APPENDIX A

SPECIFICATION

for

ADJUSTABLE WARD BEDS

0. APPLICABLE STANDARDS

0.1 The latest issues of the following standards form part of this specification:

SABS 621	Castors for hospital equipment
SABS 657	Steel tubes for non-pressure purposes Part I: Steel tubes for scaffolding and for structural and general engineering purposes
SABS 728	Electroplated coatings of nickel and chromium
SABS Methods	146, 147, 155

1. SCOPE

1.1 This specification covers the requirements for adjustable ward beds intended for use in hospitals.

NOTE: The following requirements must be specified in tender invitations and in each order or contract:

a) When so required, that the bed be capable of extension (see 3.5)
b) When so required, that the bed be supplied with a bedding support (see 3.14)
c) When acceptable, that the bed may be supplied with independent castor locks (see 3.16.1)
d) When so required, that safety sides be fitted (see 3.17.1)
e) The type of safety side, if a particular type is required by the purchaser (see 3.17.1)
f) When a drop-down safety side is specified, whether the side is required to be of fixed or adjustable length (see 3.17.2)
g) When so required, that vertical running buffer wheels be fitted (see 3.18.1)
h) When safety sides are not required, whether side buffer strips are to be fitted (see 3.18.2)
i) The type of surface coating, if a particular type is required (see 4.1)
j) The colour of the surface coating (see 4.1)

2. DEFINITIONS

2.1 For the purposes of this specification the following definitions shall apply:

Acceptable. Acceptable to the purchaser.
Power-assisted. Assisted by means of springs, counterbalancing mechanical advantage, an electric or other motor or by any other acceptable means.

3. GENERAL REQUIREMENTS

3.1 MATERIALS

3.1.1 Mild Steel Sheets and Sections. Mild steel sheets and sections shall be of a good quality mild steel and free from cracks, fins, laminations and other defects.

3.1.2 Mild Steel Tubes. Mild steel tubes shall comply with the relevant requirements for Grade 230 or Grade 250 tubes of SABS 657: Part I.

3.1.3 Epoxy-powder Coatings. Epoxy-powder coatings shall be based on a compounded epoxy resin that is suitable for application by means of an aerostatic spray process.

3.1.4 Nylon-powder Coatings. Nylon-powder coatings shall be based on a nylon formulation suitable for application by means of an aerostatic spray process.

3.2 JOINTS. The parts of each permanent joint shall be close-fitting and in correct alignment, and, in the case of a welded joint, the whole joint shall be welded.

3.3 WELDS. Welds shall be fusion welds or braze welds. Weld faces shall be smooth, clean and free from porosity, cavities and trapped slag and shall merge smoothly into the surface of the parent metal without overlap or undue undercut. The weld metal, heat-affected zone and adjacent parent metal shall be free from cracks. Where welding is done from one side only, there shall be full penetration of the joint.

3.4 GENERAL DESIGN

a) The bed shall be of general design similar to that shown in Fig. 1.
b) The construction of a bed shall be such that any mechanical movement shall be acceptably hazard-free for attendants and patients alike, particularly with regard to the trapping of limbs or the cutting of fingers by sharp projections.
c) Any adjustment of the bed under normal conditions of use shall not cause sudden or uncontrolled movement.
d) All moving parts shall be of such design that they do not require to be oiled or greased during the lifetime of the bed.
e) The outer frame tubes and the tubes attached to the castors shall have a nominal wall thickness of at least 2,0 mm .
f) All hand-operated clamping and locking screws shall be captive.
g) The construction and design of the bed shall be such as to facilitate cleaning.
h) All tube ends shall be permanently closed except where access for bed adjustment is required, in which case the tube ends shall be fitted with removable covers.

3.5 LENGTH. The length of the clear space above the mattress support between the head-end and the foot-end structures shall be 2 020 mm ± 20 mm . When specified by the purchaser, it shall be possible to extend this length to 2 190 mm ± 20 mm without the use of tools and in such a manner that it is not possible to shorten the bed again accidentally.

3.6 WIDTH AND HEIGHT

a) The width of the mattress support frame shall be 915 mm ± 15 mm and the overall width of the bed (including the buffer wheels) shall not exceed 1 030 mm .
b) The height of the mattress support when not horizontal shall be 685 ± 6 mm (measured from the floor to the top of the mattress support).

3.7 UNDERBED CLEARANCE. Except for the castors and their attaching bed frame legs and leg braces, every part of the underframe of the bed shall be at least 110 mm clear of the floor under any bed configuration.

3.8 MASS. The mass of the bed including the head-end and foot-end structures but excluding safety sides and other attachments shall not exceed 100 kg .

3.9 TILTING FACILITY. The bed shall be provided with a power-assisted tilting mechanism to allow the mattress support to be angled at positions other than the horizontal. The mechanism shall be such that

a) the mattress support can be tilted to any position within the range:

1) At least 12° from the horizontal when the foot-end is uppermost, to
2) at least 8° from the horizontal when the head-end is uppermost;

b) it automatically locks in the horizontal position (within ± 1°) when resetting to horizontal;
c) with a mass of 80 kg so positioned on the mattress support that its centre of gravity is 890 mm from the head-end and on the centre line of the bed's width, the force required to tilt the mattress support from the horizontal position to 12° away from the horizontal plane with the foot-end uppermost does not exceed 150 N;
d) with a mass of 80 kg positioned as in (c) above an attendant, working at normal speed, can re-adjust the angle of the mattress support (to and from any position within its setting range) within 7 s .

3.10 RISING BACK REST SUPPORT. The bed shall be provided with a rising back rest support. The mattress support shall be hinged across its width to allow the head-end to be raised to support the head and trunk of a patient in a semi-reclined and a sitting position.

The support shall

a) be of length 725 mm ± 20 mm[1];
b) be capable of being locked at any angle between the horizontal position and an inclination of 65° from the horizontal position;
c) be adjustable by an attendant or by the occupant of the bed from either side of the bed;
d) be so designed that an attendant, working at normal speed, can re-adjust the support (to and from any position within its setting range) within 5 s .

With the back rest supporting the head and trunk of a patient, it shall be possible, through a power-assisted mechanism permanently linked to the back rest, for an attendant to easily (without undue effort) re-adjust the position of the back rest.

3.11 HEAD END. The bed shall be supplied with a head-end structure which

a) protects the patient's head and retains pillows on the mattress;
b) is easily removable[2] without the use of tools; and
c) is suitable for use by an attendant when propelling and manoeuvring the bed.

3.12 FOOT END. The bed shall be supplied with a foot-end structure which

a) protects the patient's feet when the bed is unextended and extended;
b) is easily removable[2]; and
c) is suitable for use by an attendant to propel and manoeuvre the bed.

3.13 MATTRESS SUPPORT. The mattress support shall consist of a robust frame to which is welded a steel wire mesh (weldmesh) to cover the top surface area, forming a platform for the mattress. The weldmesh shall be constructed from steel wire of diameter 4-5 mm and the major dimensions of the aperture of the mesh shall be in the range 50-85 mm .

3.14 BEDDING SUPPORT. When required by the purchaser, the foot end of the bed shall be provided with a pull-out frame to provide a place for temporarily storing (clear of the mattress surface and clear of the floor) pillows and folded bedclothes. The length of the storage surface shall be at least 450 mm . The frame shall run in suitable plastics bushes or plastics guides and, when fully extended, the free end play shall not exceed 10 mm .

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1) It is preferable for the backrest support to be towards the maximum of the permitted length, i.e. 745 mm .
2) It is preferable that the removal of the head-end and foot-end structures does not leave projecting stubs above the top surface of the mattress support.

3.15 DRIP ROD. A fitting for the installation of a drip rod shall be provided, close to each of the four corners of the main frame of the bed, and shall allow the height of the drip rod to be adjusted. Drip rods shall not project beyond the side rails (when fitted) or the buffer wheels of the bed.

NOTE: Preferably it shall be possible to position the drip rod at any position along the sides of the mattress support.

3.16 CASTORS

3.16.1 General

a) The bed shall be mounted on four swivel castors that comply with the relevant requirements of SABS 621.
b) The size of the castors shall be at least 125 mm .
c) The castor wheel axis centre-line distance between the head-end and foot-end castors on each bed side (when the castors are set for straight line travel) shall not be less than 1 200 mm and not greater than 1 400 mm . The head-end and foot-end castors shall be equidistant from the head-end and foot-end of the bed, respectively.
d) The bed shall be supplied with a central castor locking system unless an independent castor locking system is an acceptable alternative to the purchaser.

3.16.2 Central Castor Locking System

3.16.2.1 Operating controls. The central castor locking system shall be of such design that it can be fully operated from either side of the bed. The system shall provide for an operating choice between three modes, as follows:

a) Free - when all four castors are totally free to move;
b) locked - when at least three castors are totally locked (i.e. locked swivel and wheel);
c) steering - when three castors are totally free to move and the fourth has an activated swivel directional lock.

3.16.2.2 Castors. The castor positioned at the head end of the bed on the right-hand side (when viewed from the foot end) shall, in addition to having a combined wheel and swivel lock, have a swivel directional lock such that when this lock is activated, the castor swivel, when caused to rotate, shall automatically lock in a position enabling the bed to be steered in a "straight ahead" line of travel. At least two of the remaining three castors shall be fitted with combined wheel and swivel locks.

3.16.3 Independent Castor Locking System. An independent castor locking system shall consist of

a) one castor positioned at the head end of the bed on the right-hand side (when viewed from the foot end) and that is fitted with a swivel directional lock such that when this lock is activated (semi-automatically or manually), the castor automatically locks into a position that enables the bed to be steered in a straight-ahead line of travel; and

b) at least two other castors (of the remaining three) fitted with individually activated combined wheel and swivel locks.

NOTE: When only two castors (see (b) above) are fitted with combined wheel and swivel locks, the castors shall be positioned diagonally opposite each other.

3.17 SAFETY SIDES

3.17.1 General. When specified by the purchaser, the bed shall be fitted with safety sides.

Safety sides shall be of the drop-down or collapsing type, as required (see 1.1(e)). The design of safety sides shall be such that

a) they will prevent a patient from falling off the bed;
b) they can be easily attached and detached;
c) when in the raised position the top of the safety sides shall be 405 mm ± 25 mm above the mattress support;
d) when they are not adjustable for length (see 3.17.2) they shall be of fixed length 1 425 mm ± 75 mm, and with the unguarded length at the foot-end of the bed, when not adjustable for position;
e) they automatically lock in position, when fully raised;
f) they can be raised or lowered without being removed from the bed;
g) when lowered they shall not obstruct the back-rest control lever or the bedmaking process;
h) the raising and lowering action is smooth and does not jerk the bed;
i) they are of robust construction;
j) they cannot be lowered by the bed occupant.

3.17.2 Drop-down Safety Sides. Drop-down safety sides shall be of fixed or of adjustable length (adjustable to full length), as specified by the purchaser. The safety side guiding support rods (or tubes) shall be of adequate design to prevent damage through inadvertent misuse by the patient.

3.18 BUFFER WHEELS AND STRIPS

3.18.1 Buffer Wheels. The bed shall be fitted with a buffer wheel mounted on each of its four corners and, when specified by the purchaser, two additional buffer wheels, set to run vertically, shall be fitted to the head end of the bed. Buffer wheels shall be of a smooth, uniform and solid design with rims of non-marking hard rubber or resilient plastics material.

3.18.2 Side Buffer Strips. When safety sides are not required and when specified by the purchaser, resilient buffer strips shall be fitted along the longitudinal side members of the mattress support frame. It shall not be possible to remove the side buffer strips from their means of attachment by applying a force of 100 N to the strips in any direction or in any position.

3.19 STRUCTURAL STRENGTH. When a bed is tested in accordance with 6.3,

a) no measurement taken under load shall differ by more than 40 mm from the original no-load measurement;
b) no measurement taken after removal of the load shall differ by more than 6 mm from the original no-load measurement; and
c) there shall be no permanent damage suffered by the bed or any impairment of its function.

3.20 RESILIENCE AND RESISTANCE TO UNEVEN LOADING. When a bed is tested in accordance with 6.4,

a) no measurement taken under load shall differ by more than 40 mm from the original no-load measurement;
b) no measurement taken after removal of the load shall differ by more than 6 mm from the original no-load measurement; and
c) there shall be no permanent damage suffered by the bed or any impairment of its function.

4. REQUIREMENTS FOR FINISH

4.1 GENERAL. All surfaces shall be clean, smooth and free from pits, deep scratches, scale, laps, buckles, crimps and other defects. Unplated mild steel surfaces shall have either an epoxy-powder or a nylon-powder coated finish, as required. The colour of the coated finish shall be as specified by the purchaser.

4.2 EPOXY-POWDER AND NYLON-POWDER COATINGS

4.2.1 Colour and Appearance. A powder coating shall be glossy, shall be uniform in colour and shall cover the metal surfaces completely and uniformly. The coating shall be free from grittiness and cratering and shall show not more than a slight orange peel texture.

4.2.2 Thickness of Epoxy-powder Coatings. The thickness of an epoxy-powder coating film, when determined in accordance with 6.5, shall be at least 60 µm .

4.2.3 Scratch Resistance. When a powder coating is tested in accordance with 6.6, the scratch produced shall be free from ragged edges and shall not have penetrated to the underlying metal.

4.2.4 Impact Resistance. When tested in accordance with 6.7, a powder coating shall withstand a direct impact without cracking, flaking or showing loss of adhesion.

4.2.5 Resistance to Salt Spray. When tested in accordance with 6.8, the coated surface of the test panel shall show no sign of corrosion.

4.3 NICKEL-CHROMIUM PLATING. Nickel-chromium plated surfaces shall be bright, smooth and free from cloudy patches. The plating shall be uniform in thickness and shall comply with the relevant requirements for service condition 3 (severe service) of SABS 728.

5. MARKING. The bed shall be legibly and indelibly marked with the following:

a) The manufacturer's name or trade mark or registered trade mark;
b) the serial number of the bed and its year of manufacture;
c) the function of each control, indicated by means of a pictogram in close proximity to the control.

6. INSPECTION AND METHODS OF TEST

6.1 INSPECTION. Visually examine and measure the bed for compliance with all the relevant requirements of the specification for which tests to assess compliance are not given in 6.3-6.8 (inclusive).

6.2 TEST PANELS. For the tests given in 6.6-6.8, use test panels of cold-rolled steel of thickness 0,6-0,9 mm and of size at least 150 mm x 100 mm, each having a coating of epoxy powder or nylon powder, as relevant, applied under conditions identical to those used for the coating of the unplated mild steel surfaces of the bed under test.

6.3 STRUCTURAL STRENGTH TEST

6.3.1 Procedure

a) Set the mattress support in the horizontal position.
b) Measure the height of the support above floor level at 6 points, i.e. the corners and the mid-point of each side.
c) Using any suitable apparatus, apply an evenly distributed load of 370 kg to the mattress support and, after 15 min, repeat the measurements at the 6 points given in (b) above. Check for compliance with 3.19(a).
d) Remove the load and after 5 min repeat the measurements at the 6 points given in (b) above. Check for compliance with 3.19(b).
e) Inspect the bed and check for compliance with 3.19(c).

6.4 RESILIENCE AND RESISTANCE TO UNEVEN LOADING TEST

6.4.1 Apparatus. A test load of 115 kg distributed over an area approximately 300 mm x 300 mm .

6.4.2 Test Load Position. The test shall be carried out with the test load at each of the following 6 positions in turn:

a) At each corner of the bed, such that the centre of the load is 300 mm from the end of the mattress support and 150 mm from the side of the support; and
b) at a position mid-way along each side of the support and 150 mm away from the side of the support.

6.4.3 Procedure

a) Set the mattress support in the horizontal position.
b) Measure the height of the support above floor level at 6 points, i.e. the four corners and the mid point of each side.
c) Apply the test load to one of the test load positions given in 6.4.2 and after 5 min repeat the height measurements at the points given in (b) above. Check for compliance with 3.20(a).
d) Remove the load and after 5 min repeat the measurement at the 6 points given in (b) above. Check for compliance with 3.20(b).
e) Repeat (c) and (d) above for each of the remaining test positions in turn.
f) Inspect the bed and check for compliance with 3.20(c).

6.5 DETERMINATION OF THICKNESS OF EPOXY-POWDER COATING FILM

6.5.1 Apparatus. A suitable magnetic flux type apparatus[3].

6.5.2 Procedure. Calibrate the instrument using a non-magnetic shim (of approximately the same thickness and profile as that of the film on the coated part under test) placed in full contact with a piece of clean steel of the same thickness as, and of an identical shape to, that of the part under test.

Place the operating head of the instrument on the film to be tested and read off the thickness. Repeat the measurement at three different places on the film surface and record the average of the readings. Check for compliance with 4.2.2.

6.6 SCRATCH RESISTANCE. Use SABS Method 147, but use a test panel as described in 6.2. Apply a mass-load of 2 000 g .

6.7 IMPACT RESISTANCE OF COATED FILMS. Use SABS Method 146, but use a test panel as described in 6.2.

Place the test panel on the baseplate with the coated side upwards and drop the masspiece from a height of 634 ± 2 mm (equivalent to an impact energy of 5,6 J).

When examining the dented part of the panel, ignore cracks that do not extend through the thickness of the coating.

6.8 RESISTANCE TO SALT SPRAY. Use SABS Method 155, but use a test panel as described in 6.2. Expose the test panel for 200 h .

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3)Details of a type of apparatus suitable for this test are obtainable from the South African Bureau of Standards.

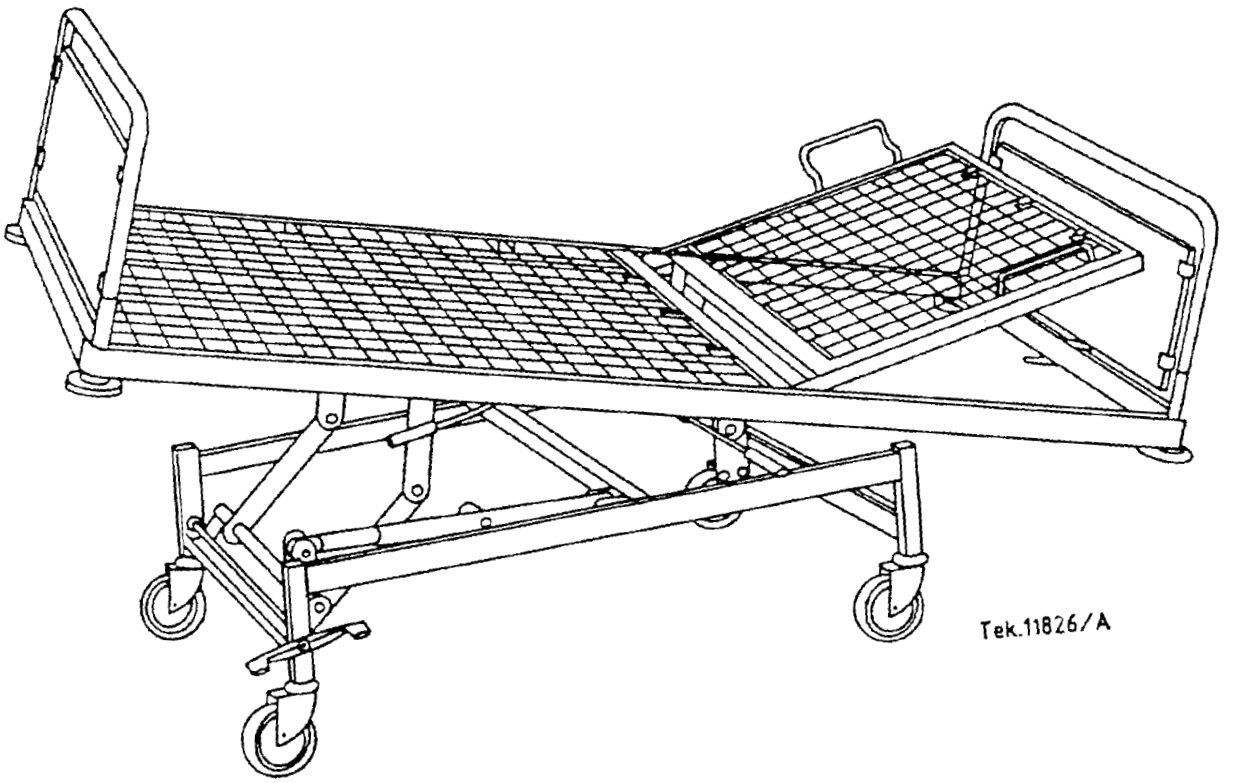

Fig 1 - Verstelbare Hospitaalbed