SRI LANKA STANDARD 1254 : 2003

UDC 629.312

SPECIFICATION FOR
NON-FOLDING WHEELCHAIRS

SRI LANKA STANDARDS INSTITUTION

SPECIFICATION FOR
NON-FOLDING WHEELCHAIRS

SLS 1254 : 2003

Gr. 12

SRI LANKA STANDARDS INSTITUTION
17, Victoria Place
Elvitigala Mawatha,
Colombo 08.
SRI LANKA

Sri Lanka Standards are subject to periodical revision in order to accommodate the progress made by industry. Suggestions for improvement will be recorded and brought to the notice of the Committees to which the revisions are entrusted.

This standard does not purport to include all the necessary provisions of a contract.

SRI LANKA STANDARD
SPECIFICATION FOR NON-FOLDING WHEELCHAIRS

FOREWORD

This standard was authorized for adoption and publication as a Sri Lanka Standard by the Council of the Sri Lanka Standards Institution on 2003-12-19 after the draft, finalized by the Working Group on Wheelchairs, had been approved by the Sectoral Committee on Materials, Mechanical Systems and Manufacturing Engineering.

The type of wheelchairs covered by this specification is the non-folding type, which has found wider application in Sri Lanka compared to the other types. Non-folding wheelchairs can be robustly built making it suitable for both indoor and outdoor use and also for riding on relatively rough surfaces.

Guidelines for the determination of compliance of a lot with the requirements of this standard, based on statistical sampling and inspection is given in Appendix **A**.

Any alternative materials, designs, methods of assembly or products, which do not comply with the specific requirements of this standard, or are not mentioned in it, but which give equivalent results to those specified, may be acceptable.

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 an analysis, shall be rounded off in accordance with **CS 102**. The number of significant figures to be retained in the rounded off value shall be the same as that of the specified value in this standard.

The assistant derived from the publication of the International Organization for Standardization (ISO) in the preparation of this standard is gratefully acknowledged.

1 SCOPE

This specification lays down minimum requirements of material, dimensions, performance and testing for non-folding adult wheelchairs used indoors and outdoors by individuals and in hospitals or similar institutions.

2 REFERENCES

ISO 2081	Metallic coatings- Electroplated coatings of zinc on iron or steel
CS 102	Presentation of numerical values
SLS 127	Bicycle tubes
SLS 224	Bicycle tyres
SLS 762	Electroplated coatings of chromium for engineering applications
SLS 1006	Part2: Steel for general Engineering Purposes
SLS*…	Determination of static stability
SLS*…	Determination of efficiency of brakes
SLS*…	Requirements and test methods for static impact and fatigue strengths
SLS*…	Determination of overall dimensions, mass and turning space
SLS*…	Measurement of seating and wheel dimensions
SLS*…	Test dummies
SLS*…	Determination of coefficient of friction of test surfaces
SLS*…	Requirements for information disclosure, documentation and labeling
SLS*…	Set up procedures

3 TERMINOLOGY AND DEFINITIONS

3.1 Terminology

The terminologies for the wheelchairs are as indicated in Figure **1**.

* Methods of test for wheelchairs (under preparation)

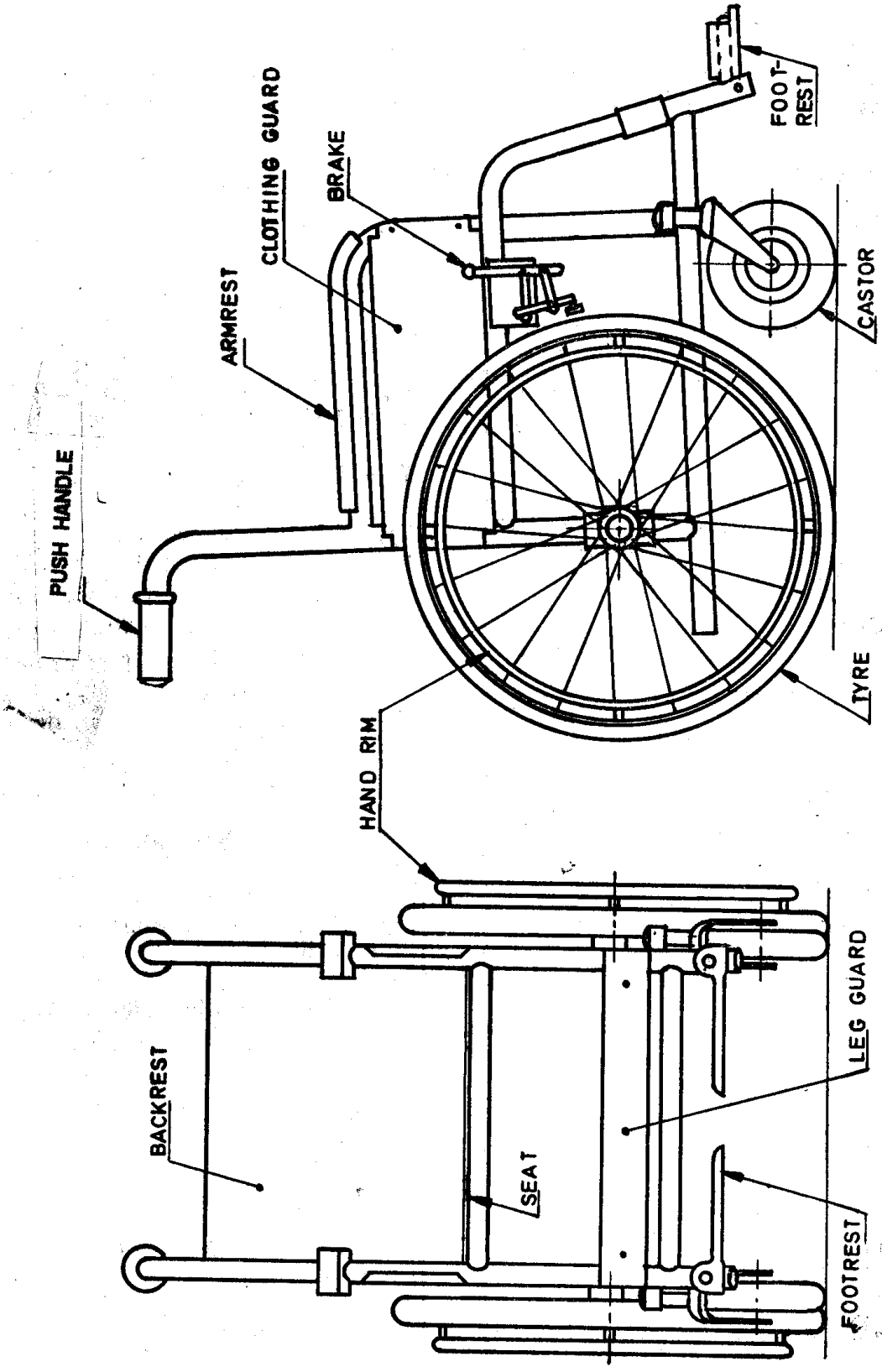


FIGURE 1 - Typical illustration of a wheel chair, non-folding adult size

3.2 Definitions

For the purpose of this standard the following definitions shall apply:

3.2.1 ***castor wheel*****:** A wheel that can pivot but is not intended to govern the driving direction

3.2.2 ***tilt or seat angle*** : The angle between the seat and the horizontal plane**.**

3.2.3 ***bucket angle :***The angle between the seat and the backrest

3.2.4 ***routine tests*****:** Tests performed at the manufacturers' works on all wheelchairs in the finished state or as appropriate during manufacture.

3.2.5 ***type tests*****:** Tests performed on wheelchairs as produced by a specific manufacturer before the manufacturer supplies, on a general commercial basis, wheelchairs designed to comply with this standard. These tests, after they have been successfully completed, need not be repeated unless changes are made which might affect compliance with the test requirements.

4 REQUIREMENTS

4.1 Materials

The materials used in the manufacture of wheelchairs shall be as indicated in **4.1.1** to **4.1.4**.

4.1.1 *Frame*

The frame shall be made of minimum 19 mm outside diameter and 1.2 mm thick mild steel tubes or other material with comparable strength.

4.1.2 *Seat*

The seat shall be provided with cushion, which may be of foam rubber or rubberized coir or as required by the purchaser.

4.1.3 *Clothing guard*

The clothing guard to avoid entangling of clothes and body from the rear wheels shall be made of canvas or according to the specification agreed with the customer.

4.1.4 *Declaration*

The manufacturer, when requested by the purchaser or testing organizations shall declare the materials used for different components.

4.2 Dimensions and construction

4.2.1 *Rear wheel*

4.2.1.1.Axle diameter

The axle shall be made of steel conforming to **SLS 1006:Part 2** with minimum diameter of 15 mm.

NOTE : *The wheels shall be firmly secured to the frame with the help of axles. It is preferable if rear wheel can be adjusted back and forward*

4.2.1.2. Tyre size

The minimum tyre size of the rear wheels shall be 24 * 1 3/8.

NOTE: *Pneumatic tyres, conforming to* ***SLS 224*** *with tubes, conforming to* ***SLS 127*** *shall be used for rear wheels. Other type of tyre used, if any, shall be with the agreement of the customer.*

4.2.1.3.Hubs

If mild steel is used the thickness at any place of the hub shall not be less than 1mm.

NOTE : *The hub width and other dimensions should be selected to suit the bearings, the axles, the rims and the spokes used.*

4.2.1.4. Spokes

All spokes should be chrome finished conforming to **SLS 762** or galvanized conforming to **ISO 2081** or be of non-corrosive material.

NOTE : *32-40 no. of spokes are available for above wheels. Three cross spokes pattern is strong and possible with available spoke length.*

4.2.1.5.Bearings

Sealed bearing shall preferably be used for the hub, castor wheel and castor fork. Cup and cone bearings or plain bearings when used, shall be with the agreement between the supplier and the purchaser. Written instructions shall be issued to the purchaser regarding any maintenance required for bearings.

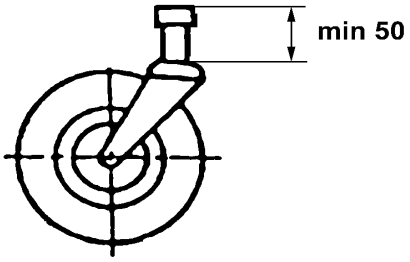
4.2.1.6 Hand rim

The hand rim shall be made of tubes of diameter between 16 mm and 22 mm.

4.2.2 ***Castor***

4.2.2.1.Castor barrel length

The minimum length of the castor barrel shall be 50 mm.



Dimension in mm

FIGURE 2- Castor barrel length

4.2.2.2.Castor barrel angle

The castor barrel angle shall be 90^{o} to the ground. The castor barrel should be so designed as to give adequate additional protection to bearings.

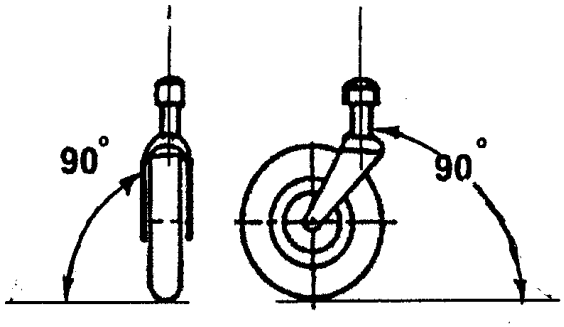
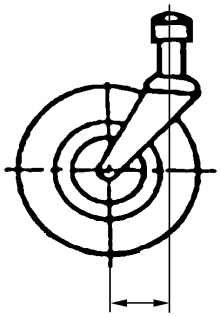


FIGURE 3- Castor barrel angle

4.2.2.3. Castor trail
The minimum castor trail length shall be between 60 mm and 65 mm.



Dimensions in mm

FIGURE 4- Castor trail

4.2.2.4.Castor wheel diameter

The minimum castor wheel diameter shall be 120 mm.

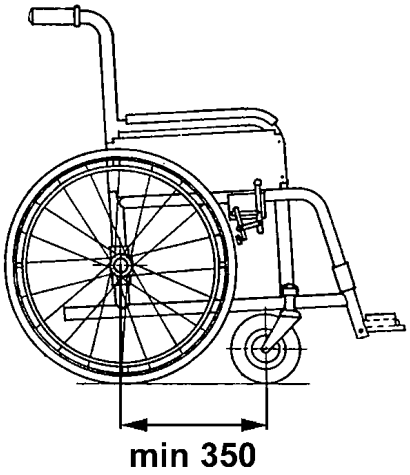
NOTE : *The castor wheel shall have sufficient strength and robustness to sustain all operational conditions the wheelchair is likely to meet during normal usage.*

4.2.3 *Parking brakes*

The brake levers shall be conveniently located, adjustable to the position of the wheel and comfortable to the hand. The efficiency of brakes shall be tested according to **4.4.3.**

4.2.4. *Frame*

4.2.4.1.Wheel base
The minimum wheel base shall be 350 mm.



Dimension in mm

FIGURE 5-Wheel base

4.2.4.2.Angle of cross tubes to seat

The angle of cross tubes to seat shall be minimum of $40^{o.}$

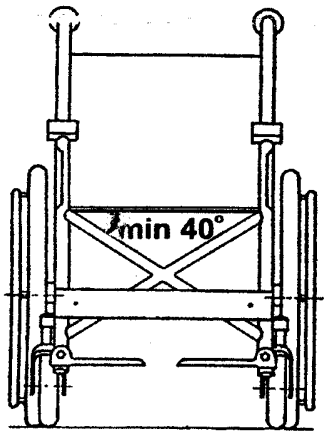


FIGURE 6- Angle of cross tubes to seat

4.2.5. ***Footrest***

4.2.5.1.Footrest angle

The footrest angle to the horizontal shall be between 0 ^{o} and 20^{o} (with the footrest front upward).

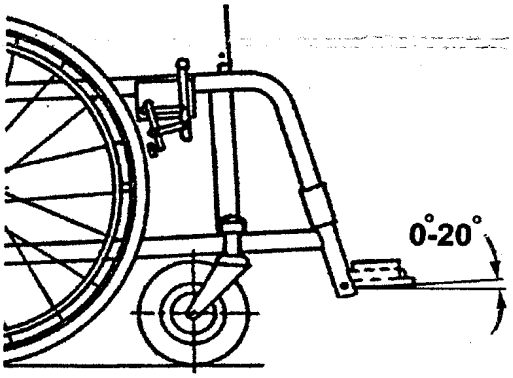
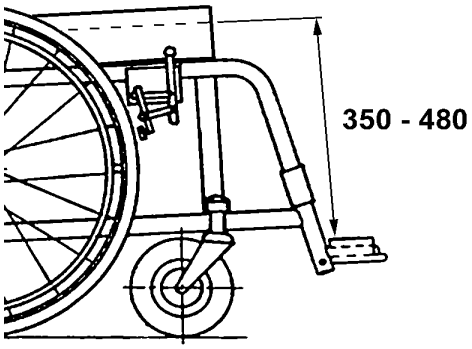


FIGURE 7- Footrest angle

4.2.5.2.Foot rest to seat distance

The distance between the top of the compressed cushion and the footrest shall be between 350 mm and 480 mm.

NOTE : *The height of footrest shall be adjustable and surface of the footrest shall be non-slip.*



Dimensions in mm

FIGURE 8-Footrest to seat distance

4.2.5.3 Knee angle
The knee angle shall be between 70^{o} and 110^{o} .

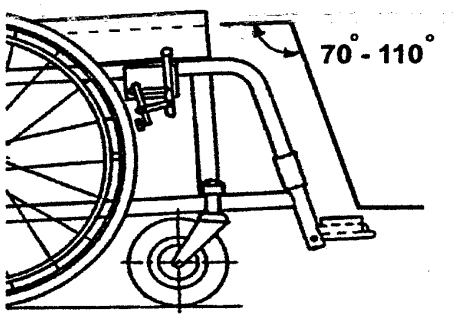
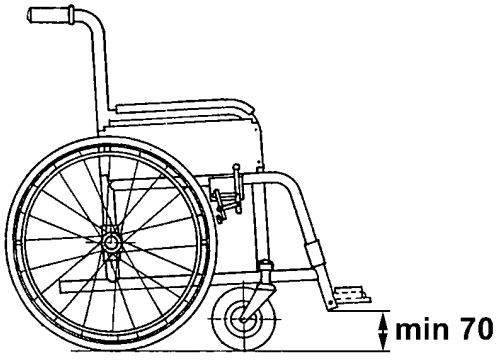


FIGURE 9 - Knee angle

4.2.5.4 Ground clearance

The minimum height from the ground to the lowest part of the wheelchair shall be 70 mm.



Dimension in mm

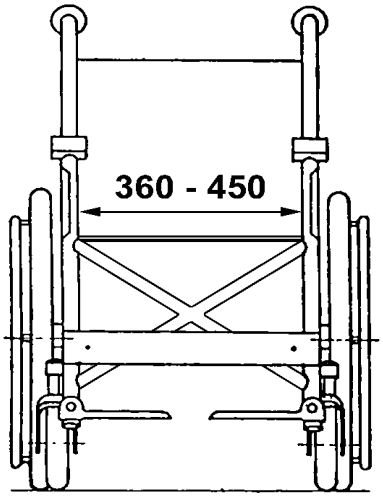
FIGURE 10 - Ground clearance

4.2.6 *Seat*

4.2.6.1.Seat width

The available seat width range shall be between 360 mm and 450 mm in minimum three sizes.

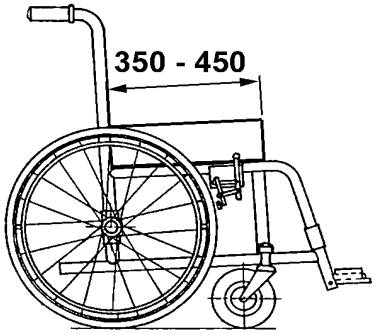
NOTE: *The availability of three sizes of seat widths provides better selection for users.*



Dimensions in mm

FIGURE 11 - Seat width

4.2.6.2.Seat depth
The seat depth shall be between 350 mm and 450 mm.



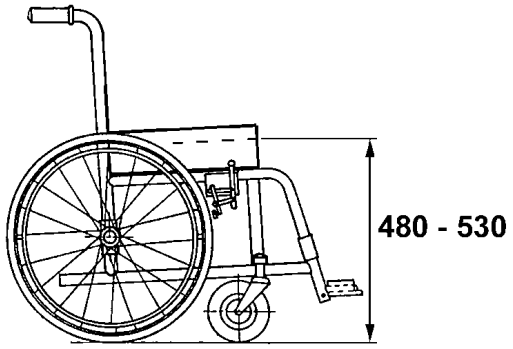
Dimensions in mm

FIGURE 12 -Seat depth

4.2.6.3.Seat height

The seat height from top of the compressed cushion measured at the front of the seat to the ground shall be between 480 mm and 530 mm.

NOTE : *Wheelchair riders prefer the wheelchair as low as possible because then it will be more stable. It will also allow the rider to reach the things off the floor.*

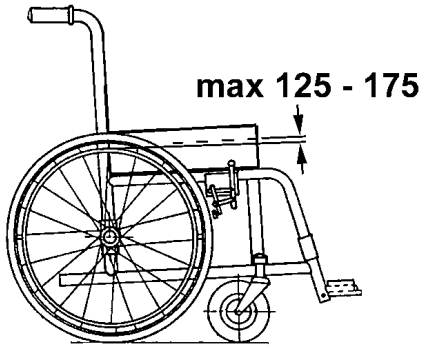


Dimensions in mm

FIGURE 13 - Seat height

4.2.6.4 Seat tubes to top of hand rim

The maximum distance between the top of the compressed cushion to the top of the hand rim shall be between 125 mm and 175 mm.

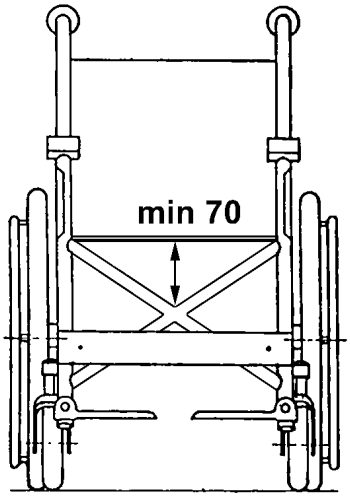


Dimensions in mm

FIGURE 14 - Seat tubes to top of hand rim

4.2.6.5 Seat elevation from cross tubes

The minimum seat elevation from cross tubes shall be 70 mm.



Dimension in mm

FIGURE 15 - Seat elevation from cross tubes

4.2.6.6. Seat angle

The seat angle shall be between 0 ^{o} and 12 ^{o} (to the horizontal)

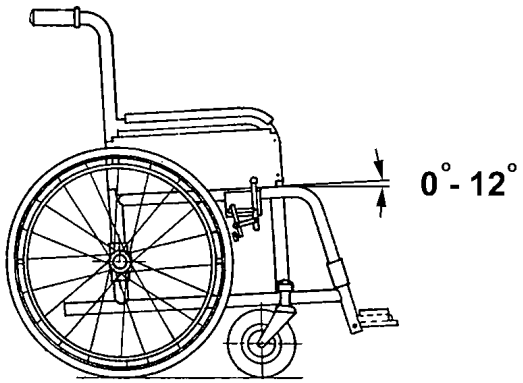


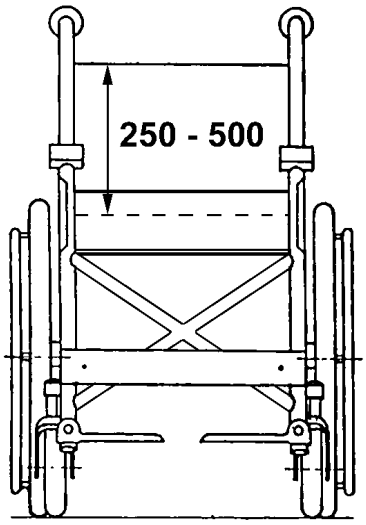
FIGURE 16 - Seat angle

4.2.7. *Backrest*

4.2.7.1 Backrest height

The backrest height shall be between 250 mm and 500 mm, measured from the top of the compressed cushion to the top of the backrest.

NOTE : *Provision should be made so as to adjust the height within the range of 250 mm to 500 mm in minimum to two positions*



Dimensions in mm

FIGURE 17 - Backrest height

4.2.7.2. Bucket angle

The bucket angle shall be between 80^{o} and 100 ^{o}.

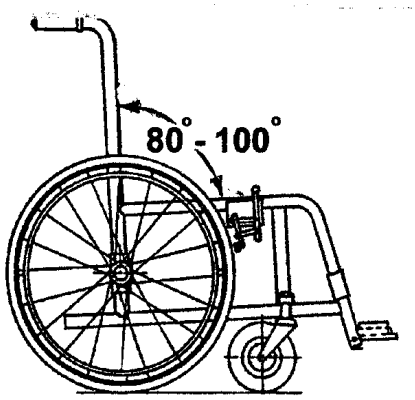


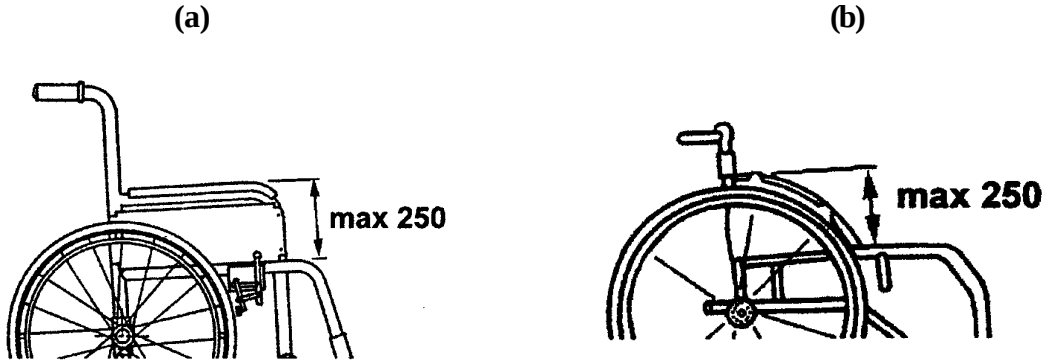
FIGURE 18 - Bucket angle

4.2.8. *Accessories*

4.2.8.1. Armrest (If fitted)

The maximum height of the armrest from the seat shall be 250 mm.

NOTE : *The length of the armrest should be selected to suit the user preference and convenience. The armrest should not obstruct, transverse to and from the wheelchair.*



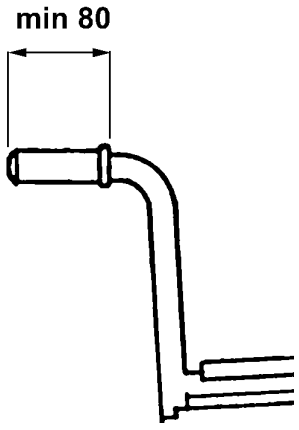
Dimensions in mm

FIGURE 19 – Armrest

4.2.8.2. Push handle

4.2.8.2.1. Push handle grip

The push handle shall have enough length for someone to grip when pulling the wheelchair rider up and down stairs and steps. Grip handle length shall be minimum 80 mm .

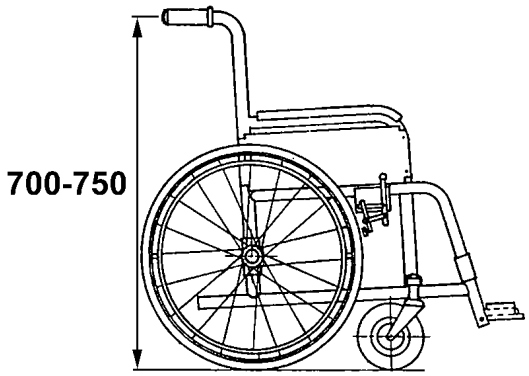


Dimension in mm

FIGURE 20 - Push handle grip

4.2.8.2.2. Push handle height

The push handle height shall be between 700 mm and 750 mm (above the ground)



Dimension in mm

FIGURE 21 - Push handle height

4.2.9. *Other*

4.2.9.1.Wheelchair weight

The maximum weight of the wheelchair shall be 25 kg.

4.2.9.2.Manual of instructions

An adequately illustrated manual shall be provided by the supplier in all three languages (Sinhala, Tamil and English). The manual shall include a complete list of regular and optional parts, instructions for dismantling, cleaning and assembly, instructions for routine inspection, adjustments and replacement of parts, and instructions for handling and using the wheelchair.

4.3 Workmanship and finish

4.3.1 Materials and finishes shall be non-toxic and shall not cause any skin diseases.

4.3.2 All permanently exposed metallic parts shall be plated, powder coated, epoxy painted or automotive painted as agreed between the purchaser and the supplier. The resulting finish shall be hard and shall not readily chip or flake.

4.3.3 Welding shall be finished smooth and there shall be no exposed sharp edges.

4.4. Performance

4.4.1 *Static stability*

The wheelchair shall conform to the static stability requirements of SLS* ……

4.4.2 *Static, impact and fatigue strength*

The wheelchair shall conform to the static, impact and fatigue strength requirements of SLS* ……

4.4.3 *Parking brakes*

The wheelchair shall conform to the parking brake requirements of SLS* ……

5 MARKING

5.1 Wheelchairs shall be marked legibly and indelibly with the following:

a) Name and address of the manufacturer of the wheelchair;
b) Model designation serial number of the wheelchair;
c) Year of manufacture;
d) Riding restrictions and
e) Recommended maximum mass of the user.

6 TESTING

6.1 Test preparation

6.1.1 *Test dummies*

The test dummies shall be prepared according to SLS* …….

6.1.2 *Coefficient of friction of test surfaces*

The method for determination of coefficient of friction of test surfaces shall be according to SLS*……

6.1.3 *Set-up Procedure*

The set up procedure to be used in the preparation of wheelchairs for testing, shall be according to SLS* …as applicable to manual wheelchairs.

6.2 Methods of test

The requirements for testing specified in **6.2.1** to **6.2.5** shall be those applicable to manual wheelchairs of the respective standards.

6.2.1 *Overall dimensions, mass and turning space*

Methods for determining overall dimensions mass and minimum turning space of wheel chairs shall be according to SLS* …….

6.2.2 *Measurement of seating and wheel dimensions.*

The method for measuring the seating and wheel dimensions shall be according to SLS*……

6.2.3 *Static stability*

The static stability shall be tested according to SLS* …….

6.2.4 *Static, Impact and fatigue strength*

Static, impact and fatigue strengths shall be tested according to SLS*…….

6.2.5 *Efficiency of brakes*

The brakes shall be tested according to SLS*……

* Methods of test for wheelchairs (under preparation)

APPENDIX A
COMPLIANCE OF A LOT

The sampling scheme given in this Appendix should be applied where compliance of a lot to the requirements of this standard is to be assessed based on statistical sampling inspection.

Where compliance with this standard is to be assured based on manufacturers control systems complied with type testing and check tests or any other procedure, appropriate schemes of sampling and inspection should be adopted.

A.1 Type tests

The following tests shall be carried out as type tests on selected samples of wheel chairs. The samples being drawn preferably at random from the lot.

a) Static stability (**4.4.1**)
b) Static, Impact and fatigue strength (**4.4.2**)

A.1.1 *Sample Size*

The number of samples selected from a lot shall be two and each shall be subjected to the tests specified in **A.1**

A.1.2 Criteria for Approval

All samples subjected to the type tests shall pass all the tests for proving conformity with the requirements of this standard.

A.2 Acceptance tests

A.2.1 *Lot*

In any consignment, all the wheelchairs of same type belonging to one batch of manufacture or supply shall constitute a lot.

A.2.2 *Scale of sampling*

A.2.2.1 Samples shall be tested from each lot for ascertaining the conformity of the lot to the requirements of this specification.

A.2.2.2 The number of wheelchairs to be selected from the lot shall be in accordance with the Table **1** given below :

TABLE 1 – Scale of sampling

Number of items in the lot	Number of items to be selected
Up to 15	2
16 to 25	3
26 to 90	5
91 to 150	8
151 and above	13

A.2.2.3 The wheelchairs shall be selected at random. In order to ensure randomness of selections, table random numbers as given in SLS **428** shall be used.

A.2.3 ***Number of tests***

A.2.3.1 Each wheelchair selected as in **A.2.2.2** shall be inspected for marking requirements.

A.2.3.2 Each wheelchair selected as in **A.2.2.2** shall be examine for the requirements given under **4.1**

A.2.3.3 Each wheelchair selected as in **A.2.2.2** shall be tested for the requirements given under **4.2**

A.2.3.4 Each wheelchair selected as in **A.2.2.2** shall be visually examined or tested where applicable for requirements given under **4.3.**

A.2.3.5 Each wheelchair selected as in **A.2.2.2** shall be tested for the requirement given in **4.4.3**.

A.2.4 ***Criteria for conformity***

A lot shall be declared as conforming to the requirements of this specification if the following conditions are satisfied.

A.2.4.1 Each wheelchair inspected as in **A.2.3.1** satisfies the relevant requirements.

A.2.4.2 Each wheelchair examined as in **A.2.3.2** satisfies the relevant requirements.

A.2.4.3 Each wheelchair tested as in **A.2.3.3** satisfies the relevant requirements.

A.2.4.4 Each wheelchair examined/tested as in **A.2.3.4** satisfies the relevant requirements.

A.2.4.5 Each wheelchair tested as in **A.2.3.5** satisfies the relevant requirements.

SLS CERTIFICATION MARK

The Sri Lanka Standards Institution is the owner of the registered certification mark shown below. Beneath the mark, the number of the Sri Lanka Standard relevant to the product is indicated. This mark may be used only by those who have obtained permits under the SLS certification marks scheme. The presence of this mark on or in relation to a product conveys the assurance that they have been produced to comply with the requirements of the relevant Sri Lanka Standard under a well designed system of quality control inspection and testing operated by the manufacturer and supervised by the SLS/ *which includes surveillance inspection of the factory, testing of both factory and market samples.*

Further particulars of the terms and conditions of the permit may be obtained from the Sri *Lanka Standards Institution, 17, Victoria Place, Elvitigala Mawatha, Colombo 08.*

Printed at SLSI (Printing Unit)

SRI LANKA STANDARDS INSTITUTION

The Sri Lanka Standards Institution (SLSI) is the National Standards Organization of Sri Lanka established under the Sri Lanka Standards Institution Act No. 6 of 1984 which repealed and replaced the Bureau of Ceylon Standards Act No. 38 of 1964. The Institution functions under the Ministry of Science & Technology.

The principal objects of the Institution as set out in the Act are to prepare standards and promote their adoption, to provide facilities for examination and testing of products, to operate a Certification Marks Scheme, to certify the quality of products meant for local consumption or exports and to promote standardization and quality control by educational, consultancy and research activity.

The Institution is financed by Government grants, and by the income from the sale of its publications and other services offered for Industry and Business Sector. Financial and administrative control is vested in a Council appointed in accordance with the provisions of the Act.

The development & formulation of National Standards is carried out by Technical Experts and representatives of other interest groups, assisted by the permanent officers of the Institution. These Technical Committees are appointed under the purview of the Sectoral Committees which in turn are appointed by the Council. The Sectoral Committees give the final Technical approval for the Draft National Standards prior to the approval by the Council of the SLSI.

All members of the Technical & Sectoral Committees render their services in an honorary capacity. In this process the Institution endeavours to ensure adequate representation of all view points.

In the International field the Institution represents Sri Lanka in the International Organization for Standardization (ISO), and participates in such field of standardization as are of special interest to Sri Lanka.

Printed at the Sri Lanka Standards Institution, 17, Victoria Place, Elvitigala Mawatha, Colombo 08.