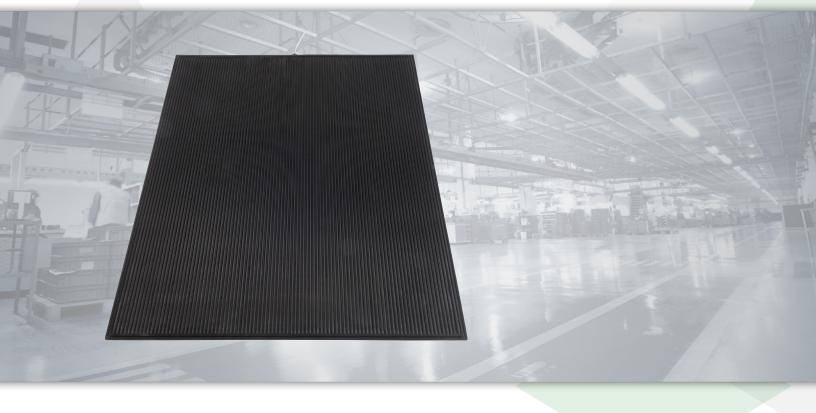


Safety Mat Systems

Installation, Use and Maintenance Guide







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Important Safety Message

Larco safety mat systems are general-purpose presence-sensing devices designed to help protect personnel working around moving machinery. As with any device of this type, the user must comply with applicable local and national codes and regulations.

There are several organizations that publish information regarding the proper use of safety devices in machine guarding applications. In particular, the American National Standards Institute (ANSI) publishes a number of standards containing information on proper selection, application, installation, maintenance, operation, training and responsibility for safety systems use. Larco safety mat systems are designed for easy compliance with these standards. Even though these standards are voluntary in nature, it is common for regulating organizations, such as the Occupational Safety & Health Administration (OSHA), to refer to ANSI standards in the course of compliance checking.

A partial list of organizations who publish safety standards can be found on page 12 of this manual. Contact Larco for more information about safety standards.

WARNING! Usage of safety mats and safety mat devices is governed by each user's local codes and applicable industry standards. Improper usage of these devices could result in severe injuries. Applications must be limited to machines that can be stopped consistently and immediately at any point during the hazardous portion of the cycle or stroke. In the event that Larco safety mats do not prevent all access to the hazardous operation, the unprotected access must be guarded by other appropriate safeguarding devices or barriers.

Getting Started

Please read through this installation manual, review any installation drawings specific to your application and familiarize yourself with the planned installation before opening any cartons.

This manual will help guide you through a logical installation sequence beginning with site preparation and installation, continuing through testing and ending with use and maintenance.

Instructions for other components of the overall safety system, such as a Zone Monitor safety control interface, contain their own specific set of instructions and will be used in conjunction with this manual. Be sure to follow all appropriate instructions relative to the particular component of the system, as well as instructions and safety information from the manufacturers of any tools used during the installation process.



a. Required Tools

Below is a list of typical tools and their uses in the installation of safety mat systems. Your installation may not require the use of every tool shown, as certain options available from the ATEK would eliminate the need for some on-site operations. For example, aluminum trim kits typically used to anchor the mats in place can be fabricated on site from stock length extrusions or can be purchased from ATEK completely machined and ready to install.

TOOL	USE	
For All Installations		
Razor knife	Trimming away vinyl edges of mats IF instructed to do so	
Wire stripper	Stripping wire insulation to make electrical connections	
Shop vacuum or broom	Cleaning the safety mat mounting surface	
Ohm meter	Testing the safety mats if shipping damage is suspected	
Personal protective wear	Safety glasses, gloves, hearing protection, etc.	
For Screw and Anchor-type Installations with Aluminum Mounting Trim		
Drill & drill bits	Drilling anchor holes in the mounting surface	
Phillips screw driver	Fastening trim screws	
Lightweight hammer	Tapping screw anchors into pre-drilled holes	
Aluminum saw	Cutting cord exits in aluminum trim	
Aluminum file	Removing sharp edges around cord exits on aluminum trim	
For Fabricating Aluminum Mounting Trim on the Job Site		
Chop saw or miter box	Cutting aluminum profiles to the correct size/shape	
Drill & drill bits	Drilling and countersinking screw holes in aluminum trim	
Tape measure	Measuring for correct profile dimensions prior to cutting	
For Labor Saver Self-Adhesive Mat Mounting		
50/50 solution of Isopropyl alcohol & water	Cleaning the mounting surface. Refer to mat cleaning instructions at www.larco.com/resources	
Clean rags	Wiping the mounting surface	



b. Mounting Surfaces and Preparation

Inspect the mounting surface where the mat(s) will be installed. The surface should be relatively flat, smooth and free of debris.

Protrusions in the mounting surface higher than approximately 1/8" (3 mm) could affect mat performance and should be removed prior to installation. An alternative to this procedure would be to use an underlayment like plywood to provide a smooth surface, especially where the mounting surface is in very poor condition. Avoid uneven adjacent surfaces, such as metal diamond tread floor plates. They do not present a problem in themselves, but the uneven surface created where two plates meet can affect mat performance. A difference in elevation from one surface to the other, greater than approximately 1/8" (3 mm) should be corrected prior to installation of the safety mats.

Openings in the mounting surface, such as those found in walkway grating, should not affect the mat performance unless they are larger than 3" (76 mm) square.

Other surface preparations may be necessary depending on the chosen method of securing mats in place. For example, the use of Larco's Labor Saver self-adhesive safety mat mounting option may require cleaning the mounting surface depending on its condition. If options such as these are part of your system, refer to specific instructions relating to those options that have been packaged with the product.

Unpacking and Handling Mats and Trim

Do not cut safety mat cartons open with a razor knife, as accidental cutting of the mat and/or mat cord can occur. Remove the staples along one side where they attach to the wooden frame until you can grab the cardboard and tear it away from the wooden frame. Be careful, as staples may fly as you pull the cardboard away from the wooden frame. Wear safety glasses.

Once installed, the Larco safety mat is extremely durable and damage resistant. The most vulnerable time for a safety mat is during unpacking and installation. If a mat is larger than 24" x 36" (610 x 914 mm), use additional help in lifting, carrying and positioning the mat. Dropping a mat on its corner can damage the mat (and it's internal electrode) beyond repair.

The proper way to handle a mat is to grasp the long edges and lift while causing a slight bow downward along it is length (see Figure 1 below). This method prevents the mat from bending across its width, which could cause a kink or bend in the internal electrode assembly.

When unpacking aluminum trim kits and extrusions, be aware that they may have sharp edges and points where angles are formed. Protect yourself from injury when handling, and protect the ends of the trim from being bent or deformed.



Figure



a. Visual Inspection

Visually inspect each mat after it has been removed from its shipping carton. Make sure there are no bends, dents, kinks or obvious damage. Pay particular attention to the corners and cord.

b. Electrical Inspection

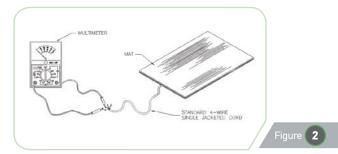
It is good practice to inspect the mats electrically prior to installation, especially if shipping and handling damage is suspected. Use an ohmmeter to check each mat after it has been removed from its carton and placed on a flat surface.

For the purposes of this test, a closed circuit is defined as less than 10 ohms and an open circuit as at least one million ohms.

There are four wires housed in a single jacketed cord attached to each mat. Two of the wires are black and two of the wires are white.

First, with no one standing on the mat and no pressure being applied, test to ensure that there is a closed circuit between any like colored wires (white to white and black to black).

Next, with no one standing on the mat and no pressure being applied, test to ensure that there is an open circuit between any black and white wire combinations.



Last, while standing on the mat with pressure applied, test to insure that there is a closed circuit between any black and white wire combinations (refer to Figure 2).

Positioning Mat(s)

Clean the area where the mats are to be installed, removing all debris. Place the mat(s) in the area where they are to be installed. For installations with adjoining mats, dry fit the supplied joining trim between adjacent mats to set the proper distance between them. Do not drill any holes at this time.



a. Joining Trim and Cord Routing

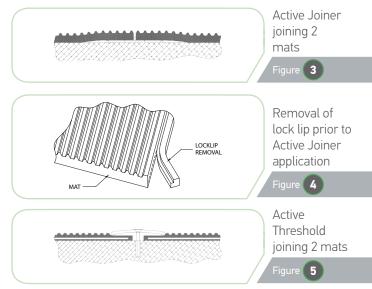
There are two types of joining trim. The first is the Active Joiner shown in Figure 3, which fits under adjacent mats when wire clearance is not necessary. The Active Joiner requires removal of the lock lip on the edge of the mat where the Active Joiner is used. The Active Joiner is held in place by the weight of the mats and any perimeter trim used on the outside edges.

CAUTION: Be sure of your mat placement before removing the lock lip on the edges of the mats to be joined. The lock lip cannot be replaced once removed.

Using a sharp razor knife and straight edge, carefully remove the lock lip only on the mat edges that will be joined together using the active joiner. (Refer to Figures 3 and 4).

The second type of joining trim is Active Threshold (shown in Figure 5) which bridges adjacent mats and provides a gap between the mats for wiring.

Route the cords for each mat to the mat control device. Typically, cords are routed around the edges of the mat(s) and under the perimeter trim until they reach the desired exit point, or they exit the trim immediately and are routed through a wire raceway to protect the cords from damage.



Note: To aid with wire management, small drops of instant adhesive may be used to secure the cord to the edge of the mat at appropriate intervals.

b. Perimeter Trim and Cord Clearance

Note: The following instructions apply to those installations using the traditional method of physically anchoring the mat(s) in place with screws and anchors through extruded aluminum mounting trim. Some applications do not require the trim, such as those where the mat is mechanically "trapped" in place. Another example would be installations using the Larco Labor Saver Self-Adhesive system. For more information on this visit www.larco.com/resources

If your installation was ordered without mounting trim, or with a different mounting method, refer to the specific installation instructions enclosed with the product and then skip to **Electrical Connections** on page 10.



There are several types of perimeter trim depending on the application, but they all fit into one of two categories.

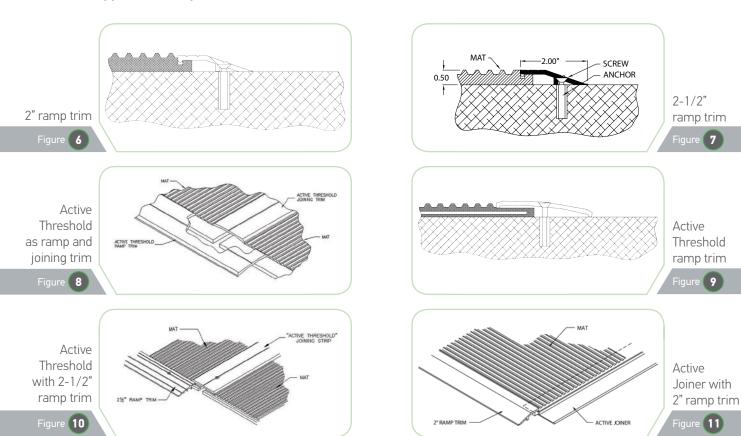
- 1. Trim that fits into the lock lip of a mat (shown in Figures 6 and 7).
- 2. Active Threshold type trim that fits onto the active edge of a mat (shown in Figures 8 and 9).

The difference in the mat edge style for the two different categories of trim is obvious as shown below. Many different combinations of trim can be used in an application to accomplish the necessary result.

NOTE: If your installation contains many mats and/or the mats form a specific pattern, you should have received a drawing specific to your installation. Refer to it when laying the mats in place.

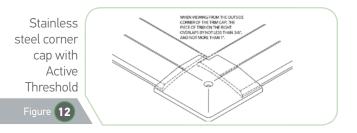
Dry fit the balance of the trim pieces in their proper position. If cord exits were pre-determined at the time of ordering, the trim kits may have been ordered with machined notches where the mat wire(s) exits the perimeter trim.

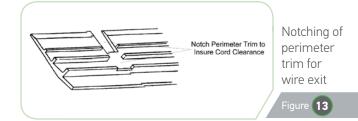
Various applications of perimeter trim





If wire exit notches are not present, they should be created now. Use a metal saw and file to create and smooth the necessary notches allowing the cord to exit the trim without being cut or crushed. (Refer to Figure 13).





Securing Mats in Place

Depending on the type of extrusion used, there are two possible sizes of mounting screw and anchor. The first is a smooth shank #12 screw, part #214920, used for all "Active Threshold" extrusions. (Refer to Figure 14). This screw uses the blue-colored anchor and requires a 9/32" (7 mm) hole. The use of this screw with the Active Threshold type extrusion is critical for proper operation, as the smooth shank allows the threshold to move up and down to activate the mat(s) as pressure is applied and removed.

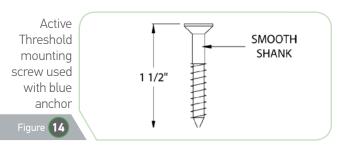
The second size is a #10 screw, part #210745, used for all other drilled extrusions. (Refer to Figure 15). This screw uses the green-colored anchor and requires a 1/4" (6 mm) hole.

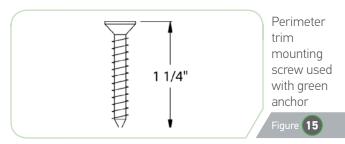
Note: If your application is to be mounted on a steel plate, machine screws should be used. Contact ATEK to request machine screws if your application requires them.

Once satisfied with the alignment of all of the mats and trim, use the drilled extrusion as a template for drilling the mounting holes. Hold the trim in place securely and drill through the center of the pre-drilled and countersunk holes with the appropriate drill bit, being careful not to damage any mat cords that may be present. Drill 1"-deep (25 mm) holes for the screw anchors as straight and vertical as possible into the mounting surface.

Depending on the length of trim and number of holes, one or two holes may be drilled at each end of the extrusion and fasten them with the screws and anchors to help hold the extrusion from moving while the balance of the mounting holes are drilled.

Remove the drilling debris with a shop vacuum. Clean out the holes and tap the appropriately colored (green or blue) plastic anchors into each hole. Insert the screw through the holes in the extrusion and start the screws into the anchors but do not tighten completely when using the Active Threshold type trim. See the special instructions for Active Threshold trim on next page. For all other types of perimeter trim tighten down the screws.







a. Active Threshold Trim

CAUTION: Do not over-tighten Active Threshold screws. The Active Threshold bridges the active surface of the mat and can cause continuous activation if it is pulled down too tightly by the screws. The proper method for adjusting Active Threshold screws is to tighten the screws until the screw head just makes contact with the extrusion, and then back off 1/4 turn.

NOTE: Remember to use the blue anchor and the smooth shank screw for Active Threshold installations.

Electrical Connections

With all the mats anchored in their proper position, the electrical connections from the mats to the control system can be made. Please read the general instructions below and then refer to the specific wiring instructions included with your safety mat control device.

Larco offers a variety of wiring options designed to adapt to specific installation requirements, but regardless of which one you have chosen for your application, several basic rules apply in all cases.

Maintain fluid tight connections especially in wet applications. The Larco mat is built to be immune to fluid-intense environments. It is the installer's responsibility to maintain the fluid-tight integrity of the electrical connections to eliminate fluid-related nuisance problems during operation.

Larco recommends that all electrical connections be made inside of a fluid-tight enclosure, such as the Zone Monitor or Larco junction boxes for 5 or 10 mats.

If you must make electrical connections outside of a fluid-tight enclosure, be sure to choose a connection method that maintains a dry connection.

Protect the wires from damage especially in traffic areas. Don't leave wires exposed where they could become worn or damaged. Use appropriate conduits or wire raceways to protect the wires.

Periodic Mat System Testing

With the installation phase complete, perform final testing of the overall system. Please read the following general instructions and precautions, and then refer to the specific testing instructions included with your safety mat control device.

As with all safety related equipment, periodic testing to verify functionality must be performed per the equipment manufacturers recommendations.



a. Recommended Testing Intervals

Larco recommends that its safety mats be tested at the beginning of each shift and more often under severe conditions. Examples of severe conditions would include frequent or constant submersion in fluid and continuous forklift traffic.

b. Mat Design Characteristics

Electrically, the safety mat itself is a relatively simple device that, for testing purposes, can be compared to a Single Pole Single Throw (SPST) normally open switch. When no pressure is applied to the mat, the switch should be open. When pressure is applied to the mat, the switch should be closed. The typical Larco safety mat has two white wires internally attached to one of the contacts, and two black wires attached to the other contact.

With this arrangement there should always be continuity between like-colored wires. In its open state (no pressure applied), there should be no continuity between either black and either white wire and conversely, there should be continuity between black and white wires when the mat is in a closed (pressure applied) state.

Before testing, ensure the safety of the individual performing the test by neutralizing the hazard. The safety mat control device, such as the Larco Zone Monitor will provide a visual indication of the mat status (open or closed) while performing the test. Refer to the specific instructions included with your control device for appropriate control reactions to mat activation and de-activation. If a Larco Zone Monitor is not being used, an open circuit is defined in resistive terms as one million ohms or more and a closed circuit as ten ohms or less.

Typical Larco mat installations include an aluminum extrusion around the perimeter of the mat or group of mats, which serves as a ramp up to the mat surface and also as a method for securing the mat(s) to the mounting surface. This extrusion is not considered part of the active area of the mat. If the installation consists of multiple mats, there may be extrusion at the area where two mats meet. This extrusion is considered part of the active area, and, when pressure is applied, should activate one or both of the mats that it joins.

b. Testing Activation and De-Activation

Test for mat activation by stepping on the mat surfaces and verifying that activation (contact closure) takes place whenever pressure is applied. Don't limit the test to only one area of the mat(s). Extend the test to the edges corners and all across the mat surface.

The instructions included with the control system will also include methods for testing reactions to a disconnected mat or broken mat wire. Be certain of proper operation before putting the equipment into use. Contact your supplier immediately if there is any suspicion of improper operation.



Use and Periodic Maintenance

The Larco safety mat was designed for the industrial environment. The mats are extremely durable and moisture-proof. The outer shell of the mat is made from PVC and provides the protection for the inner switch assembly. They are very resistant to impacts, unaffected by most chemicals and in most applications you need not treat the mats any differently than the floor that they are mounted on.

Normal housekeeping, like sweeping up debris and cleaning up spills, are all that's needed once the mat system is properly installed. Go to www.larco.com/resources/documents for cleaning instructions for heavily soiled mats.

Visually inspect the mat(s) at the beginning of each work shift to verify their condition. Look for obvious problems, like mat cord damage, loose or missing trim pieces, and repair or replace promptly before they lead to functional problems.

Safety Publications

The following organizations can provide information on the use of presence-sensing devices in safety applications. Larco provides this information as reference only and makes no claim regarding a specific recommendation of any organization, the accuracy or effectiveness of any information provided or the appropriateness of any information provided for a users specific application.

Federal OSHA Standards (OSHA)

The US Government Printing Office Order desk 202-512-1800

Global Engineering Documents

15 Inverness Way East Englewood, CO 80112 800-447-2273

American National Standards Institute (ANSI)

25 West 43rd Street Fourth Floor New York, NY 10036 212-642-4900

The Association for Manufacturing Technology

7901 Westpark Drive McLean, VA 22102 703-893-2900

Robotics Industry Association

900 Victors Way Suite 140 Ann Arbor. MI 48108 734-994-6088

Canadian Standards Association

13799 Commerce Parkway Unit 120 Richmond, BC Canada V6V 2N9 604-273-4581

Precision Metalforming Association

6363 Oak Tree Boulevard Independence, OH 44131 216-901-8800

National Safety Council

1121 Spring Lake Drive Itasca, IL 60143 800-621-7615



223-0139-000 Rev. C 5/19 WARNING: Cancer and Reproductive Harm - www.P65Warnings.ca.gov

ATEK Access Technologies

www.atekaccess.com

