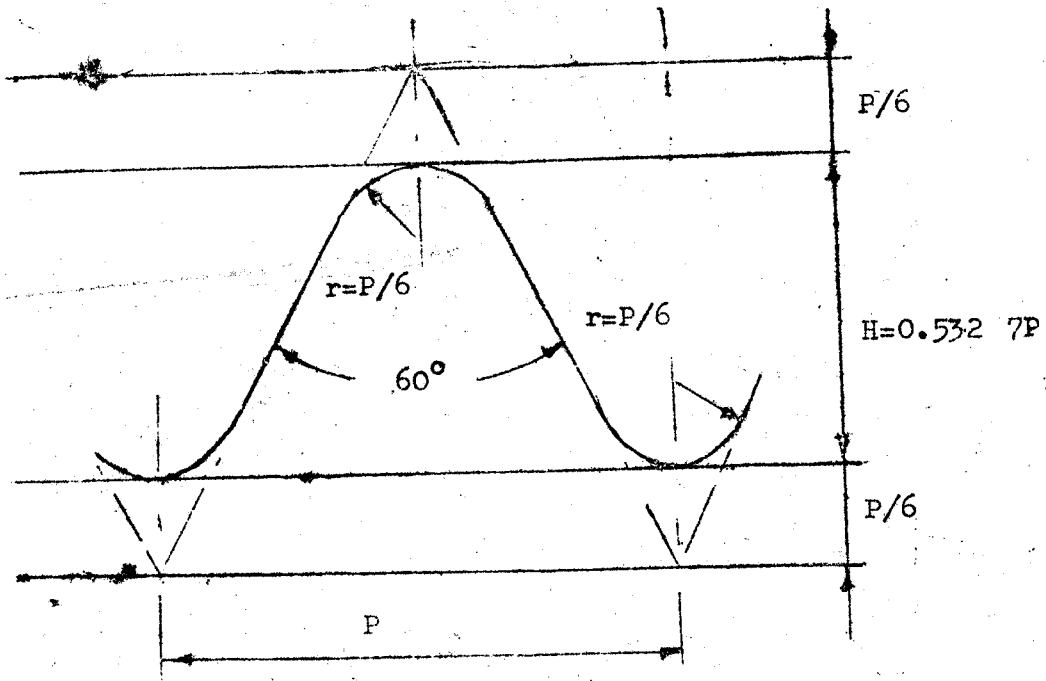
APPENDIX 1 - FORM OF ISO METRIC SCREW THREAD
M35x1 FOR HUBS



All dimensions in millimetres

Nominal Size	Pitch P	Major Dia		Pitch Dia		Minor Dia	
		Max	Min	Max	Min	Max	Min
M35x1	1	34.974	34.794	34.324	34.199	33.747	33.550

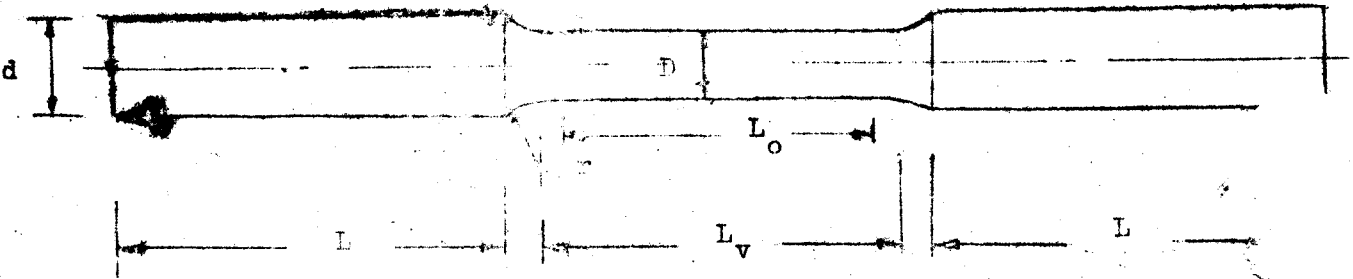
APPENDIX 2 - FORM OF CYCLE THREADS



All dimensions in millimetres

Size	Pitch P	Bolt						Nut					
		Major Dia		Effective Dia		Minor Dia		Major Dia		Effective Dia		Minor Dia	
		Max	Min	Max	Min	Max	Min	Min	Max	Min	Max	Min	
.98	0.977	7.938	7.798	7.417	7.325	6.896	6.706	7.938	7.508	7.417	7.193	6.896	
9.52x0.98	0.977	9.525	9.380	9.004	8.908	8.484	8.288	9.525	9.101	9.004	8.781	8.484	
34.60x1.06	1.058	34.798	34.620	34.234	34.107	34.670	33.442	-	-	-	-	-	

APPENDIX 3 - HUB SHELL CAST TENSILE TEST PIECE



All dimensions in millimetre.

Nominal Diameter D	Tolerance on Nominal Diameter	Shank Dimensions		Gauge Length $L_o = 3D$	Length L_v	Radius Shoulder r
		Diameter D	Length L			
9	+ 0 - 0.6	13	40	27	30	6