APPENDIX H

SPECIFICATION

for

WEIGHING SCALES FOR PATIENTS (DOCTOR'S TYPE)

1. APPLICABLE STANDARDS

The latest issues of the following standards form part of these specifications:

SABS 657	Steel tubes for non-pressure purposes Part 1: Steel tubes for scaffolding and for structural and general engineering purposes
SABS 663	Primer and enamel paint for hospital furniture
SABS 728	Electroplated coatings of nickel and chromium
SABS 989	Aluminium and aluminium alloy casting ingots for remelting
SABS 1190	Malleable iron castings

2. SCOPE

This specification covers the dimensional, constructional, and performance requirements for patients' weighing scales of the steelyard, dial and digital indication types (with height-measuring attachment) intended for use in medical institutions.

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

a) Whether a steelyard type, dial type or a digital indication type is required (see 4.1)

b) The colour of enamel finishes (see 6.13)
c) The type of finish of stainless steel parts (see 6.13)

3. DEFINITIONS

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

3.1 Acceptable. Acceptable to the purchaser.

3.2 Effective plastics material. A plastic material that is capable of performing the required functions and that is based on a polymer of a grade and quality recommended by the polymer manufacturer as being suitable for the specific purpose.

4. REQUIREMENTS

4.1 Type. A weighing scale shall be of the platform design and shall be of one of the following types, as specified by the purchaser:

Type 1 The steelyard lever-resistant type.
Type 2 The self-indicating spring-resistant dial type.
Type 3 The self-indicating digital indication type.

4.2 Capacity. A weighing scale shall have a weighing capacity of at least 200kg.

5. MATERIALS

5.1 Rolled Steel Sections and Sheet. Rolled steel sections and sheet shall be of an acceptable quality mild steel and shall be free from cracks, fins, laminations, and other deleterious defects.

5.2 Stainless Steel. Stainless steel shall be 18/8 (AISI Type 304) stainless steel or other acceptable austenitic stainless steel.

5.3 Welding Electrodes and Filler Rods. Filler metal used in fusion welding and braze welding shall be such as to produce a joint having mechanical properties of at least the same order as those of the parent metal.

5.4 Paint. The paint shall be an enamel, or a system comprising a primer and an enamel, complying with the relevant requirements for Type III (catalyst hardened) paint of SABS 663.

5.5 Plastics material. Plastics components shall be of an effective plastics material.

5.6 Aluminium Alloy. Aluminium alloy shall be an alloy of designation A1-Sil2B (code No. SA22), that complies with the relevant requirements of SABS 989.

5.7 Mild Steel Tubes. Mild steel tubes shall comply with the relevant requirements of SABS 657 for tubes of Grade 210 (Type EFW).

5.8 Cast Iron. Cast iron shall be an acceptable quality malleable cast iron that complies with the relevant requirements of SABS 1190.

5.9 Wood. Wood shall be free from seasoning defects and shall have a moisture content of 10, ± 2 % and a density of at least 480 kg/m 3.

5.10 Fusion welded joints. Parts joined by fusion welding shall be close-fitting and in correct alignment, and the joints shall have mechanical properties and, when relevant, corrosion resistance of at least the same order as those of the parent metal. Weld faces shaII be smooth,

clean, and free from porosity, cavities, spatter, and trapped slag. They 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.

6. DESIGN

6.1 General. The base of a weighing scale shall be large enough to provide acceptable stability and shall be so formed as to provide for the rigid attachment of a vertical pillar and headpiece carrying the steelyard assembly or dial. The weighing mechanism shall, as far as possible, be enclosed within the base, the pillar, and the headpiece (for protection of the moving parts), and the links shall be such that they cannot easily become detached in normal use and during transportation. A height-measuring attachment shall be fixed to the pillar. (see 6.10.)

6.2 Platform. The weighing platform shall have a top surface that accommodates an insert of acceptable material) at least 300mm long x 250mm wide x 3mm thick and that is firmly attached by means of an acceptable adhesive.

6.3 Pillar. The vertical pillar shall be made from stainless steel or mild steel plate, tube, or other material of acceptable strength and rigidity. The bottom of the pillar shall be securely attached to the base by bolting or other acceptable means. The top of the pillar shall be formed as to facilitate secure attachment of the headpiece or it shall be integral with the headpiece.

6.4 Indicating mechanism

6.4.1 Type 1. The steelyard shall be of stainless steel or of mild steel with a chromium-plated finish. The poises shall be of stainless steel or of mild

steel or of an acceptable copper alloy with a chromium-plated finish. The graduations and figures shall be engraved, embossed, or otherwise permanently and indelibly marked, and shall be finished in a contrasting colour that provides good legibility.

6.4.2 Type 2. A self-indicating weighing scale shall be fitted with a circular dial that is so constructed as to enable a direct reading of mass to be obtained. The pointer shall be so damped as to prevent excessive oscillation. The dial and pointer shall be protected by an acceptable dustproof transparent cover.

6.4.3 Type 3. Visual, digital indication shall be effected by means of a display of figures constituting the number indicative of the numerical result of a measurement, together with the symbol denoting the measuring unit. The mass indicated shall be clearly legible and the figures shall be in line and so arranged that the result of a measurement may be read by simple juxtaposition of the figures. The height of the figures denoting the numerical result of a measurement shall be not less than 5mm in the case of a scale having a capacity of not more than 50kg and not less than 15mm in the case of a scale having a capacity of more than 50kg. The height of the symbol denoting the measuring unit shall be compatible with, but in no case less than one half of the height of the figures denoting the numerical values to which the symbol relates. The symbol denoting the measuring unit shall be marked conspicuously on the dial, either immediately following the figures denoting the numerical value or immediately above or below such figures.

Where the figures comprise seven separate segments, the apparatus shall be so arranged that whenever the power to the apparatus is switched on having previously been switched off all digitals shall show the figure 8 for a short period sufficient for the figures to be read, unless the apparatus is provided with a device which automatically tests the functioning of all the segments immediately before each measurement and inhibits a display in the event of any malfunction.

6.5 Weighing mechanism

6.5.1 Type 1. The weighing mechanism shall be of the lever-resistant type having major and minor counterbalance masses (poises) arranged to slide on the poise bar. Loose proportional masses shall not be used. The poise bar shall be connected to the weighing platform through such a system of links and levers as will ensure that the mass registered is constant irrespective of the position of the body on the platform, and it shall be provided with a means of indicating the balance position, and a means of locking the steelyard when not in use. All knife edges, bearings, and friction surfaces shall be of hardened steel or of agate. Knife edges and bearings shall be so fitted as to allow the levers and steelyard to move easily. Knife edges shall be firmly secured in position and shall be truly paralleled and coplanar, and shall bear throughout the length of the parts designed to be in contact with the bearings. All bearings and knife edges shall be readily replaceable.

6.5.2 Type 2. The weighing mechanism shall be of the spring-resistant type of which the spring constant is not affected by temperature.

6.6 Calibration

6.6.1 Type 1. The poise bar shall be graduated from 0 to the full scale reading in 5kg divisions for the major sliding mass, and from 0-5kg (in 50-9 divisions) for the minor sliding mass. Each division for the major sliding mass shall be notched and denominated; the zero, the 500g division, and each division that is a multiple of 500g for the minor sliding mass shall be denominated.

6.6.2 Type 2. The dial shall be graduated from 0 to at least 200kg in divisions not larger than 500g. The distance between the consecutive divisions shall be at least 2mm. Each 5kg marking shall be denominated in bold numerals, and each 500g division shall be indicated by means of a line.

6.7 Sensitivity

6.7.1 Type 1. Both when the weighing platform is unloaded and when it is loaded with any mass up to the capacity of the scale, the addition to, or subtraction from, the load of a mass of 500g shall cause the displacement of the steelyard, to the full extent of its travel, from the horizontal position of balance.

6.7.2 Type 2. Both when the weighing platform is unloaded and when it is loaded with any mass up to the capacity of the scale, the addition to, or subtraction from, the load of a mass of 50g shall cause a visible movement of the pointer.

6.7.3 Type 3. Both when the weighing is unloaded and when it is loaded with any mass up to the capacity of the scale, the addition to, or subtraction from, the load of a mass of 50g shall cause a visible oscillation of the digits.

6.8 Accuracy

After a weighing scale has been correctly balanced at zero load, it shall indicate, to within 50g of the true value, the mass of any load up to and including half capacity and to within 100g of the true value, the mass of any load between half and full capacity .

6.9 Zero adjustment

A separate screw-operated device for the adjustment of zero balance shall be provided for Type 1 and Type 2 scales. In the case of a Type 3 scale provision shall be made for a mean for indicating the position of balance at zero load. A weighing scale which has digital indication may be provided with a device which, when set in operation by means of a push-button, automatically resets the indication to zero.

6.10 Height-measuring attachment

The height-measuring attachment shall be a vertical post of stainless steel, aluminium alloy, or other acceptable metal, rigidly fixed to the pillar and carrying a linear scale made from acceptable wood or an effective plastics material. The scale shall be graduated in 2mm divisions over the range 750 - 2 000mm measured from the top surface of the platform as datum, with major (denominated) divisions every 20mm, and shall have a sliding cursor that carries a horizontal feeler arm for making contact with the top of the patient's head. The cursor shall have a spring-loaded, frictional, arresting mechanism that prevents it from slipping, and shall give a direct reading of the patient's height.

6.11 Durability

When a weighing scale is tested in accordance with 7.1 it shall, at the end of the test, still be in good working condition and shall still comply with the relevant requirements of 6.7 and 6.8.

6.12 Workmanship

Workmanship shall be of an acceptable standard throughout. All exposed parts shall be smoothly finished and shall be free from burrs, fins, sharp edges, and other defects that affect the appearance or may affect the serviceability of the weighing scale. Plastics components shall, in addition, be free from flash. Joints that are welded or brazed shall be of acceptable strength and shall be free from weakening and disfiguring defects.

6.13 Finish

Parts made from mild steel shall be coated with enamel paint (see 5.4) having a dry film thickness of at least 60pm. The colour shall be as specified by the purchaser. Stainless steel shall have a medium directional satin finish or a bright polished finish[1]), as specified by the purchaser. Chromium plating shall comply with the relevant requirements for coatings for mild service conditions given in SABS 728. Wood surfaces shall be sanded to a fine even finish and coated with an acceptable sealer or penetrant that renders the wood resistant to moisture. The material used and the type of finish shall be such that they are acceptable.

7. METHOD OF TEST

7.1 Test of durability

7.1.1 Apparatus. A device that is capable of so lowering and raising, at a rate of 15 ±1 cycles per minute, a sandbag of mass 100kg on to and from the weighing platform that the free motion of the sandbag is approximately sinusoidal and that the bag rests on the platform just long enough to cause the scale to indicate a mass of 100kg.

7.1.2 Procedure. Place the weighing scale on a solid horizontal surface so that its platform is centred below the sandbag of the apparatus. In the case of a Type 1 weighing scale preset the poises to 100kg. Subject the scale to 50 000 cycles, each consisting of lowering and then raising the sandbag. On completion of the test, check the weighing scale for compliance with the requirements for sensitivity (see 6.7) and accuracy (see 6.8) and examine it visually for any sign of deterioration or structural failure.

[1]) Information regarding a medium directional satin finish and a bright polished finish is obtainable from the South African Bureau of Standards.