



Kenya Power

TITLE:

**SPECIFICATION FOR
OVERHEAD LINES
LOAD HANDLING DEVICES**

Part 3: Fall Arrest Lanyard with
Connectors and Full Body
Harness

Doc. No.

KP1/3CB/TSP/09/060-3

Issue No.

1

Revision No.

0

Date of Issue

2014-07-08

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0.1 Circulation List

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FOREWORD

This specification has been prepared by the Research and Development Department in collaboration with Distribution Division, both of The Kenya Power and Lighting Company Limited (KPLC) and it lays down requirements for fall arrest lanyard and full body harness for use on power lines. It is intended for use by KPLC in purchasing the safety harness and anchorage device.

1. SCOPE

- 1.1. This specification is for fall arrest lanyard and full body harness for use on distribution power lines. The full body harness shall be supplied together with the safety anchor device complete with lanyard and connectors.
- 1.2. The specification also covers inspection and test of the fall arrest and full body harness as well as schedule of Guaranteed Technical Particulars to be filled, signed by the manufacturer and submitted for tender evaluation.
- 1.3. The specification stipulates the minimum requirements for fall arrest lanyard and full body harness; acceptable for use in the company and it shall be the responsibility of the supplier to ensure adequacy of the design, good engineering practice, adherence to the specification and applicable standards and regulations as well as ensuring good workmanship in the manufacture of the fall arrest lanyard and full body harness for The Kenya Power & Lighting Company.

The specification does not purport to include all the necessary provisions of a contract.

2. REFERENCES

The following standards contain provisions which, through reference in this text constitute provisions of this specification. Unless otherwise stated, the latest editions (including amendments) apply:

- ISO 9554: Fibre ropes — General specifications
- ISO 2808: Paints and varnishes – Determination of film thicknesses,
- ISO 6158: Metallic and other inorganic coatings -- Electrodeposited coatings of chromium for engineering purposes
- ISO 1140: Fibre ropes -- Polyamide -- 3-, 4-, 8- and 12-strand ropes

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- EN 361: Personal protective equipment against falls from a height. Full body harnesses
- EN 362: Personal protective equipment against falls from a height. Connectors
- EN 354: Personal protective equipment against falls from a height. Lanyards
- EN 355: Personal protective equipment against falls from a height. Energy absorbers
- BS EN 795: Personal fall protection equipment - Anchor devices
- BS EN 364: Personal protective equipment against falls from a height. Test methods
- OSHA 1926.502: Fall protection systems criteria and practices.

3. TERMS AND DEFINITIONS

For the purposes of this specification the definitions given in the reference standards shall apply

4. REQUIREMENTS

4.1. SERVICE CONDITIONS

The fall arrest lanyard and full body harness shall be tropicalized, designed and constructed for continuous outdoor operation in tropical areas and harsh climatic conditions including areas exposed to:

- Sea spray (along the coast),
- Humidity of up to 95% and
- Average ambient temperature of +30°C with a minimum of -1°C and a maximum of +40°
- Altitude of up to 2000m above the sea level.

4.2. PARTICULAR REQUIREMENTS

4.2.1. Safety lanyard complete with connectors

- 4.2.1.1. The fall arrest lanyard complete in this specification shall be designed, manufactured and tested in accordance with EN 354 and suitable for use with a class C anchor device for anchoring on round or polygonal poles of diameter up to 320mm.

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- 4.2.1.2. The lanyard shall also be suitable for use with safety anchor devices such as eye bolts, overhead beams, and integral parts of the building structures being part of the anchorage points in accordance with BS EN 795: 2012.
- 4.2.1.3. The lanyard shall be designed with tie-off points that support the entire weight of the fall arrest system. The anchorage shall be capable of supporting 22.2kN for each worker attached as per OSHA 1926.502(d) (15) (i).
- 4.2.1.4. They shall also be designed, installed, and used as part of a complete personal fall arrest system which maintains a safety factor of at least two under the supervision of a qualified person.
- 4.2.1.5. The lanyard shall be supplied complete with an energy absorber capable of supporting a 1.4kN per person after free falling for 1.8m (6') (22kN requirements).
- 4.2.1.6. The lanyard rope shall be made of polyamide fibre material – nylon 6.6, conforming to ISO 9554:2005 and minimum diameter of 16mm; length not less than 2m as shown in Fig. 1. It shall be equipped with mobile slide allowing the adjustment according to the anchorage point.
- 4.2.1.7. All metallic parts of the lanyard including snap-hook zinc coated steel connector shall comply with the corrosion protection of EN 362:1992 to ensure they are durable and safe for use in the outdoor environment.
- 4.2.1.8. The connector assembly shall have a minimum tensile strength of 22kN as per OSHA 1926.502(e)(5)
- 4.2.1.9. The lanyard shall be so designed as to ensure that it is not possible for correctly connected personal protective equipment to become detached unintentionally.
- 4.2.1.10. The different elements of an anchor device shall be such that they cannot appear to be correctly assembled without being positively locked together.
- 4.2.1.11. The connection of the harness with the fall arrester (safety anchorage device) system shall be made using a triangular connector compliant with safety standard EN 362.
- 4.2.1.12. The lanyard shall meet the static strength and dynamic strength tests requirements under the BS EN 364:1993 standard to ensure they possess sufficient strength for safe

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use as per Table 1 below. A typical illustration of the lanyard complete with connectors is shown in Fig. 1.

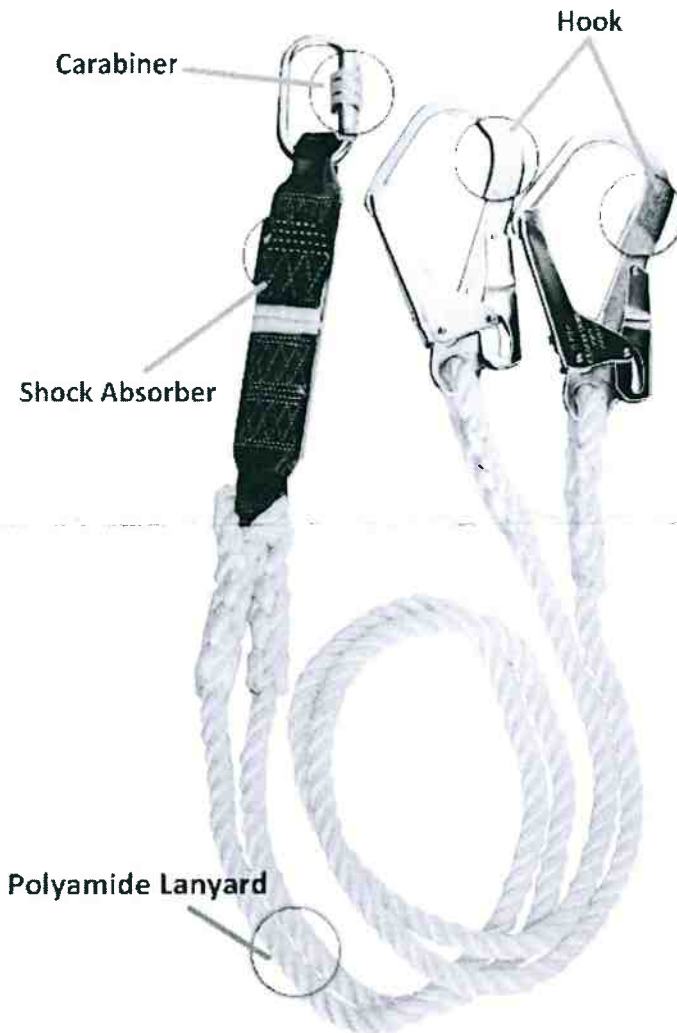


Fig. 1: Fall arrest lanyard and connectors

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Table 1: Properties of the lanyard rope material

Physical properties of polyamide as per ISO 1140:2012						
Approximate gravity	Tenacity		Elongation at break	Abrasion resistance	Creep resistance	Moisture regain
	Kg/dm ³	N/tex	%			%
1.14	7.5 – 10.5	0.66 – 0.93	14 - 28	Dry – excellent Wet - fair	good	4 - 6
Environmental properties of polyamide as per ISO 1140						
Environmental resistance		Sunlight resistance		Effects of chemical exposure		
Excellent		Very good		<ul style="list-style-type: none"> - Resistant to weak acids, alkalis and organic solvents - Soluble in chlorinated hydrocarbons 		

4.2.2. Full Body Harness (FBH)

4.2.2.1. General

4.2.2.1.1. The full body harness (FBH) shall be designed, manufactured and tested in accordance with BS EN 361:2002. It shall be an essential component of personal protective systems protecting against falls from a height, used at worksites in power distribution systems.

4.2.2.1.2. The full body harness (FBH) in this specification shall be a class A type harness and shall have one D-ring for fall arrest attachment affixed to both shoulder straps at the back and two D-rings on either side, quick connecting buckle for chest connection and leg connection, protective covers for label pack, lanyard keepers, and web keepers.

NOTE: *It is recommended that a class A harnesses be provided with a sub-pelvic strap and a sliding D-ring for fall arrest attachment.*

4.2.2.1.3. The full body harness shall ensure that the personal fall arrest systems, when stopping a fall, shall limit maximum arresting force on an employee to 8.2kN when used with a body harness as per OSHA 1926.502(d) (16) (2).

4.2.2.2. Design and construction

4.2.2.2.1. Webbing and thread elements shall be made from synthetic fibres, having characteristics consistent with those of polyamide and polyester. Sewing threads shall be physically compatible with and of a comparable quality to that of the webbing, but

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shall be of a different colour from that of the webbing in order to facilitate visual inspection.

- 4.2.2.2.2. A full body harness shall comprise of straps or similar elements which are placed in the pelvic area and on the shoulders, as shown in Fig. 2. The full body harness shall fit the wearer. Means of adjustment shall be provided.
- 4.2.2.2.3. The straps shall not migrate from their positions and shall not loosen by themselves. The harness shall contain the body and shall distribute suitably the dynamic fall arrest forces and post-fall arrest suspension forces over the body. The harness shall not create any supplementary risk and shall offer an acceptable degree of comfort.
- 4.2.2.2.4. It shall be possible to carry out a visual inspection of all the components of the harness. If it is dismantled, it shall be impossible to reassemble it incorrectly.

NOTES: *The fall arrest attachment element (s) may be placed in such a way so that during the use of the harness these lie in front of the chest, at the shoulders, and/or at the back of the wearer.*

4.2.2.3. Width and Strength of the Straps

The minimum width and thickness of webbing for waist straps shall be 40 mm and 3 mm respectively. The waist belts shoulder straps, hoisting straps, sole straps and all types of belts and harnesses shall not break under a minimum tensile load of 19.6kN (2 000 kg).

4.2.2.4. Materials requirements

4.2.2.4.1. Webbing

All belts and harnesses shall be made from nylon or other synthetic materials, such as polyester. The material shall have a uniform thickness and uniform width. The waist belt, shoulder straps, hoisting straps, pole straps and all types of safety belts and harnesses shall be made from nylon/polyester webbing. The test specimen shall be of entire cross section whose minimum width and thickness should be 40 mm and 3 mm respectively.

All the materials used in the production of webbing and rope shall pass the flammability tests as given in Annex A of EN 361:2002.

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4.2.2.4.2. Threads for Sewing

Threads for sewing the loadbearing components shall have similar physical and chemical properties to that of the materials being sewn. Number of stitches shall be not less than 3 per cm and the type of thread shall be synthetic fibre such as nylon, polyester etc. The threading shall be of different colour from that of webbing in order to facilitate visual inspection.

4.2.2.4.3. Rivets and Washers

All rivets and washers if used for joining the various sections shall be made from bronze or brass.

4.2.2.4.4. Life Line/Safety Line

Only nylon, polyester or synthetic fibre shall be used. The breaking load shall be a minimum of 19.6kN (or approx. 2 000 kg) when tested in accordance with test method reference as per EN 361:2002.

4.2.2.4.5. Working at height

The length of lanyard shall not be more than 3 m in length subject to the condition that free fall shall not be more than 1.8m.

4.2.2.5. Metal Components

4.2.2.5.1. All metal components shall be solid or forged in such a manner that the joints are not visible and the joined part of the metal does not impair the strength or quality. The surfaces shall be smooth-finished and free from any manufacturing defects, burrs or uneven surface.

4.2.2.5.2. In order to protect all metal fittings against corrosion and/or other chemical reaction, it is necessary that all the fittings shall be coated by chromium plating, powder coating.

4.2.2.5.3. The minimum thickness of chromium plating shall be 8 microns when measured in accordance with the method prescribed in ISO 6158:2011 whereas for powder coating the thickness shall be minimum 45 microns when measured in accordance with the method prescribed in ISO 2808.

4.2.2.5.4. Care shall also be taken that the part of metal fittings matching with the webbing shall be smoothly finished, rounded and designed to prevent damage to the webbing, etc.

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4.2.2.5.5. Hooks, clamps or other fastening and holding devices shall be of similar quality and properly treated or plated. The design of the hooks shall be self-closing type and care shall be taken to ensure that if pressure is exerted accidentally on the tongue or latch, they shall not disengage.

4.2.2.5.6. If any springs are used, then they shall be so arranged and loaded that when the hooks are closed, the springs rest in position and are free from any movement until pressure is applied to release or to engage. Aluminium, magnesium or titanium metals or alloys thereof shall not be used.

4.2.2.6. Performance Requirements

4.2.2.6.1. Strength

Hooks and main load bearing metal parts and fittings shall not break under the test load of 19.6kN (2 000 kg). The load shall be applied as closely as practicable in a manner in which the component is stressed in service.

4.2.2.6.2. Attachment Means

In order to avoid the user from attaching a sub connecting system to an incorrect attachment points, no loop made of textile shall be present and buckles other than those meeting the prescribed requirements of EN 361:2002 shall be of a smaller size such that a clear distinction is made from those attachment points.

4.2.2.6.3. Performance Tests

The attachment of metal parts, load bearing components and the making of splices and joints shall be such that finished assembly shall pass the prescribed performance test, as given in Annex B of EN 361:2002.

NOTE - *The complete assembled harness when subjected to performance test shall be destroyed to avoid its reuse.*

4.2.2.6.4. Static Load

The harness shall withstand a 15kN load when tested in accordance to the static load test given in Annex C of EN 361:2002 without releasing the dummy and the test is applied in turn to each attachment element.

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NOTE – The static test does not require a test machine but a load indicator is needed. A simple test frame and a winch are enough.

4.2.2.6.5. **Dynamic Load**

The effect of the velocity of the test discovery at the end of free fall on the performance of the harness and the effect on the shape of the test dummy shall be carried out as per the method given in Annex D of EN 361:2002.

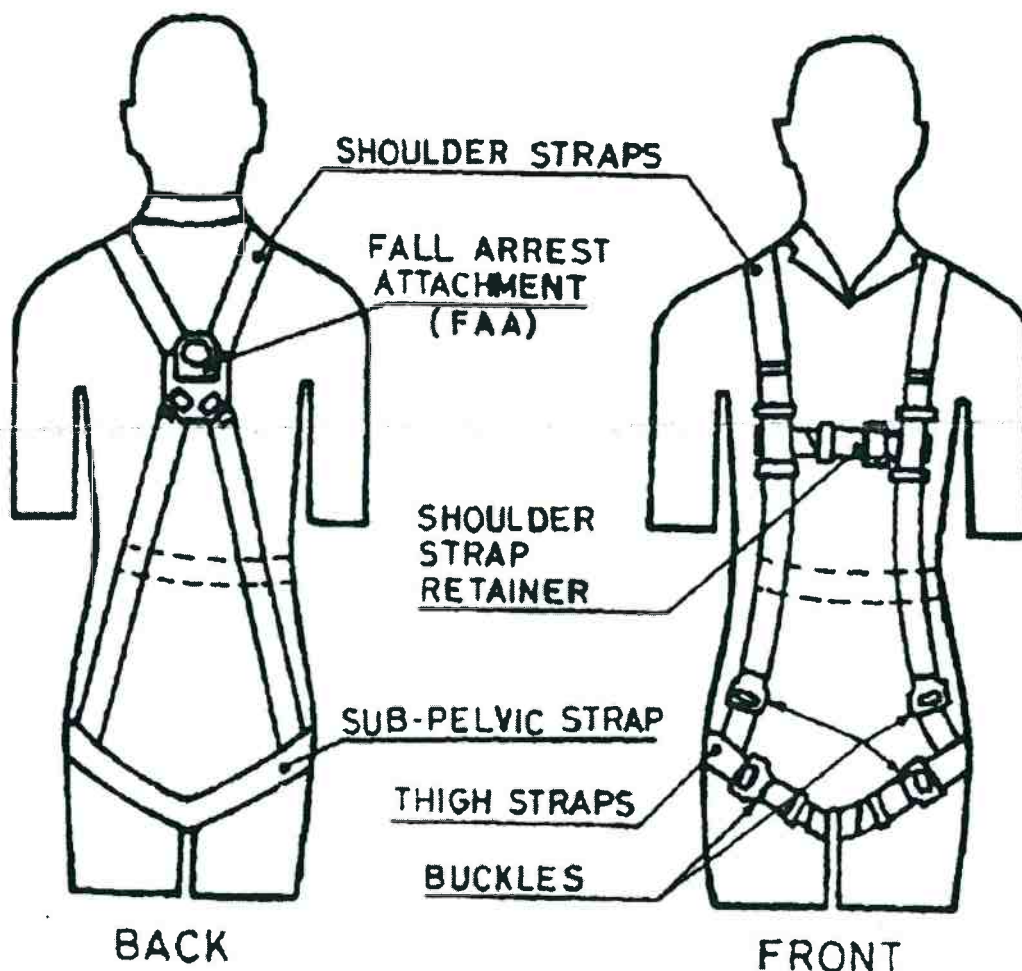


Fig. 2: Typical illustration of full body harness (FBH)

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4.3. Quality Management System

- 4.3.1. The supplier shall submit a quality assurance plan (QAP) that will be used to ensure that the design, material, workmanship, tests, service capability, maintenance and documentation of the fall arrest lanyard and full body harness fulfil the requirements stated in the contract documents, standards, specifications and regulations. The QAP shall be based on and include relevant parts to fulfil the requirements of ISO 9001:2008.
- 4.3.2. The Manufacturer's Declaration of Conformity to applicable standards and copies of quality management certifications including copy of valid and relevant ISO 9001: 2008 certificate shall be submitted with the tender for evaluation.
- 4.3.3. The bidder shall indicate the delivery time of the fall arrest lanyard and full body harness, manufacturer's monthly & annual production capacity and experience in the production of the type and size of items being offered.

5.0. TESTS AND INSPECTION

- 5.1. The fall arrest lanyard and full body harness shall be inspected and tested in accordance with ISO 9554, ISO 6158, ISO 2808, ISO 1140, EN 361, EN 362, EN 354,, EN 355 BS EN 364, BS EN 795 and OSHA 1926.502 standards and all the provisions of this specification. It shall be the responsibility of the supplier to perform or to have performed the tests specified and whatever other tests he normally performs at works.
- 5.2. Copies of previous Type Tests Reports issued by a third party testing laboratory that is accredited to ISO/IEC 17025 shall be submitted with the tender for the purpose of technical evaluation. The accreditation certificate to ISO/IEC 17025 for the same third party testing laboratory used shall also be submitted with the tender document (all in English Language).
- 5.3. The fall arrest lanyard and full body harness shall be subject to acceptance tests at the manufacturer's works before dispatch. Acceptance tests shall be witnessed by two Engineers appointed by The Kenya Power and Lighting Company Limited (KPLC). Routine and Sample Test Reports for the fall arrest lanyard and full body harness to be supplied shall be submitted to KPLC for approval before delivery of the goods.
- 5.4. On receipt of the product, KPLC will perform any of the tests specified in order to verify compliance with this specification. The supplier shall replace without charge to KPLC the fall arrest lanyard and full body harness which upon examination, test or use; fail to meet any of the requirements in the specification.

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6.0. MARKING AND PACKING

6.1. MARKINGS

The fall arrest lanyard and full body harness shall be clearly and indelibly marked or, permanently labelled by any suitable method not having a harmful effect on materials with the following information:

- a) The type of harness belt and lanyard;
- b) The name, trade-mark or other means of identification of the manufacturer or the supplier who is responsible for acting on behalf of the manufacturer for claiming compliance with this standard;
- c) Manufacturer's product identification information that shall include the manufacturer's batch or serial number that enables the origin of the item to be traced;
- d) The year of manufacture;
- e) The identity of the fibre used as the material of construction;
- f) Information that states by appropriate means the intended purpose of each attachment element and to identify specifically those attachment elements that are designed to be used as part of a complete fall arrest system; and
- g) Warning for not to deviate from the manufacturer

6.2. PACKAGING

- 6.2.1. The fall arrest lanyard and full body harness shall be packed in such a manner so as to avoid damage during transportation and storage.
- 6.2.2. Each fall arrest lanyard and full body harness shall be supplied by wrapping in moisture-proof material non-woven bag.
- 6.2.3. The following information shall be printed on a suitable label firmly attached to each packaging:
 - a) Purchase order number/tender
 - b) Manufacturer's name
 - c) Year of manufacture
 - d) Catalogue number of the devices
 - e) The words, "PROPERTY OF KENYA POWER & LIGHTING CO.

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7. DOCUMENTATION

7.1 The bidder shall submit its tender complete with technical documents required by Annex A (Guaranteed Technical Particulars) for tender evaluation. The technical documents to be submitted (all in English language) for tender evaluation shall include the following:

- a) Fully filled clause by clause Guaranteed Technical Particulars (GTP) signed by the manufacturer;
- b) Copies of the Manufacturer's catalogues, brochures, drawings and technical data;
- c) Sales records for the last five years and at least four customer reference letters;
- d) Details of manufacturing capacity and the manufacturer's experience;
- e) Copies of required type test reports by a third party testing laboratory accredited to ISO/IEC 17025;
- f) Copy of accreditation certificate to ISO/IEC 17025 for the third party testing laboratory;
- g) Manufacturers letter of authorization, ISO 9001:2008 certificate and other technical documents required in the tender.

7.2 The successful bidder (supplier) shall submit the following documents/details to The Kenya Power & Lighting Company for approval before manufacture:

- a) Guaranteed Technical Particulars signed by the manufacturer;
- b) Design Drawings with details of fall arrest lanyard and full body harness to be manufactured for KPLC.
- c) Quality assurance plan (QAP) that will be used to ensure that the design, material; workmanship, tests, service capability, maintenance and documentation will fulfill the requirements stated in the contract documents, standards, specifications and regulations. The QAP shall be based on and include relevant parts to fulfill the requirements of ISO 9001:2008
- d) Detailed test program to be used during factory testing;
- e) Marking details and method to be used in marking the fall arrest lanyard and full body harness;
- f) Manufacturer's undertaking to ensure adequacy of the design, good engineering practice, adherence to the specification and applicable standards and regulations as well as ensuring good workmanship in the manufacture of the fall arrest lanyard and full body harness for The Kenya Power & Lighting Company;
- g) Packaging details (including packaging materials).

7.3 The supplier shall submit recommendations for use, care, storage and routine inspection/testing procedures, all in the English Language, during delivery of the fall arrest lanyard and full body harness to KPLC stores.

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ANNEX A: Guaranteed Technical Particulars (to be filled and signed by the Supplier and submitted together with copies of manufacturer's catalogues, brochures, drawings, technical data, sales records, customer reference letters and copies of certificates/test reports for tender evaluation)

Tender No.

Clause number	Bidder's offer (indicate full details of the offered item for each requirement of the tender & specification)
Bidder's Name	
Manufacturer's Name, address and country	
Type reference/model number of item(s) offered	
Scope: 1.1	
1.2 Load Handling Accessories	
a) Safety anchorage device complete with a lanyard and connectors	
b) Full Body Harness	
1.4	
1.5	
2.0 Applicable Standards (References)	
3.0 Terms & definitions	
4.0 Requirements	
4.1 Service conditions	
4.2 Particular requirements	
4.2.1 Safety anchorage device complete with a lanyard and connectors	
4.2.1.1. -4.2.1.12.	
4.2.2 Full Body Harness	
4.2.2.1 General	
4.2.2.1.1 - 4.2.2.1.3	
4.2.2.2 Design and construction	
4.2.2.2.1 - 4.2.2.2.4	
4.2.2.3 Width and length of the straps	
4.2.2.4 Material requirements	
4.2.2.4.1 Webbing	
4.2.2.4.2 Threads for sewing	

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13.0 Statement of compliance to specification (indicate deviations if any & supporting documents)	

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Supplier's Name, Signature, Stamp and Date

Issued by: Head of Section Tech Stds & Specs

Authorized by: Head of Department, R & D

Signed:

Signed:

Date: 2014-07-08

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