

Test Report

ANSI Z359.11-2021 Safety Requirements for Full Body Harnesses

Report no: 2.23.04.13

Customer: Changzhou Sunnergy Energy Technology Co., Ltd.
Xinbei District, Changzhou-213022
Jiangsu Province
China

Manufacturer: Changzhou Sunnergy Energy Technology Co., Ltd.
as advised by the Customer

Customer order: T/1090

Order received: 29 November 2022

Model: SND20

Dates of tests: 15 March 2023 to 27 April 2023

Signed:



Steven Sum, Laboratory Manager

Issued: 30 April 2023

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Summary of assessment *

Clause	Requirement	Assessment (See Key)
3.1	Design requirements	Ltd
3.1.10	Static Feet First – Lanyard parking attachment element	Pass
3.2	Attachment Element Requirement	
3.2.1	Dorsal	Pass
3.2.1.3.1	Dynamic Feet First	Pass
3.2.1.3.2	Dynamic Head First	Pass
3.2.1.3.3	Static Feet First	Pass
3.2.1.3.4	Fall Arrest Indicator	Pass
3.2.2	Sternal	Pass
3.2.2.3.1	Dynamic Feet First	Pass
3.2.2.3.2	Static Feet First	
3.2.2.3.3	Fall Arrest Indicator	
3.2.3	Frontal	
3.2.3.1.1	Dynamic Feet First	
3.2.3.1.2	Static Feet First	
3.2.4	Shoulder	
3.2.4.1.1	Static Feet First	
3.2.5	Waist, Rear	
3.2.5.2.1	Static Feet First	
3.2.6	Hip	Pass
3.2.6.1.1	Static Feet First	Pass
3.2.7	Suspension Seat	
3.2.7.1.1	Static Feet First	
3.3	Component Requirements	
3.3.1	Load bearing straps	Ltd
3.3.1.2	Strap tensile test	Pass
3.3.1.5	Strap tensile test (after abrasion conditioning)	Pass
3.3.2	Thread and Stitching	Ltd
3.3.3	Connecting Components	NAs
3.3.1.2	Strap tensile test (soft loops)	
3.3.1.5	Strap tensile test (soft loops - after abrasion conditioning)	

Clause	Requirement	Assessment (See Key)
5.1	Marking requirements	Ltd
5.2	Instructions requirements	Ltd

Key

	Shading shows the clauses requested. Any other clauses were not requested.
Pass	Requirement satisfied.
Ltd	Testing requested was insufficient completely to verify compliance with the clause. Refer to the "Result details" section for more information.
Fail	Requirement not satisfied. Refer to the "Result details" section for more information.
NAs	Assessment not carried out.
NAp	Requirement not applicable.
NT	Requested but not tested due to early termination following failure.

* Assessment relates only to those specimens which were tested and are the subject of this report.

Submission details

Product	Quantity	Date received	INSPEC specimen no.
Shoulder straps, part no. 957#	15 m	11 March 2023	2L05901A to 01J (cut into 10 equal lengths)
Leg straps, part no. 10 #	15 m		2L05902A to 02J (cut into 10 equal lengths)
Full body harness, model 1831007E-FD	09		2L06301 to 2L06309

Procedures

The specimens detailed within the submissions above were used for the tests covered by this report.

Testing was performed in accordance with ANSI/ASSP Z359.11-2021 unless otherwise specified below. Reference should be made to the standard when reading this report.

Specimens were tested in the condition as received by INSPEC.

Testing was performed at INSPEC's laboratory in Kunshan, China.

Load bearing straps were tested and reported in INSPEC Test Report 2.23.04.11

Result details**3 Requirements****3.1 Design Requirements**

Specimen 2L06302 was assessed.

- | | | |
|--------------------|--|-------------|
| 3.1.2 | The specimen permanently incorporated a dorsal attachment element. | Pass |
| | <i>The specimen did incorporate other attachment elements. The other attachment elements were located at the sternal and hip location.</i> | |
| | The specimen incorporated a load bearing sub-pelvic strap. | Pass |
| 3.1.3 | All shoulder straps on the specimens came together at the dorsal location and were crossed and attached with a (D-ring) connector. | Pass |
| | Testing of the (D-ring) connector was not requested. | NAs |
| 3.1.4 | The specimen permanently incorporated a back-strap as a mean to control the separation of the shoulder straps on the back of the full body harness. | Pass |
| | When the specimens were mounted on to the torso as per manufacturer's instructions, some portion of the back-strap was located between datum levels G and K. | Pass |
| 3.1.5 /
3.1.5.1 | The specimen was not equipped with modular components or assemblies. | NAp |
| 3.1.5.2 | The specimen was not equipped with attachment element extenders; therefore, this clause is not applicable. | NAp |
| 3.1.6 | The specimen was not integrated into a vest or garment. | NAp |
| 3.1.7 | The specimen was equipped with two fall arrest indicators at the dorsal area. | Pass |
| | Both fall arrest indicators deployed during dynamic testing defined in section 3.2 when attached to the dorsal attachment element. | Pass |
| | It was visually possible to inspect both fall arrester indicators. | Pass |
| 3.1.7.1 | The specimen was not equipped with other fall arrest indicators. | NAp |
| 3.1.8 | The specimen was not equipped with connecting subsystem combinations. | NAp |
| 3.1.9 | The specimen did include strap retainers (keepers) which serve to control the loose ends of straps. | Pass |

3.1.10 Static Feet First Test - Lanyard Parking Attachment Element

Specimen 2L06301 was assessed.

The specimen was equipped with two lanyard parking attachment elements. Both lanyard parking attachment elements did not differ in design.

During the static feet-first tests, the lanyard parking attachment element disengagement load was 105.7 pounds. This value was less than the maximum 120 pounds permitted.

Pass

Specimen 2L06302 was assessed.

3.1.11 It was not possible to remove elements of the full body harness that support the shoulders / upper torso from those that support the legs / lower torso.

Pass

3.1.12 The dorsal attachment element was located laterally along the vertical centreline of the full body harness.

Pass

The sternal attachment element was located laterally within 0.4 inches (10 mm) of the vertical centreline of the full body harness.

Pass

3.1.13 The specimen consists of a single point sternal attachment element.

NAp

3.1.14 The specimen did include a sub-pelvic strap.

NAp

3.2 Attachment Element Requirements

3.2.1 Dorsal

Specimen 2L06302 was assessed.

The dorsal attachment element was located in the dorsal area shown in figure 2 of the standard.

Pass

The dorsal attachment element was specified in the User Instructions to be used for fall arrest.

Pass

3.2.1.1 The dorsal attachment was specified in the User Instructions to be used in travel restraint or rescue.

3.2.1.2 During the dynamic performance test, it was confirmed that the design of the full body harness directed the load through the shoulder straps supporting the user and around the thighs.

Pass

3.2.1.3 Dorsal Attachment Element Requirements

3.2.1.3.1 Dynamic Feet First Test

Specimen 2L06302 was assessed.

During the dynamic feet-first test, the test torso was not released.

Pass

The harness did support the test torso for a period of five minutes post fall.

Pass

During this period, the angle of the test torso to vertical was 9 degrees. This value was less than the maximum 30 degrees permitted.

Pass

Both fall arrest indicators deployed visibly and permanently.

Pass

Full body harness stretch was 10.6 inches.

Full body harness stretch stated in the manufacturer's instructions was 18 inches.

Full body harness stretch shall not exceed 18 inches, or that which is stated in the manufacturer's instructions, whichever is less, was satisfied

Pass

3.2.1.3.2 Dynamic Head First Test

Specimen 2L06303 was assessed.

During the dynamic head-first test, the test torso was not released.

Pass

The harness did support the test torso for a period of five minutes post fall.

Pass

During this period, the angle of the test torso to vertical was 8 degrees. This value was less than the maximum 30 degrees permitted.

Pass

Both fall arrest indicators deployed visibly and permanently.

Pass

3.2.1.3.3 Static Feet First Test

Specimen 2L06304 was assessed.

During the static feet-first test, the test torso was not released from the harness.

Pass

During the static feet-first test, all adjusters did not slip.

Pass

All straps of the full body harness did not show signs of tearing.

Pass

3.2.1.3.4 Fall Arrest Indicator Test

Specimen 2L06305 was assessed.

When tested in accordance with 4.3.6.1 using the dorsal attachment element, both fall arrest indicators deployed visibly and permanently.

Pass

3.2.2 Sternal

Specimen 2L06306 was assessed.

The sternal attachment element was specified in the User Instructions to be used as an alternate fall arrest attachment.

3.2.2.1 The sternal attachment element was specified in the User Instructions to be used in travel restraint or rescue.

3.2.2.2 During the dynamic performance test, it was confirmed that the design of the full body harness directed the load through the shoulder straps supporting the user and around the thighs.

Pass

3.2.2.3 Sternal Attachment Element Requirements

3.2.2.3.1 Dynamic Feet First Test

Specimen 2L06306 was assessed.

During the dynamic feet-first test, the test torso was not released.

Pass

The harness did support the test torso for a period of five minutes post fall.

Pass

During this period, the angle of the test torso to vertical was 25 degrees. This value was less than the maximum 50 degrees permitted.

Pass

Full body harness stretch was 9.7 inches.

Full body harness stretch stated in the manufacturer's instructions was 18 inches.

Full body harness stretch shall not exceed 18 inches, or that which is stated in the manufacturer's instructions, whichever is less, was satisfied

Pass

3.2.2.3.2 Static Feet First Test

Specimen 2L06307 was assessed.

During the static feet-first test, the test torso was not released from the harness.

Pass

During the static feet-first test, all adjusters did not slip.

Pass

All straps of the full body harness did not show signs of tearing.

Pass

3.2.6 Hip

Specimen 2L06308 was assessed.

The hip attachment elements were specified in the User Instructions to be used as a pair. **Pass**

The hip attachment elements were specified in the User Instructions to be used solely for work positioning or travel restraint. **Pass**

The hip attachment elements were specified in the User Instructions not to be used for fall arrest. **Pass**

3.2.6.1 Hip Attachment Element Requirements

3.2.6.1.1 Static Feet First Test

Specimen 2L06308 was assessed.

During the static feet-first test, the test torso was not released from the harness. **Pass**

During the static feet-first test, all adjusters did not slip. **Pass**

All straps of the full body harness did not show signs of tearing. **Pass**

3.3 Components Requirements

3.3.1 Load Bearing Straps

Specimen 2L06301 was assessed.

- 3.3.1.1 The minimum widths of the load bearing straps were 1.73 inches (44 mm). This is more than the minimum 1-5/8 inches (41 mm) specified. **Pass**
- 3.3.1.2 Strap specimens 2L05901A to 01E and 2L05902A to 02E withstood the tensile tests of 5,000 pounds applied for 1-minute without breaking. **Pass**
- 3.3.1.3 The material and characteristics of load-bearing straps were not assessed. Manufacturer to certify. **NAs**
- 3.3.1.4 The ends of load bearing straps were hot-cut to prevent fraying. **Pass**
- 3.3.1.5 Following abrasion conditioning, strap specimens 2L05901F to 01J and 2L05902F to 02J withstood the tensile tests of 3,600 pounds applied for 1-minute without breaking. **Pass**
- 3.3.1.6 Straps in contact with metal connectors at attachment elements were protected from wear. Plastic sleeves were used. **Pass**
- 3.3.1.7 There were no buckle and eyelet type adjusters used in the specimens **NAp**

3.3.2 Thread and Stitching

Specimen 2L06301 was assessed.

- 3.3.2.1 The material and characteristics of threads used was not assessed. Manufacturer to certify. **NAs**
- 3.3.2.2 All types of stitching were not assessed. Manufacturer to certify. **NAs**
- 3.3.2.3 Threads used for sewing the harnesses were white colour. This contrasted with the yellow and black colours of the load bearing straps. **Pass**

3.3.3 Connecting Components

Specimen 2L06301 was assessed.

- 3.3.3.1 Testing of connecting components was not requested. **NAs**
- 3.3.3.2 Soft loop attachment was not used. **NAp**
- 3.3.3.3 Soft loop attachment was not used. **NAp**
- 3.3.3.4 Soft loop attachment was not used. **NAp**

5 Marking and Instructions

5.1 Marking Requirements

Specimen 2L06301 was assessed.

5.1.1	-	Markings shall be in English.	Pass
	a	The legibility and attachment of required markings shall be designed to endure for the life of the component, subsystem or system been marked. Mfr to certify.	NAs
5.1.2		<i>Markings were legible and attached after testing completed</i>	-
	b	When pressure-sensitive labels are used, they shall comply with the applicable provision of the reference in Section 7.6. Mfr to certify.	NAs
	c	When labels are concealed, a permanent marking shall be visible to the unaided eye that describes how to access the labels.	Pass
	a	The material of construction; [Polyester]	Pass
	b	The size or range of sizes; [L-XL]	Pass
	c	Part number and/or model designation; [1831007E-FD]	Pass
	d	The month and year of manufacture; [11/2022]	Pass
	e	The manufacturer's name or logo; [PALOMA]	Pass
	f	An identifying number, unique to each individual FBH produced by the manufacturer; [000011]	Pass
	g	A warning to follow Mfr instructions included with the equipment at the time of shipment from the Mfr.	Pass
	h	A label permanently attached to the lanyard parking attachment which either state "Park Lanyard Here. See instructions." verbally or conveys this by means of a pictogram.	Pass
5.1.3	i	If the harness stretch measurement for the frontal attachment exceeds 18 inches (457 mm) in 3.2.3.1.1, then harness shall include a warning with the stated stretch out distance.	NAp
	j	If the FBH includes an integrated D-ring extender, a warning shall be included on the D-ring extender that increased free fall should be considered when using this product.	NAp
	k	Applicable pictogram in Figure 12 with a minimum height of 0.8 inches (20 mm) or applicable pictograms from CSA Z259.10-18 Figure 1 – Figure 8.	Pass
	l	A label as defined in Figure 11a:	Pass
		1) The label shall be placed in a prominent location on the FBH	Pass
		2) If the label is part of a label pack or book, the label shall be placed so that the user will see it first.	Pass
		3) The label may be modified to include the mark of the qualification body. And may include a part number located on the label outside of the border as needed by the manufacturer as defined in figure 11a and 11b.	NAp

5.2 Instruction Requirements

The instructions to users have been assessed as detail below, with reference only to the relevant requirements of the Standard.

INSPEC Technical Services has not assessed these instructions with respect to claims made by the manufacturer outside of these requirements, and therefore accepts no responsibility for the legitimacy of any such claims.

- 5.2.1** Instructions shall be provided to the user in English and affixed to the equipment at the time of shipment from the manufacturer. **Ltd**

User Instructions in English were provided electronically and used for assessment

5.2.2 Instructions shall contain the following information:

- | | | |
|--------------|--|-------------|
| a) | Annex A in its entirety, either incorporated in the Mfr's instructions, as an appendix to the Mfr's instructions, or separately provided with the product along with the Mfr's instructions. | Pass |
| b) | A statement that the Mfr's instructions shall be provided to the users. | Pass |
| c) | Manufacturer's name, address and telephone number. | Pass |
| d) | Manufacturer's part number and/or model designation for the equipment. | Pass |
| e) | Intended use and purpose of the equipment. | Pass |
| f) | Length of FBH Stretch H _s , and warning to include other factors such as D-ring/connector length, setting of the user's body and all other contributing elements when calculating fall clearance. | Pass |
| g) | Proper method of use and limitations of the equipment. | Pass |
| h) | Illustrations showing locations and markings on the equipment. | Pass |
| i) | An illustration demonstrating the load indicator before and after deployment. | Pass |
| j) | Reproduction of printed information on all markings. | Pass |
| k) | Inspection procedures (including frequency) required to assure the equipment is in serviceable condition and operating correctly. | Pass |
| l) | Criteria for discarding equipment that fails inspection. | Pass |
| m) | Procedures for cleaning, maintenance and storage. | Pass |
| n) | Reference to ANSI/ASSE Z359.11 (full body harnesses) and applicable regulations governing occupational safety. | Pass |
| o) | Acceptable use for all attachment elements (see Annex A) | Pass |
| 5.2.3 | Instructions shall require that only the equipment Mfr, or persons or entities authorized in writing by the Mfr, make repairs to the equipment. | Pass |
| 5.2.4 | Instructions shall require the user to remove equipment from service if it has been subjected to the forces of arresting a fall and will include information on inspection of load indicators. | Pass |

- 5.2.5** Instructions shall require the user to have a rescue plan and means at hand to implement it when using the FBH for fall arrest. **Pass**
- 5.2.6** Instructions shall provide warnings against:
- a) Altering equipment **Pass**
 - b) Misusing equipment **Pass**
 - c) Using combinations of components or sub-systems, or both, which may affect or interfere with the safe function of each other. **Pass**
 - d) Exposing the equipment to chemicals, heat, flames or other environmental conditions, which may produce a harmful effect and to consult the manufacturer in case of doubt. **Pass**
 - e) Using the equipment around moving machinery and electrical hazards. **Pass**
 - f) Using the equipment near sharp edges or abrasive surfaces. **Pass**
 - g) Exposure to light (UV degradation) **Pass**

Estimates of the uncertainty of measurement

Clause	Test	Uncertainty	
3.1.1	Dorsal attachment	Not applicable	
3.1.2	Sub-pelvic strap	Not applicable	
3.1.3	Shoulder straps	Not applicable	
	Connector	See report	
3.1.4	Waist belt or back strap – control of separation of shoulder straps	Not applicable	
3.1.5	Modular components or assemblies, as appropriate	Not applicable	
3.1.5.1	Modular components.	See report	
3.1.5.2	Attachment element extender	Length	±0.1 inches
3.1.6	Full body harness integrated into a vest	Not applicable	
3.1.7	Fall Arrest Indicator	Not applicable	
3.1.8	Harness with attached connecting subsystem combinations	See report	
3.1.9	Strap retainers (keepers)	Not applicable	
3.1.10	Lanyard parking attachment element - Disengagement load	±3.4%	
3.1.11	Support – shoulders/upper torso	Not applicable	
3.1.12	Location of single point attachment	Not applicable	
3.1.13	Sternal attachment – bilateral elements	Not applicable	
3.1.14	Sub-pelvic straps	Not applicable	
3.2.1	Dorsal attachment element	Not applicable	
3.2.1.3.1	Dorsal attachment element	Dynamic Feet First	±3.4%
3.2.1.3.2		Dynamic Head First	±3.4%
3.2.1.3.3	Dorsal attachment element	Static strength	See Note 1
		Slippage	±1.3%
3.2.1.3.4	Fall Arrest Indicator test – dorsal attachment	See Note 1	
3.2.2	Sternal attachment element	Not applicable	
3.2.2.3.1	Sternal attachment element	Dynamic Feet First	±3.4%
3.2.2.3.2	Sternal attachment element	Static strength	See Note 1
		Slippage	±1.3%
3.2.2.3.3	Fall Arrest Indicator test – sternal attachment	See Note 1	
3.2.3	Frontal attachment element	Not applicable	
3.2.3.1.1	Frontal attachment element	Dynamic Feet First	±3.4%
3.2.3.1.2	Frontal attachment element	Static strength	See Note 1
		Slippage	±1.3%
3.2.4	Shoulder attachment element	Not applicable	

3.2.4.1.1	Shoulder attachment element	Static strength	See Note 1
		Slippage	±1.3%
3.2.5	Waist, Rear attachment element		Not applicable
3.2.5.2.1	Waist, Rear attachment element	Static strength	See Note 1
		Slippage	±1.3%
3.2.6	Hip attachment element		Not applicable
3.2.6.1.1	Hip attachment element	Static strength	See Note 1
		Slippage	±1.3%
3.2.7	Suspension Seat attachment element		Not applicable
3.2.7.1.1	Suspension Seat attachment element	Static strength	See Note 1
		Slippage	±1.3%
3.3.1.1	Straps	Width	±1.3%
3.3.1.2	Straps	Static strength	See Note 1
3.3.1.3	Straps – material and characteristics		Not applicable
3.3.1.4	Straps - terminations		Not applicable
3.3.1.5	Straps (after abrasion)	Static strength	See Note 1
3.3.1.6	Straps – contact with metal connectors		Not applicable
3.3.1.7	Buckle & eyelet type adjusters	Spacing	±0.1 mm
3.3.2.1	Threads and stitching – material		Not applicable
3.3.2.2	Lock stitching		Not applicable
3.3.2.3	Stitching – contrasting colour		Not applicable
3.3.3.1	Connecting components (except soft loops)		See report
3.3.3.2	Soft loop attachments		Not applicable
3.3.3.3	Soft loop	Static strength	See Note 1
	Soft loop (after abrasion)	Static strength	See Note 1
3.3.3.4	Soft loop attachments – protection from wear		Not applicable
5.1	Marking requirements		Not applicable
5.2	Instructions requirements		Not applicable

Note 1 The acceptance criterion for this test is a straightforward “Pass/Fail”, rather than a numerical value. Consequently, as there is no value to be reported, uncertainty has not been reported either.

Note 2 The uncertainty value is based on a standard uncertainty multiplied by a coverage factor $k = 2$, which provides for a confidence level of approximately 95%. Values expressed as a percentage (%) are relative.

Note 3 It should be noted that the above values have not been taken into account when making assessment to the pass/fail criteria.

ANNEX

This Annex comprises one section.

1. Photograph of the product tested. (1 page)

END OF REPORT

Changzhou Sunnergy Energy Technology Co., Ltd.
Full body harness, model SND20

