

Gravitec Systems Inc. 21291 Urdahl Road NW Poulsbo, WA 98370



Per ANSI Z359.7, Qualification Testing is initial testing conducted on new or revised products consisting of a

minimum of 3 test samples. Verification Testing consists of

a minimum of 1 sample and is intended to ensure continued

product compliance for an existing product that has gone

Qualification Testing

Verification Testing

Informational Testing



Test Report #: 210138-AHD-02 Customer Contact: Daniel Minehart Client Name: SkySaver, Inc.

Service Address: Gravitec Systems Inc. Client Address: 729 Ocean Parkway

21291 Urdahl Road NW Poulsbo, WA 98370

Brooklyn, NY 11230

Tε	st Sample Informa	tion
(	Evacuation Harness	

for assisted or self

Full Body Harness

meeting Z359.11 fall

arrest requirements

rescue only

Manufacturer:

SkySaver, Inc.

Description:

See "Sampling Details" below

Model/Part #:

Lot/Batch #: Serial #:

Sample Receipt Date:

and Sample Condition:

22 (assigned)

X

5/20/2015

**Environmental Conditioning:** 

Sampling Details/Deviations

Ambient, procedure does not require conditioning

through Qualification Testing in the past. Evacuation harness featuring a metal mounting plate in dorsal area for attachment of automatic descender

Sample is constructed with:

a heavier weight, thicker, courser and stiffer weave webbing than webbing commonly used for seat belts,

\* the edges of the 6 slots of the mounting plate were wrapped (by client) with duct tape to shield the webbing connections from the metal edges of the plate.

Sample received in new and good working condition. No previous tests performed on this sample.

### **Test Information**

## Testing Method (Standard and Section): ANSI Z359.4-2013, 4.3.1.2 Dynamic Performance Testing (for Rescue Attachments on Full Body Harnesses and Evacuation Harnesses)

- 1. The drop test structure, test torso, test lanyard of 4 feet (1.2m) length, and quick release mechanism shall be in accordance with 4.1.1, 4.1.3, 4.1.5, and 4.1.9 respectively.
- 2. The test sample shall be put on the test torso as though the torso was a person and adjusted for a snug fit.
- 3. Attach one end of the test lanyard to the appropriate attachment element of the sample and the other end to the test structure.
- 4. Raise the test torso to a level, which will allow a 2 foot (0.6m) free fall upon release of the test torso.
- 5. The test torso shall be lifted to a point no more than 12 inches (305mm) horizontally from the anchorage.
- 6. Release the torso with the quick release mechanism.
- 7. After the drop, the torso is to remain suspended for a period of one minute.
- 8. During the post fall suspension period, measure the angle at rest.
- 9. After test, evaluate the sample according to 3.2.2.1.3 or 3.2.2.2.6 appropriate (for full body or evacuation harness).

### Acceptance Criteria: ANSI Z359.4-2013, 3.2.2.2.6 Dynamic Performance of Evacuation Harness

- 1. The harness shall not release the test torso when dynamically tested.
- No load bearing element shall break or separate from the self-rescue harness.
- The test torso shall remain suspended for one minute after drop testing.
- 4. The angle at rest between the torso vertical centerline and the vertical shall not exceed 30 degrees after the torso comes to rest.

Gravitec Test Procedure ID: TP ANSI Z359.4-2013, 4.3.1.2 DPT HAR

Job #: 210138 Test Code: AHD Test ID#: 2

File Name: 210138-AHD-02

Test Weight (lbs): 220 Free Fall (in): Load Cell: C0\_251081 DAQ Module: 1521EAF

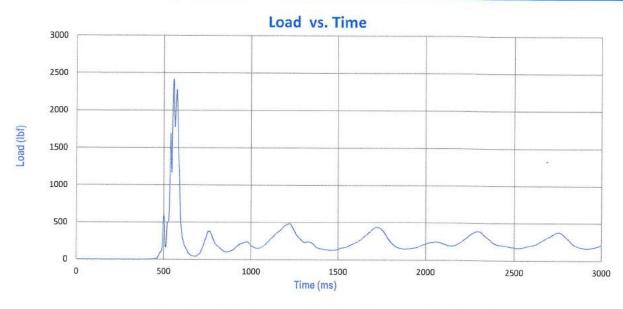
Test Date: 6/4/2015 Time: 2:02 PM Temp. (°F): 74

Humidity (%): 48

### **Test Instrumentation**

ANSI Compliant Test Structure, 5k Load Cell/Data Acquisition System, ANSI Compliant 220 lbs ± 2 lbs Test Torso, ANSI Compliant Test lanyard, Quick Release Mechanism, Portable Floor Scale, Zip Level, Digital Protractor, Tape Measure, Digital Timer, Digital Thermometer, miscellaneous connecting hardware

## **Drop Test Results**



Torso Not Released: No Load Bearing Breakage: Time Requirement (sec): Angle at Rest (\*): Peak Force (lbf):

e Criteria	Test Results	Exp. Uncertainty
CK	CHECK	
CK	CHECK	
Minimum	> 61	± 1
Maximum	22.1	± 0.8
mation	2414.7	± 6.9
	CK CK Minimum Maximum	CK         CHECK           CK         CHECK           Minimum         > 61           Maximum         22.1

Pass/Fail	
PASS	
PASS	
PASS	
PASS	
N/A	

Test Comments/Notes:

None

Opinions and Interpretations:

None

Manager Name: Dave Lough

Signature:

ate: 7

**Engineer Name:** 

Larry Cimino, PE

Signature:

Date: 7-06

The results of this test only apply to the item tested.

All instrumentation used in testing is traceable to NIS

Reported uncertainties represent expanded uncertainties expressed at approximately the 95% level of confidence using a coverage factor of k=2. Where limits of acceptability are applicable, false accept risk is limited to 2% or less by guard-banding the limit of acceptability with the expanded uncertainty value.

This laboratory is accredited to ISO 17025 by ACLASS ANSI-ASQ National Accreditation Board for tests conducted under its scope of accreditation.

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Gravitec Systems Inc. 21291 Urdahl Road NW Poulsbo, WA 98370



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Qualification Testing

Verification Testing

Informational Testing



Test Report #: 210138-AHD-03 Customer Contact: Daniel Minehart

Service Address: Gravitec Systems Inc.

Client Name: SkySaver, Inc. Client Address: 729 Ocean Parkway

21291 Urdahl Road NW

Poulsbo, WA 98370

Brooklyn, NY 11230

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**Evacuation Harness** 

for assisted or self

**Full Body Harness** 

meeting Z359.11 fall

arrest requirements

rescue only

Manufacturer:

SvkSaver, Inc.

Description:

See "Sampling Details" below

Model/Part #:

Lot/Batch #: Serial #:

Sample Receipt Date:

23 (assigned)

5/20/2015

**Environmental Conditioning:** Sampling Details/Deviations and Sample Condition:

X

Ambient, procedure does not require conditioning

through Qualification Testing in the past. Evacuation harness featuring a metal mounting plate in dorsal area for attachment of automatic descender Sample is constructed with:

- \* a heavier weight, thicker, courser and stiffer weave webbing than webbing commonly used for seat belts,
- Cobra buckles,
- \* the edges of the 6 slots of the mounting plate were wrapped (by client) with duct tape to shield the webbing connections from the metal edges of the plate.

Sample received in new and good working condition. No previous tests performed on this sample.

#### **Test Information**

## Testing Method (Standard and Section): ANSI Z359.4-2013, 4.3.1.2 Dynamic Performance Testing (for Rescue Attachments on Full Body Harnesses and Evacuation Harnesses)

- 1. The drop test structure, test torso, test lanyard of 4 feet (1.2m) length, and quick release mechanism shall be in accordance with 4.1.1, 4.1.3, 4.1.5, and 4.1.9 respectively.
- 2. The test sample shall be put on the test torso as though the torso was a person and adjusted for a snug fit.
- 3. Attach one end of the test lanyard to the appropriate attachment element of the sample and the other end to the test structure.
- 4. Raise the test torso to a level, which will allow a 2 foot (0.6m) free fall upon release of the test torso.
- 5. The test torso shall be lifted to a point no more than 12 inches (305mm) horizontally from the anchorage.
- Release the torso with the quick release mechanism.
- 7. After the drop, the torso is to remain suspended for a period of one minute.
- 8. During the post fall suspension period, measure the angle at rest.
- 9. After test, evaluate the sample according to 3.2.2.1.3 or 3.2.2.2.6 appropriate (for full body or evacuation harness).

### Acceptance Criteria: ANSI Z359.4-2013, 3.2.2.2.6 Dynamic Performance of Evacuation Harness

- 1. The harness shall not release the test torso when dynamically tested.
- No load bearing element shall break or separate from the self-rescue harness.
- The test torso shall remain suspended for one minute after drop testing.
- 4. The angle at rest between the torso vertical centerline and the vertical shall not exceed 30 degrees after the torso comes to rest.

#### Gravitec Test Procedure ID: TP ANSI Z359.4-2013, 4.3.1.2 DPT HAR

Job #: 210138 Test Code: AHD Test ID #: 3

File Name: 210138-AHD-03

Test Weight (lbs): Free Fall (in): 24 Load Cell:

B3 253074

Test Date: 7/1/2015 4:22 PM Time:

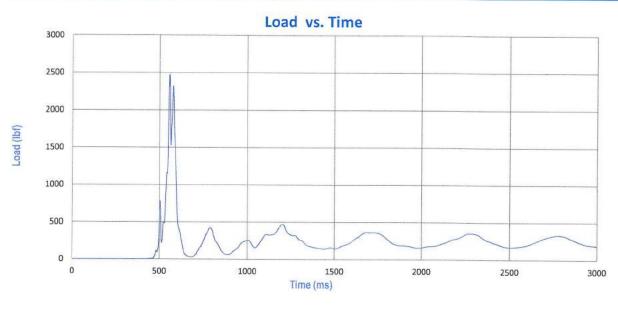
71

Temp. (°F): DAQ Module: 1521EBB Humidity (%):

#### **Test Instrumentation**

ANSI Compliant Test Structure, 5k Load Cell/Data Acquisition System, ANSI Compliant 220 lbs ± 2 lbs Test Torso, ANSI Compliant Test lanyard, Quick Release Mechanism, Portable Floor Scale, Zip Level, Digital Protractor, Tape Measure, Digital Timer, Digital Thermometer, miscellaneous connecting hardware

### **Drop Test Results**



Torso Not Released: No Load Bearing Breakage: Time Requirement (sec): Angle at Rest ("): Peak Force (lbf):

Acceptance Crite	ria	Test Results	Exp. Uncertainty
CHECK		CHECK	
CHECK		CHECK	
60 Minin	num	> 61	± 1
30.0 Maxir	num	21.4	± 0.8
For information		2477.0	± 6.9

Pass/Fail	
PASS	
PASS	
PASS	
PASS	
N/A	

Test Comments/Notes:

None

Opinions and Interpretations:

None

Manager Name: Dave Lough

Signature:

Data:

**Engineer Name:** 

Larry Cimino, PE

Signature:

Date

7-0675

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Gravitec Systems Inc. 21291 Urdahl Road NW Poulsbo, WA 98370





Test Report #:

210133-THS-04

Customer Contact: Daniel Minehart

Service Address: Gravitec Systems Inc.

Client Name: SkySaver, Inc. Client Address: 729 Ocean Parkway

21291 Urdahl Road NW

Brooklyn, NY 11230

Poulsbo, WA 98370

### Test Sample Information

Manufacturer:

SkySaver, Inc.

Description:

Evacuation harness featuring a metal mounting plate in dorsal

area for attachment of automatic descender

Model/Part #:

---

Lot/Batch #:

Serial #:

04 (assigned)

Sample Receipt Date:

4/7/2015

Sampling Details/Deviations

Sample is constructed with:

and Sample Condition:

a heavier weight, thicker, courser and stiffer weave webbing than webbing commonly used

for seat belts.

\* eased or beveled metal edges in the 6 slots of the mounting plate and duct tape wrapping the edge to shield the webbing connections from the metal edges of the plate.

Sample received in new and good working condition. No previous tests performed on this sample.

#### **Test Information**

# Testing Method (Applicable Standard and Section): ASTM F1772-12, 12.1.2 Upright Position of the Torso

- 1. The harness shall be loaded up to 800±10N in the upright position of the torso. Under this load, adjust the torso and harness so that the attachment points are approximately symmetric about the vertical axis of the torso.
- 2. With the torso in an upright position, a tensile force shall be applied to the lower ring, increasing to 16 +0.3/-0 kN (3,597 +67/0 lbf) over a period of  $2 \pm 0.25$  min. This tensile force shall be held for a  $1 \pm 0.25$  min.
- 3. The tension then shall be completely released over a maximum of 1 min.
- 4. The tensile force shall be reapplied and increased to 16 +0.3/-0 kN (3,597 +67/0 lbf) as before and held for 3 ± 0.25 min before release.

### Acceptance Criteria (Applicable Standard and Section):

- No load-bearing part shall break completely.
- 2. The harness shall not be released from the torso.
- 3. The webbing in all buckles and adjusting devices shall slip no more than 20 mm (0.7874 inches).

210133 Job #: Test Code: THS

Test Date:

4/10/2015

Load Cell:

SN 251081 (C0)

Test ID #: 4

Time: Temp. (°F):

11:26 AM 72

DAQ Module:

1445A1C

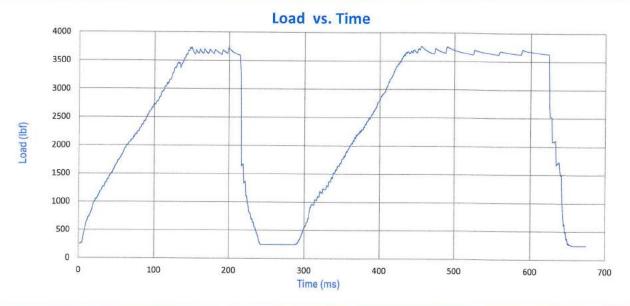
File Name: 210133-THS-04

Humidity (%): 35

### Test Instrumentation

5k Load Cell/Data Acquisition System, ANSI Compliant Test Structure, Hydraulic Ram, ANSI Compliant Test Torso, Digital Timer, Misc. Connecting Hardware

### **Test Data Graph**



## **Test Results and Comments**

	Acceptance Criteria	<b>Test Results</b>	Exp. Uncertainty	Pass/Fail
Tensile Load (lbf):	3,597 Minimum (16 kN)	3654.7 Average	± 6.9	PASS
Time Requirement (sec):	45 Minimum	67	± 1	FAGG
Tensile Load (lbf):	3,597 Minimum (16 kN)	3663.6 Average	± 6.9	DACC
Time Requirement (sec):	165 Minimum	190	± 1	PASS
Slippage (in):	0.789 Maximum	0 to 0.25	± 0.125	PASS
Complete breakage of load-b	earing part	None	-	PASS
Release of test torso		Not Released	. [	PASS

#### Test Comments/Notes:

A mock-up descender with fixed cable (supplied by client) was installed on the mounting plate to simulate actual harness use.

The procedures of this test were performed under ambient conditions per Section 11.1. F1772 references the UIAA torso; this test was conducted with the ANSI Z359 test torso. The ANSI torso has straight legs and sloped shoulders; the UIAA torso that has bent legs and straight shoulders.

Opinions and Interpretations:

None

Manager Name: Dave Lough

Engineer Name: Larry Cimino, PE

Signature:

Signature:

Date:

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Date: 4-17-2015

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GRAVITEC







Gravitec Systems Inc. 21291 Urdahl Road NW Poulsbo, WA 98370





Test Report #:

210133-THS-05

Customer Contact: Daniel Minehart

Service Address: Gravitec Systems Inc.

Client Name: Client Address:

SkySaver, Inc. 729 Ocean Parkway

Brooklyn, NY 11230

21291 Urdahl Road NW Poulsbo, WA 98370

## **Test Sample Information**

Manufacturer:

SkySaver, Inc.

Description:

Evacuation harness featuring a metal mounting plate in dorsal

area for attachment of automatic descender

Model/Part #: Lot/Batch #:

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Serial #:

05 (assigned)

Sample Receipt Date:

4/7/2015

Sampling Details/Deviations

Sample is constructed with:

and Sample Condition:

\* a heavier weight, thicker, courser and stiffer weave webbing than webbing commonly used

\* eased or beveled metal edges in the 6 slots of the mounting plate and duct tape wrapping the edge to shield the webbing connections from the metal edges of the plate.

Sample received in new and good working condition. No previous tests performed on this sample.

#### **Test Information**

# Testing Method (Applicable Standard and Section): ASTM F1772-12, 12.1.2 Upright Position of the Torso

- 1. The harness shall be loaded up to 800±10N in the upright position of the torso. Under this load, adjust the torso and harness so that the attachment points are approximately symmetric about the vertical axis of the torso.
- 2. With the torso in an upright position, a tensile force shall be applied to the lower ring, increasing to 16 +0.3/-0 kN (3,597 +67/0 lbf) over a period of  $2 \pm 0.25$  min. This tensile force shall be held for a  $1 \pm 0.25$  min.
- 3. The tension then shall be completely released over a maximum of 1 min.
- 4. The tensile force shall be reapplied and increased to 16 +0.3/-0 kN (3,597 +67/0 lbf) as before and held for 3  $\pm$  0.25 min before release.

#### Acceptance Criteria (Applicable Standard and Section):

- 1. No load-bearing part shall break completely.
- 2. The harness shall not be released from the torso.
- 3. The webbing in all buckles and adjusting devices shall slip no more than 20 mm (0.7874 inches).

Job #: 210133 Test Date:

4/10/2015

Load Cell:

SN 251081 (C0)

Test Code: THS

Time:

2:11 PM

DAQ Module:

1445A1C

Test ID #: 5

Temp. (°F):

72

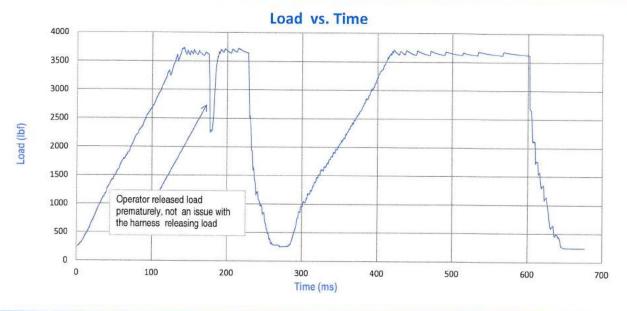
File Name: 210133-THS-05

Humidity (%): 35

### Test Instrumentation

5k Load Cell/Data Acquisition System, ANSI Compliant Test Structure, Hydraulic Ram, ANSI Compliant Test Torso, Digital Timer, Misc. Connecting Hardware

### **Test Data Graph**



### **Test Results and Comments**

	Acceptance Criteria	<b>Test Results</b>	Exp. Uncertainty	Pass/Fail
Tensile Load (lbf):	3,597 Minimum (16 kN)	3662.1 Average	± 6.9	PASS
Time Requirement (sec):	45 Minimum	77	± 1	PASS .
Tensile Load (lbf):	3,597 Minimum (16 kN)	3647.6 Average	± 6.9	DAGO
Time Requirement (sec):	165 Minimum	184	± 1	PASS
Slippage (in):	0.789 Maximum	0 to 0.25	± 0.125	PASS
Complete breakage of load-b	earing part	None	- [	PASS
Release of test torso		Not Released	•	PASS

#### **Test Comments/Notes:**

A mock-up descender with fixed cable (supplied by client) was installed on the mounting plate to simulate actual harness use. The procedures of this test were performed under ambient conditions per Section 11.1. F1772 references the UIAA torso; this test was conducted with the ANSI Z359 test torso. The ANSI torso has straight legs and sloped shoulders; the UIAA torso that has bent legs and straight shoulders.

### Opinions and Interpretations:

None

Manager Name: Dave Lough

Date

**Engineer Name:** 

Larry Cimino, PE

Signature:

Signature:

Date: 4-/

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product compliance for an existing product that has gone



Test Report #: 210138-AHD-04 Customer Contact: Daniel Minehart

Service Address:

Client Name: SkySaver, Inc. Client Address: 729 Ocean Parkway

21291 Urdahl Road NW

Brooklyn, NY 11230

X

Qualification Testing

Verification Testing

Informational Testing

Poulsbo, WA 98370

Gravitec Systems Inc.

### **Test Sample Information**

**Evacuation Harness** 

for assisted or self

**Full Body Harness** 

meeting Z359.11 fall

arrest requirements

rescue only

Manufacturer:

SkySaver, Inc.

Description:

See "Sampling Details" below

Model/Part #: Lot/Batch #:

Serial #:

24 (assigned)

Sample Receipt Date:

5/20/2015

**Environmental Conditioning:** Sampling Details/Deviations and Sample Condition:

Ambient, procedure does not require conditioning

through Qualification Testing in the past.

Evacuation harness featuring a metal mounting plate in dorsal area for attachment of automatic descender Sample is constructed with:

- \* a heavier weight, thicker, courser and stiffer weave webbing than webbing commonly used for seat belts,
- Cobra buckles,
- \* the edges of the 6 slots of the mounting plate were wrapped (by client) with duct tape to shield the webbing connections from the metal edges of the plate.

Sample received in new and good working condition. No previous tests performed on this sample.

### **Test Information**

## Testing Method (Standard and Section): ANSI Z359.4-2013, 4.3.1.2 Dynamic Performance Testing (for Rescue Attachments on Full Body Harnesses and Evacuation Harnesses)

- 1. The drop test structure, test torso, test lanyard of 4 feet (1.2m) length, and quick release mechanism shall be in accordance with 4.1.1, 4.1.3, 4.1.5, and 4.1.9 respectively.
- 2. The test sample shall be put on the test torso as though the torso was a person and adjusted for a snug fit.
- Attach one end of the test lanyard to the appropriate attachment element of the sample and the other end to the test structure.
- Raise the test torso to a level, which will allow a 2 foot (0.6m) free fall upon release of the test torso.
- 5. The test torso shall be lifted to a point no more than 12 inches (305mm) horizontally from the anchorage.
- 6. Release the torso with the quick release mechanism.
- 7. After the drop, the torso is to remain suspended for a period of one minute.
- 8. During the post fall suspension period, measure the angle at rest.
- 9. After test, evaluate the sample according to 3.2.2.1.3 or 3.2.2.2.6 appropriate (for full body or evacuation harness).

## Acceptance Criteria: ANSI Z359.4-2013, 3.2.2.2.6 Dynamic Performance of Evacuation Harness

- The harness shall not release the test torso when dynamically tested.
- No load bearing element shall break or separate from the self-rescue harness.
- The test torso shall remain suspended for one minute after drop testing.
- 4. The angle at rest between the torso vertical centerline and the vertical shall not exceed 30 degrees after the torso comes to rest.

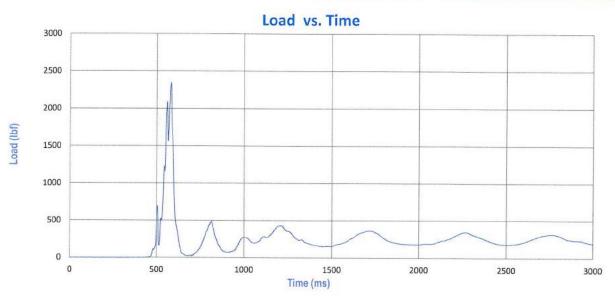
#### Gravitec Test Procedure ID: TP ANSI Z359.4-2013, 4.3.1.2 DPT HAR

Job #: 210138 Test Weight (lbs): 220 Test Date: 7/2/2015 Test Code: AHD Free Fall (in): Time: 11:59 AM Test ID #: 4 Load Cell: B3 253074 Temp. (°F): 71 File Name: 210138-AHD-04 DAQ Module: 1521EBB Humidity (%): 47

#### Test Instrumentation

ANSI Compliant Test Structure, 5k Load Cell/Data Acquisition System, ANSI Compliant 220 lbs ± 2 lbs Test Torso, ANSI Compliant Test lanyard, Quick Release Mechanism, Portable Floor Scale, Zip Level, Digital Protractor, Tape Measure, Digital Timer, Digital Thermometer, miscellaneous connecting hardware

## **Drop Test Results**



Torso Not Released: No Load Bearing Breakage: Time Requirement (sec): Angle at Rest (\*): Peak Force (lbf):

Acceptance Criteria	Test Results	Exp. Uncertainty
CHECK	CHECK	
CHECK	CHECK	***
60 Minimum	> 61	± 1
30.0 Maximum	20.4	± 0.8
For information	2347.8	± 6.9

Pass/Fail	
PASS	Ī
PASS	
PASS	
PASS	
N/A	

Test Comments/Notes:

None

Opinions and Interpretations:

None

Manager Name: Dave Lough

Signature:

Data

Engineer Name:

Larry Cimino, PE

Signature:

June Dale. /-

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