Science. Applied to Life.™

Technical Bulletin

April 2024

3M Science of Fit: Full Body Harnesses

Introduction

In July 2023, OSHA announced a proposed rule that would require an employer in the construction industry to verify that all personal protective equipment (PPE) used by its workers properly fits each worker. Although proper fit of fall protection equipment is not defined by a specific regulation or standard, there are ways to gauge the proper fit of one's equipment. This bulletin explains proper fit, how to gauge it for this product type, and some ways for employers and distributors to help.

Why is proper fit important?

Per OSHA, the proper fit of PPE "can make the difference between being safely covered or dangerously exposed." Furthermore, PPE that is not comfortable may not be worn by its users, even when it is required.

Construction workers who do not use PPE are three times more likely to be injured than those who do. Even so, some construction workers still choose not to wear PPE. A recent study by Lawrence Technological University's Construction Safety Research Center (CSRC) surveyed the reasons that construction workers chose not to wear PPE.

The study found three design factors that influenced a worker's choice not to wear PPE:

1. Poor quality and fit of PPE
2. PPE is not suited for the climate
3. Perception that PPE is cumbersome and difficult to wear (even if PPE fits and is of good quality)

If a worker's PPE does not fit them or if they believe that it is uncomfortable, then that worker may choose not to wear their PPE. The choice not to wear PPE then puts that worker at greater risk for injury or harm.

How to achieve proper fit

In general, a properly fitted harness will be snug, comfortable, and enable its user to safely perform the tasks it is intended for under its specified conditions.

The fit of a harness can be checked using the following procedure. The harness must pass each of these checks to be considered properly fitted.

1. Confirm that all buckles and adjusters are secure.
2. Check that all harness straps are comfortably snug.
3. Verify that all D-rings and other attachment elements are properly positioned.
4. Confirm that all harness straps are properly stored.
5. Check that all harness pads are comfortable, if present.

When donning a harness, the user should always see the manufacturer instructions for guidance. Workers may also refer to our donning poster for more information.

Selecting the right harness

Achieving proper fit is a simple method of adjusting one's harness—once the right harness has been selected. To select the right harness, one needs to consider the work situation and the suitability of different harness sizes and styles for their intended users.

Adapting for the situation

When selecting PPE, the first step is to confirm that the PPE is suitable for your situation. Suitability is measured against the working environment, the intended task, and its intended wearer.

Working Environment

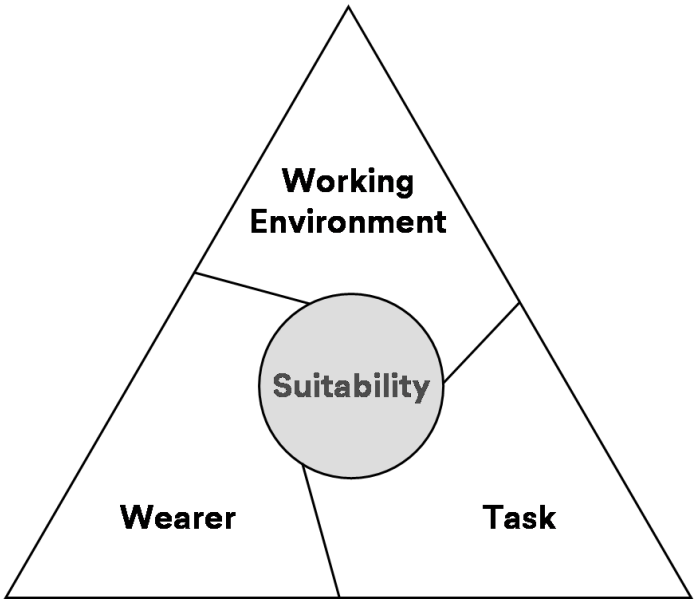
- What are the potential workplace hazards? Will the chosen PPE reduce those hazards?
- Are there any environmental hazards, such as humidity or extreme temperature, that may require additional PPE or precautions?

Intended Task

- What is the duration of the intended task? Will the worker be comfortable wearing this PPE during the task?
- How will the harness work as part of a fall protection system to keep workers safe?

Intended Wearer

- What are some worker characteristics that may affect proper fit?
- What other PPE will workers be wearing? How does the equipment fit when worn together?

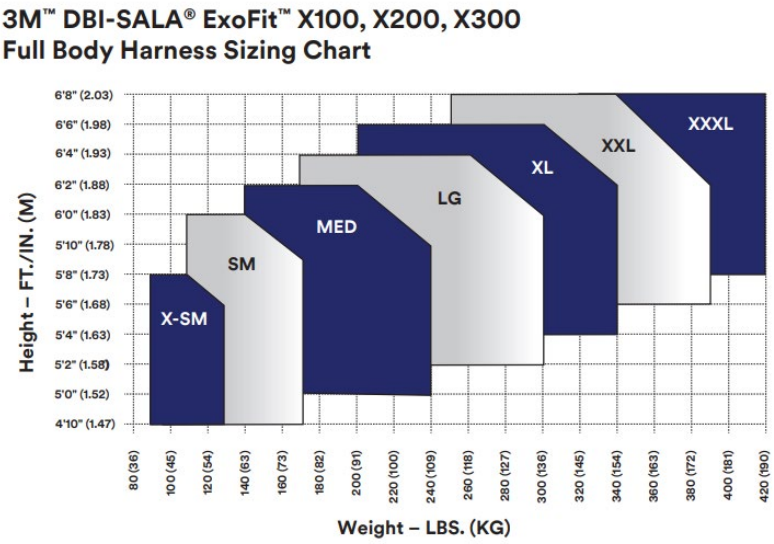


The importance of harness size

Harnesses are not "one size fits all". Just as different people come in different sizes, so too will different workers require different harness sizes.

The best way for someone to find the right harness size is for them to try a harness on. Before putting a harness on, workers can use sizing charts to identify which size is most likely to fit them best.

Figure 1: An example of a sizing chart for 3M harnesses



There are a few considerations to keep in mind about harness sizes:

- A worker's shirt size is not their harness size. Always refer to the chart first.
- Different harness styles may have different sizing charts, so workers may wear different sizes for different styles.
- Many harnesses are adjustable, so workers may be able to safely fit inside harnesses one size up or one size down from their target harness size.When considering capacity, remember to account for the weight of your tools and other equipment. When a user is below the minimum weight capacity, a Competent Person with the employer should evaluate the application to determine alternate or more suitable protection methods.
- Under ANSI/ASSP Z359.11, 3M harnesses have a user capacity range of 130 lb. to 310 lb.
- Under OSHA 29 CFR 1910.140 and 1926.502, 3M harnesses have a user capacity of up to 420 lb.

The right harness style

Different harness styles will be more appropriate for different workers and different tasks. There are five basic harness styles, each of which is suitable under different situations.

General fall arrest

The back D-ring is for fall arrest, included on all harnesses.

Ladder climbing harness

A front D-ring is the distinguishing factor of these harnesses, enabling connection to a ladder climbing safety system.

Work positioning harness

Positioning D-rings located on the hips are used with positioning devices and allow workers to use both hands.

Confined space entry/retrieval harness

A D-ring located on each shoulder strap facilitates upright rescue retrieval from confined spaces.

Descent and suspension harness

Descent harnesses typically have a front D-ring for use with descent control devices. Suspension/rigging harnesses also typically include a front D-ring but often also have extras such as side D-rings for positioning.

Different people

Different styles and features may be deemed more comfortable by some people over others.

Example: Leg straps

- For people with larger legs, tongue buckles might allow more room.
- For people with smaller legs, quick connect buckles may be more snug.

Different tasks

Different harness styles include different features that may be better suited for different work.

Example: Crossover harnesses

- Crossover harnesses may be more comfortable for overhead work, while suspension harnesses tend to be better for periods of extended suspension.
- If a harness fits lengthwise but its body belt doesn't, then a worker might substitute the current belt with a different size—or they may wish to use a crossover harness instead, if the belt isn't needed.

Tips for employers and distributors

Offer a range of harness sizes and styles

Employers and distributors can help workers find the right harness by offering a range of harness sizes and styles to workers. With a range of harness sizes and styles available, each worker should be able to achieve proper fit and everyone should be able to use the right harness for the job.

- Consider your workplace and worker base. Select harnesses for distribution based on your assessment of possible work situations.
  - What tasks will my workers need to perform?
  - What harness styles might be best for those tasks?

- Allow workers to try on harnesses before assignment or use.
  - Confirm that the worker can achieve proper fit.

Employers and distributors should also consider offering harnesses with different sets of features across the selected harness styles. Some harness features provide additional functionality while others may improve ease of use or comfortability.

	**Revolver Torso Adjusters** Enable quick and easy adjustment of torso straps.		**Quick Connect Buckles** Secure-fitting buckle helps maintain fit, greatly reducing buckle slide.
	**Anti-Slide D-ring Pad** Reduces dorsal D-ring slide and allows for positioning adjustment.		**Dual-Locking Quick Connect Buckles**Locking mechanism prevents unintentional strap adjustment.
	**SRD Adapter** Simplifies connection of personal SRDs to the harness.		**Weight Distribution System** Helps relieve shoulder stress and fatigue by redistributing weight away from the shoulders and spine.

Support fit assessments and host events

Fit assessments are events where workers are able to try on different harnesses, check the fit of those harnesses, and have an expert teach them more about proper fit. This type of event is an excellent opportunity for workers to see what's available and obtain some hands-on learning.

Hosting an event

To host a fit assessment event:

1. Obtain a range of harnesses for workers to try on and learn more about.
   a. Choose harnesses based on possible work situations for your audience.
   b. Be sure to include different sets of features for comfort and productivity.

2. Schedule an event and share that information with planned attendees.
   a. Have workers dress as they normally would. When trying on a harness, all workers should wear whatever clothing or equipment they expect to wear on the job site.

3. Reach out for additional support, if needed.
   a. Seek out experts from your harness manufacturer or fall protection supplier for support.
   b. Your point of contact may also be able to loan harnesses to increase your supply for the event.

Running the event

1. Have an expert put on a harness first to demonstrate proper donning procedures.
2. Use a sizing chart to determine what size harness each worker should use. Have each worker select a harness of that size from the available event supply.

   a. Be mindful that some may feel conscious about their sizes, so be careful how you address workers during the sizing process. Use neutral language.

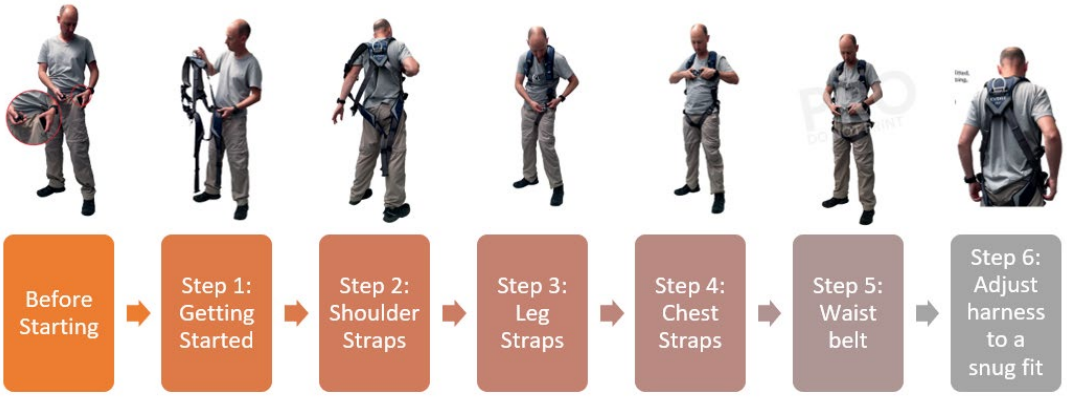
3. Ask each worker to try on their harness. Each worker should don the harness as instructed by reference materials or by the experts in attendance.
4. Check each worker's harness for proper fit. Make adjustments as necessary.
5. Ask each worker how their harness feels after adjustment. If any workers are still not comfortable, then you should either change the harness size or change the harness style.
   a. After changing a worker's harness, have them repeat the steps for donning and adjustment.
   b. Each worker should continue trying on and adjusting harnesses until they achieve proper fit with a harness and are satisfied with their selection.

General tips

- Loosen all harness straps to the largest adjustment option before offering them to workers for the event. It is generally easier to tighten a harness than it is to loosen one.
- 3M recommends that you have at least three harness styles available: vest style (single D- ring), construction styles, and crossover style.
- Be sure to have a variety of reference materials available. Different workers may find different materials easier to understand and interact with.

Checking for proper fit

Ensure all attendees complete the necessary steps for donning their harnesses. See the manufacturer instructions for each harness for more information.



1. Adjust shoulder straps to a snug fit with the torso adjusters.
   a. Each shoulder strap should be adjusted to the same length.
   b. The chest strap should be centered on your lower chest, approximately 15 cm down from your shoulders.

2. The front D-ring, if present, should be positioned in the center of your chest.
   a. Move the D-ring up or down by adjusting the shoulder straps and leg straps.

3. Center your dorsal D-ring, if present, between your shoulder blades.
   a. The dorsal D-ring can be repositioned up or down on the harness webbing as needed.

4. Adjust the leg straps to a snug fit with leg buckles.
   a. At least 8 cm of webbing should extend past the buckle.

5. Adjust the waist belt, if present.
6. Position the sub-pelvic strap beneath your tail bone.
7. Check the distance between the sub-pelvic strap and dorsal D-ring.
   a. Ensure both the sub-pelvic strap and dorsal D-ring are in the right position.
   b. If the dorsal D-ring is too low after sub-pelvic strap adjustment, then you may need to either adjust your harness or try a different size.

Basic event checklist

What you'll need for the event:

- A range of harness styles
- A range of harness sizes
- Sizing charts for your harnesses
- Reference materials for your harnesses
  - User instructions
  - Donning posters and bulletins
  - Videos
- Experts to staff the event

Reference materials

- Fall Protection Harness Donning Video https://multimedia.3m.com/mws/media/1937878O/how-to-don-the-3m-dbi-sala-exofit-safety-harness.mp4
- Fall Protection Harness Donning Poster 3m-fall-protection-harness-fitting-instructions.pdf
- 3M Fall Protection Website https://www.3m.com/3M/en_US/p/c/ppe/fall-protection/

If you have any additional questions or concerns regarding the information presented in this bulletin, please contact 3M Fall Protection Technical Services at 1.800.323.6146.

Sources

- OSHA Construction PPE Notice of Proposed Rule Making: https://www.federalregister.gov/public-inspection/2023-15285/personal-protective-equipment-in-construction
- Personal Protective Equipment - Overview | Occupational Safety and Health Administration. (n.d.). https://www.osha.gov/personal-protective-equipment. Accessed 3/6/2024
- Dr. Al-Bayati, A. (2022). The CSRC's PPE Non-Compliance Study [Dataset]. Lawrence Technological University Construction Safety Research Center. https://ltu-capture-cms.s3.us-east- 2.amazonaws.com/Engineering/CSRC/PPE_White_Paper_CSRC_2022_11_3_22_.pdf

Personal Safety Division
3M Center, Building 235-2W-70
St. Paul, MN 55144-1000

3M PSD products are occupational use only.

3M Canada
P.O. Box 5757
London, Ontario
N6A 4T1

In United States of America
Technical Service 1-800-243-4630
Customer Service 1-800-328-1667
3M.com/workersafety

In Canada
Technical Service 1-800-267-4414
Customer Service 1-800-364-3577
3M.ca/Safety