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Code of Practice for the design, production, supply and provision of wheelchairs and tricycles

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Compliance with this standard does not, of itself confer immunity from legal obligations

A Uganda Standard does not purport to include all necessary provisions of a contract. Users are responsible for its correct application

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Foreword

Uganda National Bureau of Standards (UNBS) is a parastatal under the Ministry of Tourism, Trade and Industry established under Cap 327, of the Laws of Uganda. UNBS is mandated to co-ordinate the elaboration of standards and is

(a) a member of International Organisation for Standardisation (ISO) and

(b) a contact point for the WHO/FAO Codex Alimentarius Commission on Food Standards, and

(c) the National Enquiry Point on TBT/SPS Agreements of the World Trade Organisation (WTO).

The work of preparing Uganda Standards is carried out through Technical Committees. A Technical Committee is established to deliberate on standards in a given field or area and consists of representatives of consumers, traders, academicians, manufacturers, government and other stakeholders.

Draft Uganda Standards adopted by the Technical Committee are widely circulated to stakeholders and the general public for comments. The committee reviews the comments before recommending the draft standards for approval and declaration as Uganda Standards by the National Standards Council.

Committee membership

This standard has been developed by the Transport and communication Standards Technical Committee (UNBS/TC 8).

Introduction

The standard aims to describe to designers, manufacturers, importers, suppliers and providers of wheelchairs the standards required for the design specification, materials, and procedures for prescription, production provision and follow-up of wheelchairs in Uganda.

The standards written herein are descriptive, reflecting the performance value of each component of the designs of self-propelled wheelchairs and hand powered tricycles currently used in Uganda (see Annex A).

In addition, the standard takes into consideration the rights of the end user to choose, appropriate functional assessment, prescription to best meet the identified needs and follow up to gather information about the product and service, while encouraging wheelchair design developments or innovation within this field

The functional performance of a wheelchair is determined by its design and features. Performance features include stability, manoeuvrability, pushing efficiency, transferring, transport, and reliability. A wheelchair should be evaluated based on functional performance measures and the results made available with the wheelchair for providers. A wheelchair should meet or be selected based on the functional performance requirements of the user in the environment of use.

Code of Practice for the design, production, supply and provision of wheelchairs and tricycles

1 Scope

This Final Draft Uganda Standard gives guidelines for the design and manufacture/production, supply (including importation) and provision of wheelchairs and tricycles.

This standard does not cover sports and electrical wheelchairs.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 7176-8, *Wheelchairs – Part 8: Requirements and test methods for static, impact and fatigue strengths*

3 Terms and definitions

For the purposes of this standard, the following terms and definitions shall apply.

3.1
appropriate wheelchair
wheelchair that meets the user's needs and environmental conditions; provides proper fit and postural support; is safe and durable; is available; and can be accessed, maintained and sustained in the country at an economical price

3.2
manual wheelchair
wheelchair that is propelled by the user or pushed by another person

3.3
wheelchair
device to provide wheeled mobility with a seating support system for a person with a walking limitation

3.4
wheelchair provision
overall term for wheelchair design, production and service

3.5
wheelchair service
integral part of wheelchair provision concerned with providing users with appropriate wheelchairs

3.6
wheelchair user
person who uses or can benefit from using a wheelchair because his or her ability to walk is permanently or temporarily limited

3.7
rehabilitation
process of restoration to the highest functional ability of an individual with movement challenges to live a healthy and better life

3.8
caregiver
person who helps the wheelchair user propel the wheelchair due to the inability of the user to propel him/herself

3.9
assessment
process of gathering information to identify a wheelchair user's individual needs for a prescribed product that will optimise the user's potential

3.10
prescription
analysing assessment results correctly to recommend for an appropriate wheelchair which is acceptable to the user

3.11
provision
giving out wheelchairs following a process of assessment, prescription fitting, user training and follow-up that meets or exceeds an internationally agreed minimum

3.12
community workers
people who offer rehabilitation services in the community

3.13
recognised supplier
supplier that is certified by the Ministry responsible for health or any other designated authority

3.14
CBR
Community Based Rehabilitation

3.15
PWD
People with Disability

3.16
NGO
Non-Governmental Organisation

4 Levels of wheelchair service provision

There are three levels of service provision namely.

a) basic level which is for persons who can sit without any postural deformities or abnormality. Mobility and postural supports are provided through a well fitted wheelchair and seat cushion;

b) intermediate level which is for persons with mild to moderate postural deformities or tendancies. If unaddressed, these deformities will limit comfort, health and function. Supportive seating is provided through individual modification to a basic wheelchair, or a specialized seating system.

c) advanced level which is for persons with complex fixed postural deformities. Even with support many cannot sit normally. They require individual prescribed and customized wheelchairs to provide postural support and accommodate fixed deformities

5 Types of wheel chairs

5.1 General

There are three categories of wheelchair designs:

- 3-wheeler chairs;
- 4-wheeler chairs; and
- hand powered tricycles.

5.2 3-wheeler chairs

5.1.1 The 3-wheeler chairs shall be classified either as rigid terrain or Huckstep type.

5.1.2 The rigid type has a castor wheel at the front and is often provided to users living in rural settings where the terrain is very rough. This design provides a stable chair and is easy to perform rear-wheel balance, but is difficult to transport.

5.1.3 The Huckstep type has a castor wheel at the back. It is unable to be tipped backwards, has a wide external dimension but is difficult to side-transfer.

5.2 4-wheeler chairs

5.2.1 The 4-wheeler chairs shall be classified either as foldable type wheelchair or rigid type wheelchair.

5.2.2 The foldable type is easy to transport in vehicles with easier side-transfers if provided with removable arm rests. This design provides a reduced stability over rough terrain.

5.2.3 The rigid wheelchair is stable on even ground but may not be stable on rough terrain.

5.3 Hand powered tricycle

The tricycle design feature cause less fatigue over distances and some designs may allow carrying of items. It is not viable for use in restricted spaces, that is, around the home, office, school and it very difficult to transport,

NOTE Due to the diversity among wheelchair users, there is a need for different types of wheelchairs. No one wheelchair can meet the needs of all wheelchair users. Those providing wheelchairs need an understanding of the needs and context of the intended wheelchair users as well as the rationale behind different wheelchair designs.

6 Framework for wheelchair service provision

6.1 General

The purpose of this standard is to improve the way in which wheelchair users receive wheelchairs and to ensure that the wheelchairs given to PWDs are appropriate.

Wheelchair services shall provide the framework to:

a) assess individual wheelchair user needs;

b) prescribe produce and fit an appropriate wheelchair;

c) instruct and educate wheelchair users and caregivers on the correct use and maintenance of a wheelchair;

d) provide on-going follow up, repair and maintenance of a wheelchair; and

e) referral to other services where appropriate.

6.2 Recommended steps for provision of wheelchair services

6.2.1 Referral and appointment

The system of referral will depend on the service. Wheelchair users may self-refer or be referred through networks made up of government or NGOs health and rehabilitation workers or volunteers working at community, district or regional level.

6.2.2 Assessment

Each wheelchair user requires an individual assessment.

6.2.3 Prescription

Using the information gained from the assessment, a wheelchair prescription is developed. The prescription details the wheelchair type, size, special features, and modifications. Also detailed is the instruction the wheelchair user needs to effectively use and maintain the wheelchair.

6.2.4 Ordering

The wheelchair shall be ordered from a recognised supplier.

6.2.5 Product preparation

The wheelchair service provider prepares the wheelchair for the initial fitting. Depending on the prescription, this may include assembly, and possible modification, of products supplied by manufacturers or fabrication of products in the service workshop.

6.2.6 Fitting

The wheelchair user tries the wheelchair. If modifications or postural support components are required, additional fittings may be necessary. Final adjustments are made to ensure that the wheelchair fits the user and is correctly set-up.

6.2.7 User instruction

The wheelchair user and care-givers are instructed on how to safely and effectively use and maintain the wheelchair. Service providers shall provide instruction manuals to the users in the language that is understood by the user or caregiver.

6.2.8 Follow-up, maintenance and repairs

Follow-up appointments are an opportunity to check wheelchair fit and provide further training and support. The timing depends on the needs of the wheelchair user, and what other services are available to them. The service should also offer maintenance and repairs, for technical problems that cannot be easily solved in the

community. Wheelchair services providers are encouraged to partner with organisation that offer CBR service so that users are followed-up and wheelchairs are maintained.

6.3 Requirements for assessment and prescription to the end user

6.3.1 Requirements for assessment

In the provision of wheelchairs for PWDs, each individual shall receive the appropriate assessment by a trained health professional or anyone who is trained in assessment and prescription registered by the Ministry responsible for health. These professionals shall include orthopaedic surgeons, medical officers, orthopaedic officers, occupational therapists, physiotherapists, orthopaedic technologists and wheelchair technologists..

6.3.2 Good practice in assessment

6.3.2.1 Assessments should be carried out in a private, quiet and clean space. This may be a dedicated space within the hospital or workshop, at another healthcare or community facility, or at the wheelchair user's home.

6.3.2.2 Assessments should be carried out by personnel with both appropriate clinical and technical training.

6.3.2.3 Equipment for the assessment should be readily available, including an assessment bed (plinth, mat or table), measuring tape, goniometers, foot blocks and infection control supplies.

6.3.2.4 Assessment should take into consideration the wheelchair user's physical condition; home, school, work and other environments of use; lifestyle; size and age.

6.3.2.5 Assessments should be clearly documented on an approved assessment form and filed for future reference.

6.3.2.6 Where a service provider is unable to meet the wheelchair user's needs due to lack of an appropriate product, or personnel with sufficient skills, the service provider either:

a) refers the wheelchair user to another service provider that is staffed and equipped to serve the wheelchair user;

b) hosts outreach visits of more qualified personnel; or

c) documents the wheelchair user's needs to help build a picture of un-met needs to guide future service development.

6.3.3 Good practice in prescription

6.3.3.1 Wheelchair service personnel should write up assessment and prescription notes, immediately after each appointment.

6.3.3.2 Each wheelchair prescription is documented either on the assessment form or on the prescription form. The prescription details the following:

a) the type and dimensions of wheelchair;

b) any additional components required such as pressure relief seat cushion;

c) any modifications or custom components required; and

d) the information or skills that the wheelchair user needs to know, or be able to perform, before leaving the service with their new wheelchair.

6.3.3.3 The importance of features is prioritised, to help to make the most appropriate choice from what may be a limited range of wheelchairs available.

6.3.3.4 Wheelchair users are given the opportunity to see, and where possible, try sample wheelchairs, cushions and postural support components. This assists wheelchair users and personnel to make the prescription.

6.3.3.5 Service providers should give wheelchair users an estimate of when their wheelchair will be ready. Where possible, an appointment for the wheelchair user's fitting is made at the time of making the prescription.

6.4 Requirements for the provision of wheelchairs

6.4.1 No wheelchair should be given out to users without proper assessment, prescription and fitting by the professionals and persons trained in wheelchair assessment, prescription and fitting.

6.4.2 Standard provision of wheelchairs to user shall incorporate demonstration of any adjustable or removable parts, the brake system and information regarding care and maintenance. The service provider shall ensure that the wheelchair is provided with either a foam cushion of at least 50 mm or pressure relief cushion or postural control cushion.

6.4.3 It is recommended that irrespective of the method of provision:

a) the wheelchair service provider should have the capacity to provide the wheelchairs in a reasonable and responsible manner;

b) the provision is based on assessment of the situation in the country or the district and considers the impact on local wheelchair producers and service providers;

c) procured wheelchairs meet or exceed the national or international standards on wheelchairs and be appropriate for the environment of use;

d) wheelchairs are provided following a provision process that meets or exceeds nationally or internationally agreed minimum requirements for service provision, including requirements for assessment, fitting, user training and follow-up; and

e) providers coordinate their service with the Ministry responsible for health and referral rehabilitation workers at all levels.

6.4.4 The main factors that need to be considered in wheelchair supply include:

a) reliability;

b) durability and performance of the wheelchair;

c) types of available wheelchairs;

d) availability of local repair services;

e) economic empowerment;

f) affordability;

g) weight;

h) responsiveness of the provider to the needs of wheelchair users;

i) coordination of supply with an overall plan for wheelchair provision; and

j) cosmetic value.

7 Quality assessment of wheelchairs

7.1 General

Wheelchairs should be safe and effective for their users. When a wheelchair fails, the user is not only at risk of injury, but he or she may not be able to go anywhere or do anything until the wheelchair is fixed or replaced.

7.2 Tests for static strength, impact and fatigue

7.2.1 Tests should be performed on each wheelchair design. As a minimum, it is therefore recommended that all wheelchairs produced locally or imported shall meet the requirements laid down in this standard when tested in accordance with ISO 7176-8 to ensure quality of wheelchairs.

7.2.2 The tests laid down in this standard should be used together with ISO standards for

- stability,
- brake effectiveness,
- overall dimensions,
- weight,
- turning space, and
- seating dimensions.

7.2.3 Carry out each test twice, in the order shown. Complete tests take about 2 h - 3 h per chair. Before loading the chair, set all adjustable settings to the middle setting. When the chair is loaded to 90 kg, test the correct weight distribution by lifting the front of the chair using a spring balance hooked under the front of the fixed footplate (tie folding plates together for this test). The lifting force to raise the front wheels should be about 20 kg. Redistribute the weight accordingly.

Since deformations are the criteria for passing or failing these tests, the key dimensions in 7.2.4 shall be measured and recorded before testing and then re-measured according to the testing plan. Deformation is to be measured as 'permanent deformation' after the removal of the load.

7.2.4 During measurement recording, use a tape measure or ruler to measure the distance from

a) rear wheel-to-rear wheel at front (toe-in/out measuring tool),

b) rear wheel-to-rear wheel at rear (toe-in/out measuring tool),

c) rear wheel-to-rear wheel at top (measure camber against a door frame),

d) rear wheel-to-rear wheel at bottom (draw guide lines on the floor) E,

e) right hand castor wheel axle to rear most point on right hand bottom rail,

f) right hand castor wheel axle to rear most point on left hand bottom rail,

g) left hand castor wheel axle to rear most point on left hand bottom rail,

h) left hand castor wheel axle to rear most point on right hand bottom rail,

i) right hand foot-rest mounting point (end of front rail) to rear most point on right hand bottom rail,

j) right hand foot-rest mounting point (end of front rail) to rear most point on left hand bottom rail,

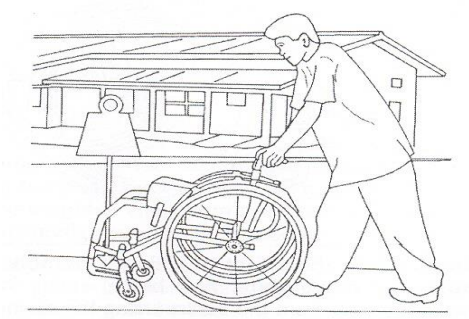
k) left hand foot-rest mounting point (end of front rail) to rear most point on left hand bottom rail,

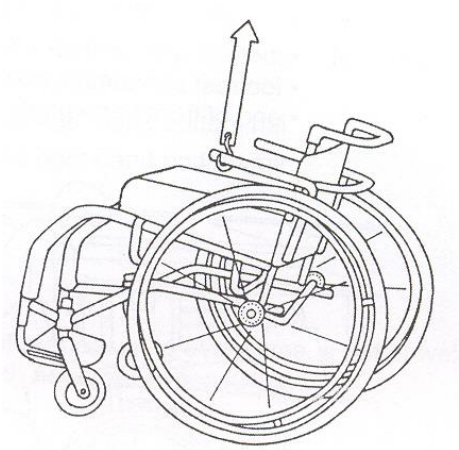
l) left hand foot-rest mounting point (end of front rail) to rear most point on right hand bottom rail,

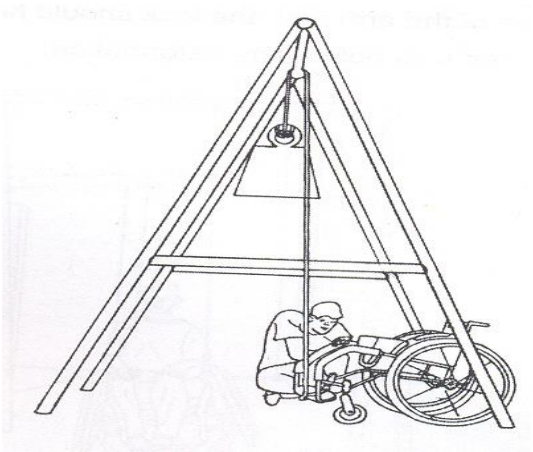
m) side-to-side between side frames at:

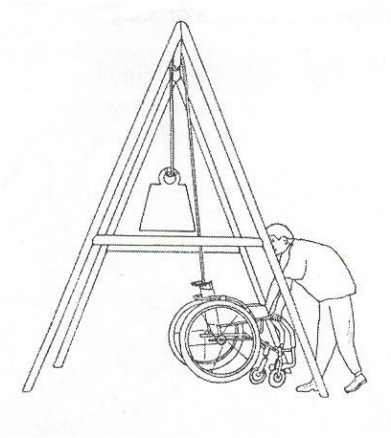
- end of front rails;
- castor barrels;
- rear most point on right hand bottom rail;
- rear most point on right hand bottom rail;
- push handles;
- seat front; and
- seat rear.

To speed up the job of re-measuring every time, a set of welding rods can be cut to the lengths which need to be measured.

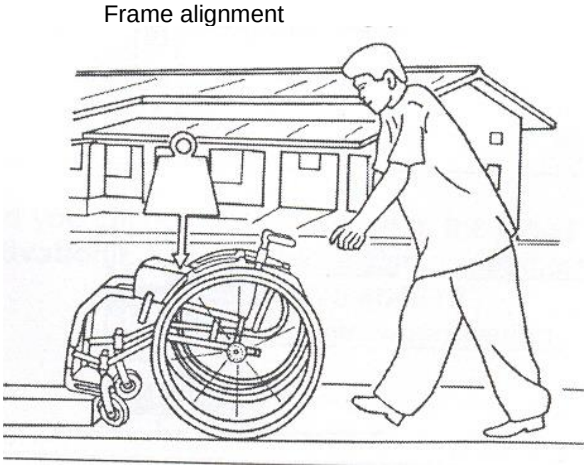
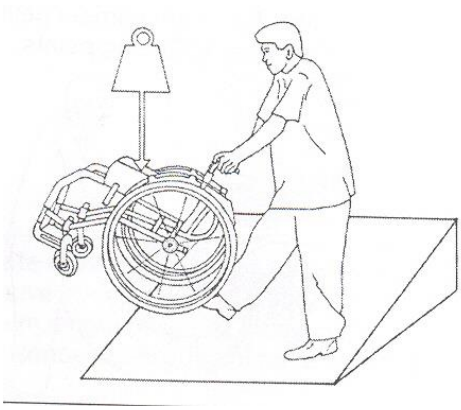
Test 1	**To simulate the effect of a hitch hiker riding on the footplate** With the chair standing on the bench (and clamped down), hang 90kg from the centre point of each foot rest and observe any deformation.	**Result**
Measure	Deformation of: footrest and footrest angle footrest attachment point end of front/bottom rail around mounting 	

Test 2 a) **Measure**	**To simulate the effect of lifting a person in their chair holding the arm rest** Armrest which swing away or are removable should lock in place, hang weighted chair from the centre of the arm rest the lock should hold 90 kg Whether the lock holds, any deformation 	**Result**
Test 2 b) **Measure**	**To simulate removing the armrest for transferring** With the armrest un-locked, use a spring balance to pull on the armrest, the forces required to remove or swing it away should be less than 4.5 kg Force required 	

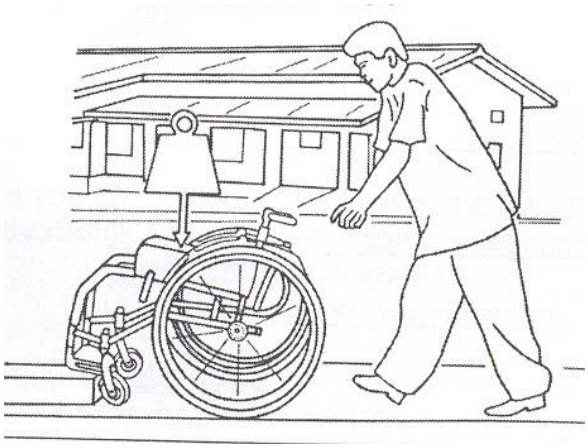
Test 3 **Measure**	**To simulate the effect of lifting a person in their chair holding the footplate** With helper sitting in the chair, lift fixed footplate from the centre using the spring balance with force of 45 kg Deformations of: footrest attachment end of front rail around footrest mounting footrest and footrest angle 	**Result**
Test 4 **Measure**	**To simulate lifting the footplate for transferring** Lift folding footplate from the free end using the spring balance the force required should be less than 4.5 kg Force required 	

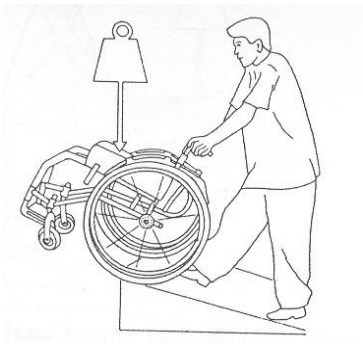
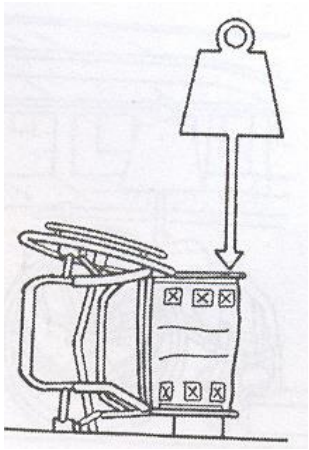
Test 5 **Measure**	**To simulate the effect of lifting a person in their chair holding the push handle** With 90 kg strapped in the chair hang the weighted chair from one push handle, repeat with opposite handle (rope should be tied around the hand grip) Deformation of: Backrest Backrest fabric attachment points Push handle Security of hand grip (will its slip off) Backrest mounting points Push handle mounting points 	**Result**
Test 6 **Measure**	**To simulate the effect of pressure relief** Ask your helpers to sit in the chair, place their hands on middle of the armrest and lift themselves fully out of the seat repeat, lift putting all pressure on one arm rest Deformation of: Backrest Backrest fabric attachment points Armrest Backrest mounting points Armrest mounting points 	

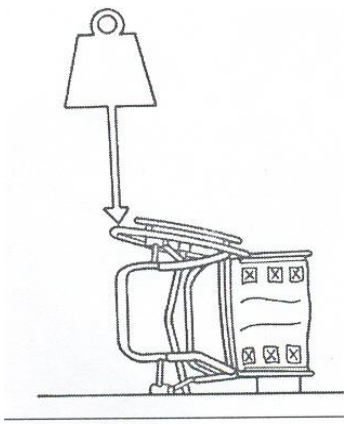
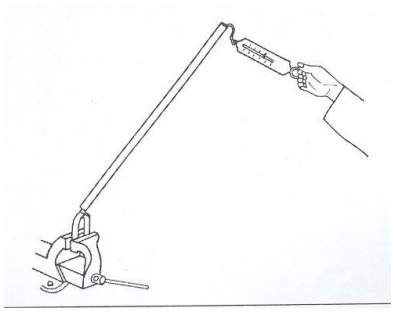
Test 7 **Measure**	**To simulate the effect of twist** With helper holding down one side frame, lift the front of the opposite side frame using the spring balance with force of 35 kg Deformation of: frame alignment 	**Result**
Test 8 **Measure**	**To simulate the effect of someone dropping the chair** Drop the empty chair from a height of 40cm on to each rear wheel when opened and folded Deformation of: Frame alignment Castor assembly Rear wheels 	

Test 9 **Measure**	**To simulate the effect of single footrest impact** With 90 kg strapped in the chair push one footrest or front of chair into a solid wall at 1.5 m/sec (a fast walking pace is 15 m in 10 s) release chair moments before it hits the curb Deformation of: Footrest and footrest angle Footrest attachment point End of front rail around footrest mounting Frame alignment 	**Result**
Test 10 **Measure**	**To simulate the effect of a person wheeling off an uneven curb** With 75 kg strapped in the chair, wheelie slowly off the sloped edge of a 10 ramp so that the lose wheel drops 18 cm (tight spokes with three cross overs will help strength) Deformation of: frame alignment Rear wheels Rear wheel alignment camber, toe-in toe out Rear axles Rear axles sleeve and mounting point Backrest Backrest fabric attachment points Seat fabric attachment points Backrest mounts points 	

Test 11	To simulate the effect of single castor impact	Result
	With 90 kg strapped in the chair, push one castor wheel into an un-mountable solid curb at 1.5 m/sec (a fast walking pace is 13 m in 10 s) release chair moments before it hits the curb	
Measure	Deformation of: Frame alignment Castor wheels Castor axles Castor barrel Castor fork Backrest fabric Backrest mounting points	



Test 12 **Measure**	**To simulate the effect of a person wheeling off a high curb** With 90 kg strapped in the chair, wheel slowly off a 30 cm curb so that the rear wheels touch the ground first (tight spokes with three cross overs will help strength) Deformation of: frame alignment Rear wheels Rear wheel alignment camber, teo-in toe out Rear axles Rear axles sleeve and mounting point Backrest Backrest fabric attachment points Seat fabric attachment points Backrest mounts points 	**Result**
Test 13 **Measure**	**To simulate the effect of a person leaning into the backrest** Take the rear wheels off the chair and place the frame on its side and clamp it over the edge of a bench carefully suspend 90kg onto the backrest tube, 30cm from the rear axle point Deformation of: frame alignment Backrest Backrest fabric attachment points Seat fabric attachment points Backrest mounts points 	

Test 14 **Measure**	**To simulate the effect of side force on a wheel and axle** Keeping the frame on its side, replace one of the rear wheels so that the wheel is horizontal carefully suspend 90 kg from the wheel rim Deformation of: Rear wheel Rear axles Rear axle sleeve and mounting point 	
Test 15 **Measure**	**To simulate the effect of side force on a castor fork bolt** Remove the castors fork, place it in strong vice and slip 12 cm length of strong tube over the fork bolt using a spring balance apply 20 kg of force at 90 to the free end of the tube Deformation of: Fork bolt Fork 	

Item	General common considerations
Design Features	Due to the diversity among wheelchair users, there is a need for different types of wheelchairs. No one wheelchair can meet the needs of all wheelchair users. Those selecting wheelchairs need an understanding of the needs and context of the intended wheelchair users as well as the rationale behind different wheelchair designs.
Caster Wheel(S)	The caster wheel structure, including tyre should be manufactured from a shock-absorbent material that can withstand operational loads without failure at an ambient temperature of 35 °C minimum. Castor barrel is made from mild-steel pipe of 15 mm or a material of such quality that ensures it can withstand the same operational loads without failure. Castor fork should spin freely at 90C to the ground. It is recommended that the caster barrel is of the same dimension as the rear hub tube. Castor wheel should spin freely perpendicular to the ground and should not wobble from side to side. All nuts and bolts attaching castor wheel to main beam should have plain washers between bolt head and caster wheel and between nut and castor wheel and should be tight and correctly mounted. The ratio of the circumference of castor wheel to the rear wheel circumference should not reduce the stability of the chair nor impede its propulsion. (is there a standard ratio)
Seat	Surface of seat should remain smooth with no protruding fastenings. Minimal seat dimensions are width 300mm, length 300mm.(for adults only). If fixed or removable armrests are not fitted, protection from sheering force of rear wheels will be provided. The seat material will be securely fastened to the frame to ensure no movement during load bearing. NB. Optimum fitting of seat for end user should ensure 20mm space either side of thighs and arm rests (if fitted), and 25mm from front edge of seat and back of knee. Exact dimensions of seat will be determined by the individual assessed need of user, and the relation between height, width, and length will vary depending on body size and shape.
Backrest	Backrest is fabricated in water-resistant material, securely fastened to frame with suitable fastening providing nil protrusion from back rest material at either side edge. Minimal backrest width is in line with seat dimensions. Optimum fitting of backrest for end user should consider free movement of shoulder blades if chair is to be self-propelled. Back rest should support the truck with hips at 90 degrees. The height should depend on the person's needs.
Frame	The frame is made from mild steel pipe of minimum 22mm or a material of a quality to ensure it can withstand the same operational loads without failure. It is recommended that the diameter of the frame is the same as the dimension of the caster barrel and hub tubes. The frame should have a minimal ground clearance of 50mm. Nuts, paintwork and welds will have no cracks or holes, and there will be no sharp edges to the finish.
Propelling Wheels (Rear Wheels)	Rear wheels are attached to the main frame by the hub, parallel to the frame (no 'toe-in toe-out'). An equal camber both sides of the rear wheel may be recommended to improve performance. Wheels are manufactured from locally available rims, inner tubes, and tyres. In materials resistance to an ambient temperature of 35 C minimum. Rear wheel diameter shall be minimum 600mm inflated. Rear wheel must spin freely in alignment to the castor wheel and axle bolts are tight but not over tight. All nuts, axle bolts and washers attaching the rear wheel onto the main frame must be tight and correctly fitted. The rim should run 'true' with the rim centred to the axle and hub. All spokes must be tight. A clearance of minimal 20mm is required between push-rim and wheel. The finish needs to be smooth and spot free. Push-rims need to be mild- steel pipes of minimum diameter 16 mm.
Footplates	The foot rest shall be positioned to provide support to two thirds of the foot with the knee angle not less than 70° and should not wobble. The surface of the footrest shall be covered in a slip-resistant material with no sharp edges. The minimal ground clearance shall be 50mm.
Cushion(S)	Minimal provision is with a 50mm foam cushion, if additional pressure relief is required assessment by an Orthopedic Surgeon, Orthopedic officers, Occupational Therapist, Physiotherapist, or Wheelchair Technologist is recommended. All cushions will be covered with water-resistant material with no wrinkles or joins in the top of the cover.
Brake(S)	Brake adjustment must be accessible. Brake design is to be of a type to enable ease of operation by the user. No movement of the wheels will be evident when the brakes are applied. On application the brake must not unlock with a backward movement of the wheelchair.

	Four wheelers – Foldable	Four wheelers - Rigid
Design Features	Foldable Imported - easy to transport in vehicles and is often regarded as aesthetically pleasing, with easier side-transfers if provided with removable arm rests. This design provides a reduced stability over rough terrain however spare parts are not available locally. Foldable Locally Made – as above, however spare parts are available locally.	The rigid wheelchair is stable on even ground but may not be stable on rough terrain.
Caster Wheel(S)	Wheelbase will be determined by the stability of the chair when tilted to an angle so that the chair remains upright .and usable. The height of the main beam should not impede transfers	Wheelbase will be determined by the stability of the chair when tilted to an angle so that the chair remains upright .and usable. The height of the main beam should not impede transfers.
Seat	The seat material should be water-resistant and fitted across the frame should not sag more than 50 mm when subjected to a uniformly distributed maximum load of 100 kg.	The seat material should be water-resistant and fitted across the frame should not sag more than 50 mm when subjected to a uniformly distributed maximum load of 100 kg.
Backrest	The backrest material should withstand repeated loading overtime of a uniformly distributed load, to a sag of no more than 50 mm.	The backrest material should withstand repeated loading overtime of a uniformly distributed load, to a sag of no more than 50 mm.
Frame	For folding chairs, all components should be fitted so that they enable free and easy folding.	Rigid
Propelling Wheels (Rear Wheels)	Rear wheels are attached to the main frame parallel to the frame Rear wheel must spin freely in alignment to the castor wheel. A clearance of minimal 20mm is required between push-rim and wheel. Push-rims need to be mild- steel pipes of minimum diameter 16 mm	Rear wheels are attached to the main frame parallel to the frame Rear wheel must spin freely in alignment to the castor wheel. A clearance of minimal 20mm is required between push-rim and wheel. Push-rims need to be mild- steel pipes of minimum diameter 16 mm
Footplates	Mild steel paint them 1-1.5 mm thickness. Can be paddedif needed with water resistant materil. Has to be flexible and adjustable.	Mild steel paint them 1-1.5 mm thickness. Can be padded if needed with water resistant material. Has to be flexible and adjustable or fixed
Cushion(S)	Should cover the seat base, removable and easy to clean. About 5 inch thickness Chip material 2 inch and soft foam 3 inch	Should cover the seat base and easy to clean. About 5 inch thickness Chip material 2 inch and soft foam 3inch
Brake(S)	Adjustments must be easily applied.	Adjustments must be easily applied.

3 Wheelers –	
Design Features	Rigid (rural) wheelchair is often provided to users living in rural settings where the terrain is very rough. This design provides a stable chair and is easy to perform rear-wheel balance, but is difficult to transport.
Caster Wheel(S)	Wheelbase will be determined by the stability of the chair when tilted to an angle so that the chair remains upright .and usable. The height of the main beam should not impede transfers.
Seat	

Backrest	The backrest material should withstand repeated loading overtime of a uniformly distributed load, to a sag of no more than 50 mm.
Frame	Rigid
Propelling Wheels (Rear Wheels)	Rear wheels are attached to the main frame by the hub, parallel to the frame (no 'toe-in toe-out'). An equal camber both sides of the rear wheel may be recommended to improve performance. Wheels are manufactured from locally available rims, inner tubes, and tyres. In materials resistance to an ambient temperature of 35°C minimum. Rear wheel diameter shall be minimum 600mm inflated. Rear wheel must spin freely in alignment to the castor wheel and axle bolts are tight but not over tight.
Footplates	Mild steel paint them 1-1.5 mm thickness. Can be padded if needed with water resistant material. Has to be flexible and adjustable or fixed
Cushion(S)	Should cover the seat base and easy to clean. About 5 inch thickness Chip material 2 inch and soft foam 3inch The cover material should be tailored to the needs of the user.
Brake(S)	Adjustments must be easily applied.

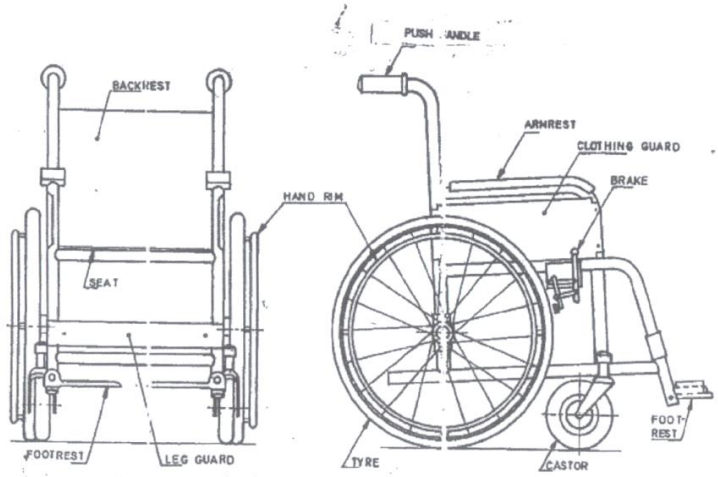
3 Wheelers- Huckstep	
Design Features	Huckstep type - offers a durable design and provides easier propulsion over distances. This design is well known in Uganda and can be repaired locally. It is unable to be tipped backwards, has a wide external dimension but is difficult to side-transfer.
Caster Wheel(S)	The casters should spin freely in the fork and should not wobble must be strong and durable.
Seat	Rigid
Backrest	Rigid should support the trunk
Frame	Rigid
Propelling Wheels (Rear Wheels)	The rear wheels should be positioned so that when the wheelchair user holds the top of the push rim the elbow is bent at 90 degrees but Huckstep should aim at 90 degrees. It has a best push with larger strides
Footplates	Mild steel paint them 1-1.5 mm thickness. Can be padded if needed with water resistant material. Has to be flexible and adjustable or fixed
Cushion(S)	Should cover the seat base and easy to clean. About 5 inch thickness Chip material 2 inch and soft foam 3 inch The cover material should be tailored to the needs of the user.
Brake(S)	One brake operates both wheels concurrently

3 Wheelers - Hand powered	
Design Features	May have a design feature that allows carrying of items and is reported to cause less fatigue over distances. Spare parts are available locally. It is not viable for use in restricted spaces, i.e. around the home, office, school, very difficult to transport, etc.
Caster Wheel(S)	2 wheels in front and a chain drive
Seat	Rigid
Backrest	Rigid
Frame	A main beam is made from mild-steel pipe of 38mm (minimum) or a material of a quality to ensure it can withstand the same operational loads without failure.

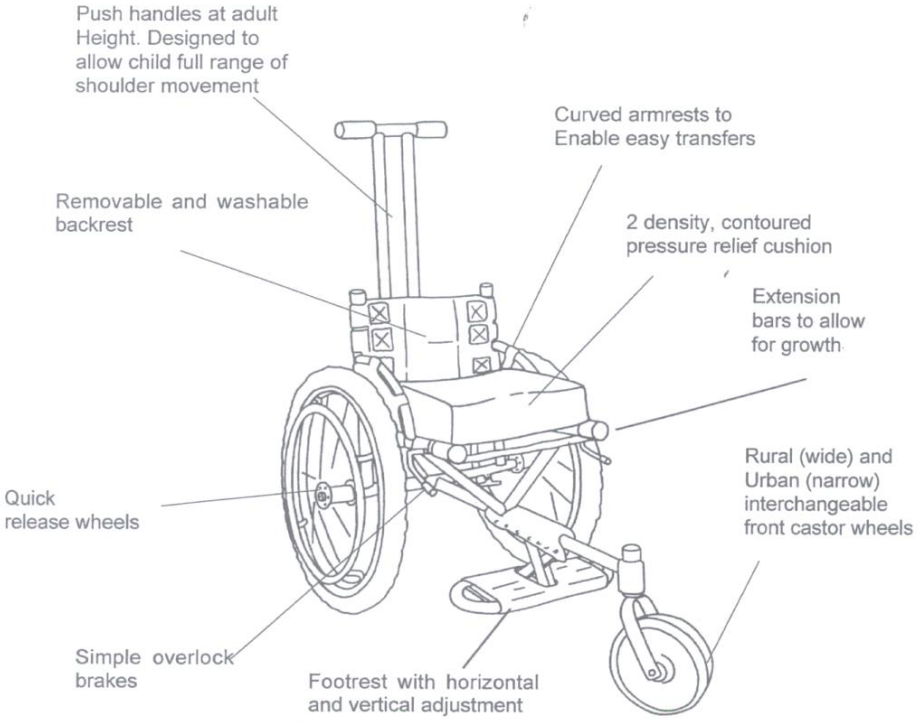
Propelling Wheels (Rear Wheels)	Rear wheels are attached to the main frame by the hub, parallel to the frame (no 'toe-in toe-out'). An equal camber both sides of the rear wheel may be recommended to improve performance. Wheels are manufactured from locally available rims, inner tubes, and tyres. In materials resistance to an ambient temperature of 35 C minimum. Rear wheel diameter shall be minimum 600mm inflated. Rear wheel must spin freely in alignment to the castor wheel and axle bolts are tight but not over tight. All nuts, axle bolts and washers attaching the rear wheel onto the main frame must be tight and correctly fitted. The rim should run 'true' with the rim centred to the axle and hub. All spokes must be tight.
Footplates	The surface of the footrest shall be covered in a slip-resistant material with no sharp edges. The minimal ground clearance shall be 50mm
Cushion(S)	Minimal provision is with a 50mm foam cushion, if additional pressure relief is required assessment by an Orthopaedic Surgeon, Orthopaedic officers, Occupational Therapist, Physiotherapist, or Wheelchair Technologist is recommended. All cushions will be covered with water-resistant material with no wrinkles or joins in the top of the cover.
Brake(S)	Brake adjustment must be accessible. Brake design is to be of a type to enable ease of operation by the user. No movement of the wheels will be evident when the brakes are applied. On application the brake must not unlock with a backward movement of the wheel. The brake must not impede transferring

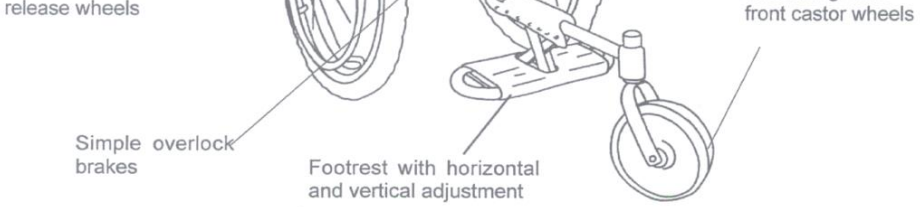
Annex A
(normative)

Wheel chair designs



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





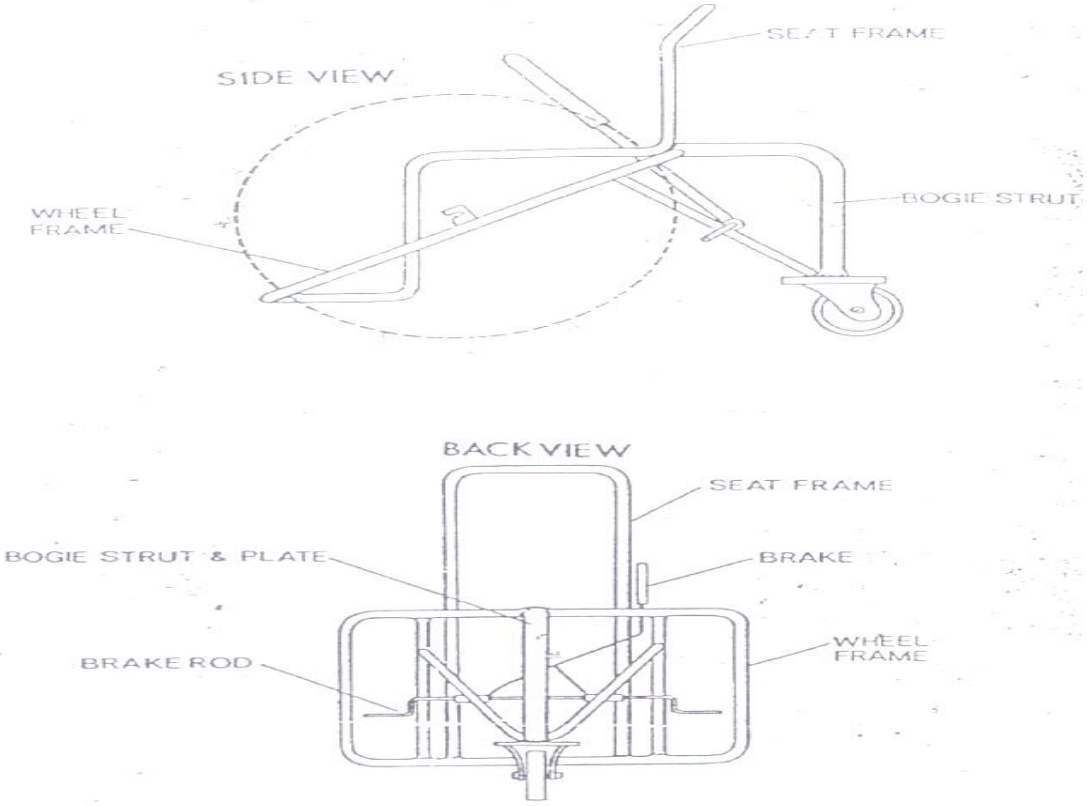
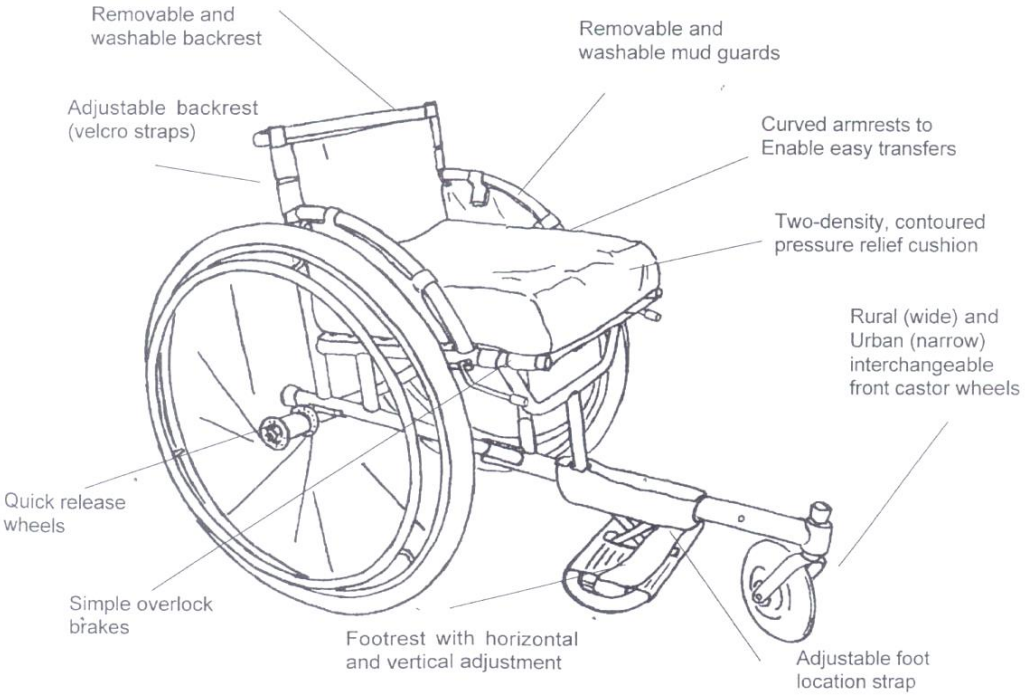


Fig. 31(s-a)



Annex B
(informative)

These guidelines have been developed to assist wheelchair builders to test wheelchairs with fixed or folding frames, in their own workshops. Testing wheelchairs will help establish minimum acceptable criteria for wheelchair builders and suppliers throughout the world.

Some wheelchair builders have been using these tests for several years and have found that if their chairs pass these tests, then they will experience a number of benefits. For the wheelchair builder, the benefits include:

- Knowing that the wheelchairs which they build are reaching an acceptable and recognized standard
- Less wheelchairs are returned to the workshop because of faults
- Better quality will result in more clients and higher sales
- Putting pressure on wheelchair importers and other manufacturers to reach the same standards
- Reducing the justification for NGOs to import second-hand wheelchairs
- Increasing the justification for asking NGOs, Government Offices and individuals to pay the actual cost of locally produced wheelchairs.
- The benefit for the user is a greater opportunity to achieve mobility, independence and higher quality of life.

Each test should be repeated once, failure is likely to have occurred if the dimensions changed in one direction after the first test, and then continued to change in the same direction after the second test. Any failure could be catastrophic so try to correct even the smallest failure and re-test that area. It is recognised that these tests for impact and strength do not directly test fatigue failure of structural materials or joints. For fatigue tests, we recommend that the chair is loaded with 150 kg and towed at speed over rough terrain. This is very un-scientific but very worthwhile (make sure that no more than 20 % of the total load is on the front wheels). Naturally, passing these tests will not necessarily mean that the wheelchairs being built are of good design, therefore these tests should be used in conjunction with other information contained in ISO wheelchair standards for: static stability, brake effectiveness, overall dimensions, weight, turning space, seating dimensions.

Bibliography

WHO *Guidelines on the provision of manual wheelchairs in less resourced settings*, 2008

Certification marking

Products that conform to Uganda standards may be marked with Uganda National Bureau of Standards (UNBS) Certification Mark shown in the figure below.

The use of the UNBS Certification Mark is governed by the Standards Act, and the Regulations made thereunder. This mark can be used only by those licensed under the certification mark scheme operated by the Uganda National Bureau of Standards and in conjunction with the relevant Uganda Standard. The presence of this mark on a product or in relation to a product is an assurance that the goods comply with the requirements of that standard under a system of supervision, control and testing in accordance with the certification mark scheme of the Uganda National Bureau of Standards. UNBS marked products are continually checked by UNBS for conformity to that standard.

Further particulars of the terms and conditions of licensing may be obtained from the Director, Uganda National Bureau of Standards.

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