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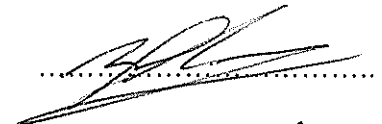


ENGINEERING AND TECHNOLOGY TECHNOLOGY MANAGEMENT

SPECIFICATION CONTROL PAGE

SPECIFICATION FOR PORTABLE GLASS REINFORCED POLYESTER (GRP) EXTENSION LADDERS.

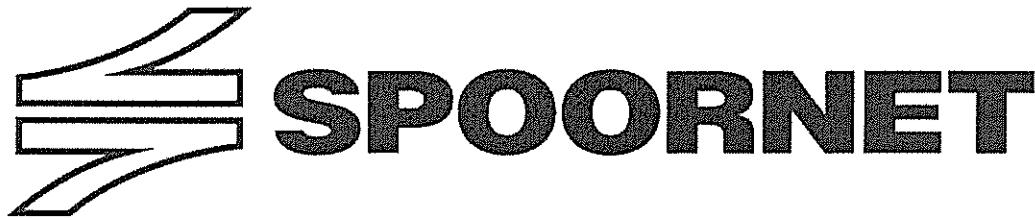
Statement of authorisation:

The specification has been compiled in a manner which shall favour / encourage local manufacture of material / equipment to a maximum degree.

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SPECIFICATION FOR PORTABLE GLASS REINFORCED POLYESTER (GRP) EXTENSION LADDERS.

Circulation restricted to:

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1.0 SCOPE

This specification covers Spoornets requirements for portable glass reinforced polyester (GRP) extension ladders for use on high voltage electrical equipment.

2.0 STANDARDS

2.1 Unless otherwise specified this specification shall be read in conjunction with the current edition of the relevant SANS, ANSI or Spoornets publication where applicable.

2.2 The following publications are referred to in this specification:

2.2.1 TECHNICAL STANDARDS

- (a) SANS 1304: 1980 - Standard Specification for light ladders.
- (b) SANS 121: 2000 - Hot dip galvanized coatings on fabricated iron and steel articles – Specifications and test methods.
- (c) SANS 911: 2004 - Natural fibre ropes
- (d) ANSI A14.5: 2000 - Safety requirements for portable reinforced plastic ladders.
- (e) Spoornet Electrical Safety Instructions: 2000

2.2.2 QUALITY ASSURANCE

Shall comply with SABS/ ISO 9000: 2000 series.

3.0 METHOD OF TENDERING

3.1 Tenderers shall indicate clause by clause with this specification. This shall take the form of a separate document listing all the specifications clause numbers indicating the individual statement of compliance or non-compliance.

3.2 The tenderer shall motivate a statement of non-compliance.

3.3 Appendix 1 to be completed by the tenderer.

3.4 Tenderers shall submit descriptive literature consisting of detailed technical specifications, general constructional details and principal dimensions, together with clear illustrations of the equipment offered.

3.5 Failure to comply with clauses 3.1, 3.2, 3.3 and 3.4 could preclude a tender from consideration.

4.0 SERVICE CONDITIONS

4.1 The ladders are required for service outdoors, under the following conditions:

Altitude : 0 to 1850 m above sea level.

Ambient temperature : Minimum : Minus 5 °C
: Maximum : Plus 45 °C

Relative humidity : As high as 90%

Lightning conditions : Severe.

Ultra violet radiation : Severe.

5.0 GENERAL REQUIREMENTS

5.1 The collapsed ladder shall have a profile height when viewed from the side of not more than 145 mm with an overlap of 1220mm for the "Type 1" and 180mm for the "Type 1A" in order that it may take up minimum space during transport.

5.1.1 The working length of a fully extended ladder shall be 9,75 meters with at least 1,22 meters overlap or 10,97 meters with at least 1,22 meters overlap as required.

- 5.1.2 The width between stiles of the fly section shall be $295 \pm 5\text{mm}$ and the width of the base section shall suit that of the fly section.
- 5.1.3 Rung spacing shall be $275\text{mm} \pm 5\text{mm}$ centre to centre.
- 5.1.4 The mass, without the rope, of the "Type 1" shall not exceed 52 kg and that of the "Type 1A" shall not exceed 70kg.

5.2 DESIGN

- 5.2.1 The design shall comply, generally, with the American National Standard Institute specification ANSI A14.5: 2000, rating heavy duty Type 1 and extra heavy duty Type 1A. Specific requirements of SpoorNet are however included in this specification.
- 5.2.2 The rope (Item number: 54033700 -approved item name: "rope, fibrous – specification: SANS 911 date 2004 - makers part number: A12/03 Inflight - stores description: cotton rope 12 mm 3 strand, breaking load 4.7 kN") shall be located out of the way of the user and to the side of the ladder in such a manner that loose rope will not pile up at the base when the ladder is extended.
- 5.2.3 The cotton rope shall be fitted to the ladder by the manufacturer.
- 5.2.4 Locks shall be reliable, user friendly and extremely robustly constructed. Parts shall not bend easily when the ladder is handled in a rough manner.
- 5.2.5 Locks shall be tested in accordance with ANSI A14.5: 2000.
- 5.2.6 The locks shall not damage the stiles with extensive use.
- 5.2.7 Robustly constructed galvanised steel feet shall be fitted to the bottom section and shall be pointed to ensure proper anchoring in the ground when the ladder is in use.
- 5.2.8 All steel parts, including bolts, nuts and rivets shall be hot dip galvanised in accordance with specification SANS 121 or manufactured from a corrosion resistant material. (Verification tests may be called for).

5.3 STILES

- 5.3.1 The ladder stiles shall be manufactured from "GRP" material complying in all respects with ANSI A14.5: 2000.
- 5.3.2 The mechanical properties of the "GRP" shall be in accordance to the table below.

Table : Mechanical properties of "GRP" material

Material Property	Position of sample	Condition	Orientation	Units	Required SpoorNet
Flexural Strength	F	Dry	LW	Mpa	304
Flexural Modulus	F	Dry	LW	Mpa	18 623
Flexural Strength	W	Dry	LW	Mpa	317
Flexural Modulus	W	Dry	LW	Mpa	17 244
Flexural Strength	W	Dry	CW	Mpa	97
Flexural Modulus	W	Dry	CW	Mpa	6 898
Tensile Strength	F	Dry	LW	Mpa	317
Tensile Strength	W	Dry	LW	Mpa	241

- 5.3.3 The stiles shall have additional weather and ultra violet radiation protection in the form of a surface veil of acceptable material and shall be fully described when tendering.

- 5.3.4 Furthermore the surface of the stiles shall be painted with at least one coat of a special polyurethane paint, for extra ultra violet protection. Plascon Glatex No 8. Plascodure or exact equivalent.
- 5.3.5 The stiles of the fly section shall be protected against abrasion damage when sliding over the rungs and through the guides.
- 5.3.6 The flange of the stiles of the fly section which can be slid along the overhead conductor shall be protected by means of sacrificial hard wearing, long lasting material preferably with some adhesion to prevent excessive wear when the ladder is slid along the overhead.
- 5.3.7 This material shall be easy to replace or renew before it is worn away to such an extent that the stiles are damaged.
- 5.3.8 The bottom ends of the stiles of the fly and base sections, both inside and outside shall be strengthened for at least 300 mm with snug fitting galvanised or corrosion resistant flat sheet sections to prevent damage to the glass fibre material.
- 5.3.9 The bottom ends of the fly section shall be supplied with suitable robust impact resisting end fittings, which will be able to protect the ends against damage when the fly section is dropped at speed.
- 5.3.10 All other ends of stiles shall be finished off with suitable durable metal caps of sufficient strength.
- 5.3.11 Prismatic fluorescent yellow green reflective tape with rounded corners shall be applied to each stile between every second rung fixing 50 mm wide by 150 mm long and coated with a clear varnish. The warranty of the reflective tape shall be at least 7 years.

5.4 RUNGS

- 5.4.1 Rungs may be of the metal type.
- 5.4.2 Rungs shall have a suitable flat top surface for greater comfort and be suitably dimpled or serrated to prevent slipping.
- 5.4.3 The rungs shall be fitted to the stiles so that the top flat surface is horizontal when the ladder is standing at an angle of 75 ± 1 degree to the horizontal.
- 5.4.4 The bottom rung of the fly section shall be arranged in such a manner that it will not injure a person's foot placed against the bottom rung on the base section to stabilise the ladder when the fly section is lowered or dropped

6.0 ELECTRICAL PROPERTIES

- 6.1 The electrical properties shall comply in all respects with ANSI A14.5: 2000, clause 7.10.

7.0 TESTS

7.1 Tests-general

- 7.1.1 The ladders shall be subjected to type tests as specified under clause 7.2 hereunder and sample tests as per clause 7.3 hereunder.
- 7.1.2 The responsibility for arranging these tests rests with the tenderer.
- 7.1.3 Spoornet reserves the right to call for further additional type tests if considered necessary.
- 7.1.4 Spoornet reserves the right to be present when type tests are conducted.
- 7.1.5 A pre-production ladder shall be submitted for evaluation purposes. Manufacturing shall not commence before written approval has been granted by Spoornet. The approved sample ladder shall be retained and be available during final inspection of the batch produced.

7.2 Type tests

- 7.2.1 The complete ladder shall be subjected to the tests applicable as described in section 8 of ANSI A14.5: 2000 and shall not fail any of the tests.
- 7.2.2 Rung fixing and strength shall comply with the tests in accordance with specification ANSI A14.5: 2000 table 17 clause 8.3.7.2 (rung torque in service test) with a minimum of 1000 inch pounds (113 Nm).
- 7.2.3 The complete ladder shall be tested in a horizontal position to determine the maximum permissible deflection and should not exceed the values as laid down in table 2 of SANS 1304: 1980.

7.3 Sample tests

- 7.3.1 Sample testing of the "GRP" material shall be done in accordance with specification SANS 1304: 1980, clause 6.

8.0 MARKING

- 8.1 The ladders shall all be clearly and permanently marked with the following:

- Date of manufacture.
- Manufacturers name.
- Manufacturers serial number.
- Spoornet approved in terms of (Electrical Safety Instructions Clause 603.3)
- SWL 113 kg - On type 1 ladder and SWL 136 kg on type 1 A ladder.
- The lettering shall not be less than 5mm in height.

9.0 TECHNICAL DATA

- 9.1 Tenderers who have not previously supplied "GRP" ladders to Spoornet shall furnish full details of their previous experience in the manufacture of similar equipment, together with one representative sample ladder, which can be tested to destruction if considered necessary.
- 9.2 The technical data requested in the annexure of this specification shall be furnished for each type of ladder offered.
- 9.2 The following additional data shall be submitted:
- (a) Properties of the "GRP" used for the stiles tested as per clause 7 of ANSI A14.5: 2000.
 - (b) Results of the type tests as per clause 7.2 and 7.3.
- 9.3 All tests shall be done by an accredited test authority such as SABS, a University with the necessary laboratory equipment or other institutions acceptable to Spoornet and results shall be presented in the form of an official test certificate.

10.0 PACKING

- 10.1 Ladders to be transported shall be packed and / or crated in such a way not to be damaged.

End

APPENDIX 1

DATA SHEET.

(Shall be completed for each type offered)

1. Make _____ Type _____
2. Mass _____ kg
3. Electrical test results of "GRP" material. _____
4. Water absorption of "GRP" material as per ANSI A14.5: 2000 (75% maximum). _____
5. Method of manufacture of "GRP" material for stiles. _____
6. Percentage glass in "GRP" material used in stiles, (by mass) _____ % (51% min)
7. Description of method and material for preventing wear of stiles when being slid along the wire. _____
8. Material used for protection against weather and ultra violet radiation. _____
9. Deflection as per SANS 1304 Table 2 _____ mm.