



SAFELINE

Pisko® SafeLine wire system
White paper

Fall protection safety products for buildings in general

In order to comply with the building code and ensure the safety of people, fall protection must be organized so that people cannot fall uncontrollably to the ground when moving around the dangerous areas of the building. In practice, this means that the roofs of all buildings should have both uninterrupted access ways to all areas requiring maintenance and servicing as well as a solution to prevent a person from falling (safety rope fixing point) which is appropriately positioned. This also applies to access ways to the roof outside the building.

It is the minimum requirement of the building code that a building higher than nine meters must be equipped with safety rope fixing points. In practice, however, all buildings in regular use must have fall protection, as falling from a low height can also be fatal. This requirement cannot be circumvented, for example, by using a ladder back guard, as this does not prevent the user from falling off the ladder. The real safety of buildings and their surroundings is created through the implementation, not by the building code.

In order to prevent falls, either certified temporary personal protective equipment (PPE) which is intended to be removable and specified in the regulation on personal protective equipment, such as various fall arresters or construction products that are in accordance with the Construction Products Regulation which are permanently installed in a building and which have been tested with their fastening systems to be suitable as safety rope fixing points, may be used.

The annual inspection of personal protective equipment must be carried out for example at the authorized inspector's office. Naturally, the inspections of fixed building products must be carried out on site.

The Pisko® access ways (such as roof ladders and roof walkways) are products covered by the Construction Products Regulation and they have been tested and certified as a system in the same way as the products are actually installed in the construction site in accordance with the installation instructions. This ensures that the product assembly and its fastening systems installed in the construction site correspond in all respects with the type-tested assembly. The Pisko® roof walkway and the Pisko® SafeGrip roof ladder carry the CE marking and are suitable to be used as safety rope anchoring points when implemented in accordance with Class 2.

In terms of personal protective equipment (e.g. individual products which are intended to be removable and certified according to EN 795, such as different anchoring devices), only PPE connected to the various fixed anchor points are certified, in other words, only the separate PPE product can be certified. This means that the permanently fixed anchor devices to which the PPE is attached to are excluded from PPE certification and the responsibility for the strength and functionality of the complete fastening system lies with the party implementing the site.

The problem is often that designers have to combine products that are essential for the safety of the building using a range of separate, incompatible or mismatching products, which can make the solution expensive and/or difficult to use.

The operating principle of Pisko® SafeLine wire system

The purpose of the Pisko® SafeLine wire system (patent pending) is to function as a simple, safe, functional and integrated safety rope fixing point solution. The system's primary use application is to install it as a fixed and permanent part of the Pisko® access ways. In practice, this means that the user will have both the uninterrupted access way required by the building code as well as fall protection covering the journey from the ground to the maintenance site and back. All the products used on the route, such as the wall ladders, roof ladders and roof walkways, are type tested with their fastening systems for a wide range of structures and roof types.

The performance of products serving as access ways is indicated by means of fastening system-specific declarations of performance linked to the CE marking. The Pisko® SafeLine wire system made of stainless steel is a type-tested safety rope fixing point used together with the Pisko® access ways. This product makes it possible to implement genuinely safe solutions for a wide range of buildings – both residential buildings and large commercial properties – in accordance with the building code and in a user-friendly manner. The solution is also advantageous in terms of the life cycle of the building, as the indicated and uninterrupted access way substantially protects the roofing material from mechanical wear and tear. The use of the Pisko® SafeLine system also means significant cost savings for those starting a construction project, as this system covers and replaces two separate solutions: the uninterrupted access way solution and fall protection solution. In addition, it is significantly easier for the designer to draw up a property-specific security plan and instructions for use in a form that is understandable to the end users.

The user connects themselves to the Pisko® SafeLine system with a personal, conformant safety rope using a glider made of acid-resistant steel which slides smoothly with the user along the wire. The glider has been tested as part of the Pisko® SafeLine system type testing and it also has the CE marking in accordance with EN 795. The safety rope fixing point, which moves with the user, ensures that the user is safely connected from the ground up to the entire length of the access way.

The uninterrupted access way implemented in accordance with the site-specific safety plan prepared by the designer also prevents the user from unnecessarily moving in the most dangerous zones of the roof. If the site is complex and there are many crossing access ways, the user can ensure safe movement with two gliders and two safety ropes, so that there is no situation where the user should, even for a moment, disengage themselves from the safety rope anchoring point in the danger zone.

It is also possible to install the Pisko® SafeLine system detached from the access way with separately type-tested fastening plates, for example directly on the surface of a suitable bitumen roof, but the preferred way to ensure the long-term durability of the roofing and compliance with the building code is, whenever possible, to install the wire system with a fixed connection to the access way. By using the access way as an installation platform, it is also possible to add fixed safety rope fixing points to desired and adequate spots, where the likelihood of working by leaning against a safety rope is higher. A rigid rope fastener in a walkway in working areas is a practical way to fix the safety rope during the job that requires moving away from the access way.



Pisko® SafeLine system components and installation

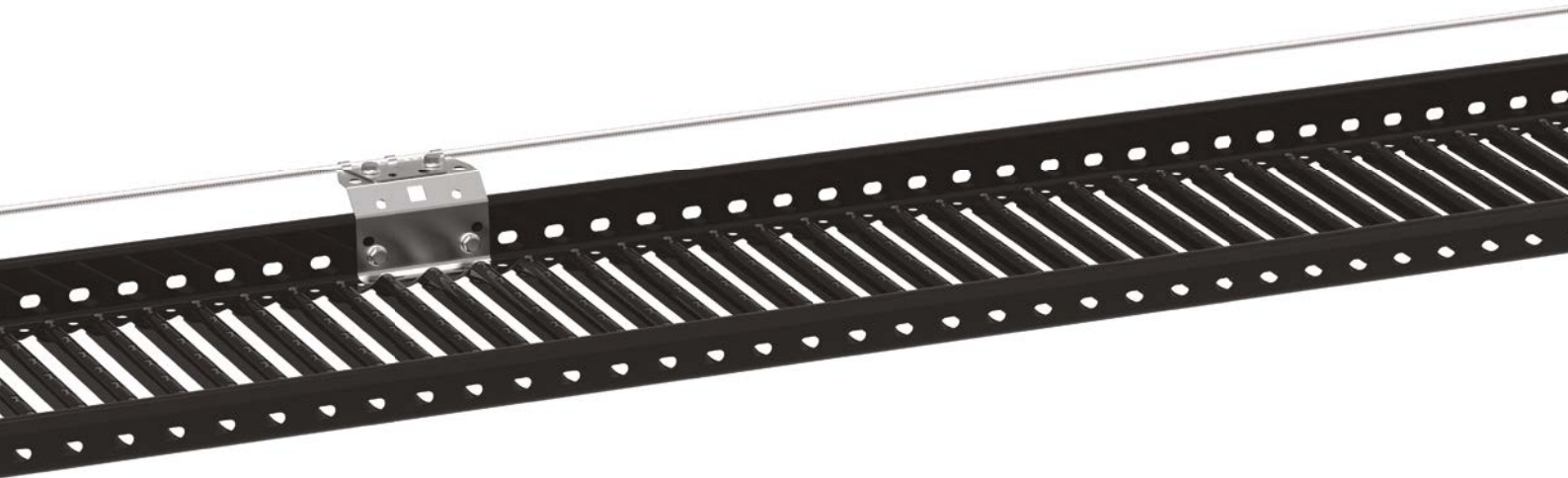
The Pisko® SafeLine system is a simple package. It consists of a couple of main components and components supplementing the functionality of the system. The most important products are the Pisko® SafeLine wire holder bracket and the system-optimized and compatible acid-resistant steel wire rope with a diameter of 8 mm.

The wire holder bracket is designed to allow for so-called continuous wire pulls without separate wire ends or extensions. This is made possible by the design of the wire holder bracket – the wire holder bracket supports the wire, ensures the anchorage strength and guides the glider. The same wire holder bracket can be used as such to be installed to the Pisko® roof walkway as well as to the Pisko® SafeGrip ladder frame. The wire holder bracket can be easily installed to the ladder with a simple accessory. For the reliability of the system, it is very important to always use measurement-optimized stainless-steel wire delivered by Piristeel Oy for installations, so that the assembly to be installed on the site corresponds to the type-tested assembly and its anchorage strength.

The products are always fastened using stainless size M8 fixing products. It is not necessary to thread the wire through the wire holder brackets when installing, as the design of the fasteners allows the wire to be pulled into place to the fastener's open space. The hinge component of the fastener locks the wire in place, so there is no need to separately tension the system, but the system is installed at the appropriate tightness at once. Since the anchorage strength is based on the wire holder bracket, no special tools or compression joints subject to strength requirements are required on site. For example, to protect the end of a cut wire, a metal protecting sleeve/terminal can be compressed on site, but such a connection does not affect the performance of the system.

In addition, the system includes a stopper used with steep ladders (access ladders and steep roof ladders), which allows the user to move upwards freely, but when coming downwards, the latch must be mechanically moved out of the front of the runner. This prevents the user from falling vertically from the wall ladder. Additional accessories include, for example, terminals for extending the wire as well as a few different options for terminating the wire and forming an integral barrier to the glider.

A very simple and easy-to-install system therefore allows for different installation assemblies and business models, as the assembly can be implemented with full-length wire measurements customized on site or with a set of cut to length wires with factory assembled extension terminals.



Testing of products

If a product entering the market is subject to specific requirements in terms of safety, health or environmental protection, a third-party assessment can be required by the legislation.

Safety products cannot be made available on the market without an accredited third party supervising the type testing. The notified body is an operator notified to the Commission by the EU Member State which is authorized to carry out conformity assessment tasks. The designation of notified bodies and the designating authority are regulated by law. There are several notified bodies in the European Union that are notified for different tasks under the legislation. For construction products, bodies carrying out harmonized assessment tasks are, for example, Eurofins Expert Services Oy in Finland and RISE in Sweden. The relevant notified bodies, including the application modules, are listed in the European Commission's Nando database.

Pisko products are mostly tested as construction products, which means that the requirements for testing products covered by the Construction Products Regulation come directly through the harmonized technical specifications of the standards. The products have been continuously and regularly tested for years under the supervision of the notified bodies. As a result of this determined work, the Pisko® products, such as ladders and roof walkways, have been type-tested as systems (i.e. the structure and product assembly used for testing correspond to the structure and installation method implemented on site) for a wide range of bases and product combinations. This long-standing product development, type testing and certification work provide the basis for the Pisko® SafeLine wire system to have been tested very comprehensively and reliably as a complete system.

Product testing typically consists of different load tests that verify the usability of the product as well as tests that simulate a severe accident situation. More demanding tests are considered to be successful when the product or device is not detached from its base or destroyed in such a way that the user's safety rope is detached from its anchoring point. The products are loaded both statically and dynamically. For example, a static load force of more than 1000 kg is applied to the safety rope anchoring point, such as the Pisko® SafeLine wire system, and the corresponding dynamic load force in the drop test. This is to ensure that in the event of an accident, the correctly installed product with its fastening system will not pose a hazard to the user.



Durability of the wire system

As described above, the Pisko® SafeLine fastened to the Pisko® access ways is a highly reliable solution. The access ways fitted in accordance with Class 2 have already been tested as suitable safety rope anchoring points, which means that the wire system adds further safety and security to them. The wire is a protective solution for the user in the event of a fall, as it flexes at the moment of stopping. This means that the highest impulse force on the user and also on the fastening system is significantly lower than in the case of a sudden stop after a short fall. The anchorage strength of the wire and the fastening system have been tested through type testing and, thereby, the system has been granted a certificate of compliance. Pisko® SafeLine is suitable to be installed to all the Class 2 Pisko® access ways.

The Pisko® SafeLine wire system consists of all-metal, stainless-steel components. Long-term durability is very good and the need for special maintenance is therefore low. The stainless steel system works smoothly and is user-friendly due to the characteristics of its material, as the interconnected surfaces are smooth and also streamlined. Small dents and scratches created during use do not reduce the corrosion resistance of the system.

The wire supplied by Piristee Oy is a very durable $\varnothing 8$ mm steel rope made of acid-resistant steel with a required breaking strength of more than 35 kN (~3,500 kg) according to the standard (EN 12385-4). When using Piristee Oy's cut-to-length wire ropes, which are equipped with end terminals that allow extensions, their end joints are made with optimized dimensions and sufficient forces according to the lifting equipment standard (EN 13411-3). Continuous quality control (tensile tests) ensures that the strength of the assembly of these wires with end terminals matches the design strength of the wire rope.

System certification

Products or product groups for which there are no harmonized standards can be approved and certified through national approval procedures. In Finland, such procedures include, for example, type approval, verification certification or quality control of manufacturing. Finnish legislation concerning the product approval of construction products (Act on the Type Approval of Certain Construction Products 954/2012) also provides that if a construction product has been approved for use in construction by a Member State of the European Economic Area or Turkey, such approval will be deemed to provide reliable information on the construction product's properties. In other words, a national authorization issued in another EU country is valid for use in Finland as such and can be used to demonstrate compliance with the technical requirements.

PPE conforming to EN 795 can only be certified as individual products which are intended to be removable. The scope of that standard in question does not include systems, which means that complete systems cannot be certified in accordance with EN 795 and, therefore, cannot be CE marked in accordance with the standard.

The aim has been to fully certify the Pisko® SafeLine wire system, as the goal has been to create unified fall protection which forms a complete system together with the other Pisko® products. For this reason, the system has a P-marking, which is a certificate in accordance with Swedish national requirements and standards for a wire system used as a construction product. The P-marking indicates that the technical requirements are met in full and that the level of compliance is equivalent to the CE marking, in other words, the assessment of compliance is carried out by a third, accredited party. The certificate number is C900083.



C900083

FAQ – Frequently Asked Questions

Why is the system not certified according to EN 795?

According to EN 795, only individual products can be certified under the scope of the standard. More precisely, the standard allows the CE-marking only for the anchor devices of the types B and E mentioned therein. The aim has been to certify Pisko® SafeLine as a complete system with fastening devices, which means that EN 795 is not an appropriate or possible technical specification for the certification. The glider, which is an integral part of the Pisko® SafeLine system, can also function as a personal protective equipment in accordance with EN 795, which is why it is certified as a part of the Pisko® SafeLine system, but also has the CE-marking in accordance with EN 795.

What does the P-marking mean and is it valid in Finland?

The P-marking is a product certificate used in Sweden. It corresponds to the national approval procedures in Finland, such as the verification certificates for construction products. The P-marking is a national approval granted in an EU Member State, meaning that it is suitable as such for proving compliance with the technical requirements also in Finland. P-marking rules have been created in Sweden for this kind of wire system applications due to a lack of proper harmonized EN standard.

Can more than one user be connected to the wire rope at the same time?

Yes. The anchorage strength of the Pisko® SafeLine wire system is based on special wire holder brackets, which form a firm and type-tested anchorage strength around the wire. The system has been type tested with two wire holder brackets tensioned around the wire and spaced from each other at a given distance. Therefore, the system can be used by several users at the same time in different areas, as long as the users are not connected to the same or adjacent gap between the wire holder brackets (leaving two wire holder brackets between the users, which also ensures that a possible simultaneous fall is not targeted at a single roof walkway). The ladders should be used by only one person at a time.

What material is the wire system made of?

The Pisko® SafeLine wire system is made of stainless steel. The grades used are AISI303, AISI304 and AISI316, where applicable. For example, the glider and the wire rope are made of acid-resistant steel.

Can any wire rope be used with the Pisko® SafeLine wire holder bracket?

No. The dimensions of the wire holder brackets are very accurately defined, which is why the type of wire rope itself as well as the measuring range are very accurately specified. Installations carried out at the construction site must comply with the type-tested assembly, so the only way to ensure the equivalence of the performance level is to acquire quality-controlled wire through Piristeel Oy.

What kind of a warranty does the system have?

The system's stainless-steel components are granted a 50-year technical warranty in accordance with Piristeel's product warranty.

Does the system require maintenance?

In addition to annual inspections, light cleaning work is sufficient for the system. For example, snow or ice may have piled up on the system in the winter, making it difficult to use it without clearing the snow. A brush and, if necessary, water can be used for cleaning the system if dirt hindering the use has accumulated on the surface of the products. If the user notices any obvious damage to the system, its use should be prohibited, and the damage repaired or the damaged parts should be replaced.

Can the Pisko® SafeLine wire system be installed in access ways of all manufacturers?

The Pisko® SafeLine wire system has been type-tested with the Pisko® access ways installed in accordance with Class 2. Pisko® wall ladder must be installed according to the specific installation instructions. The functionality of the system can be guaranteed only for assemblies tested with the Pisko® products.

Why are there far fewer components in the system than in the competing solutions?

Piristeel Oy's product development studied carefully the solutions on the markets and surveyed the customers' opinions on the installation and usability of well-known solutions. The product family has not been copied from the existing solutions but is a result of innovation work which created a completely new way of attaching the wire to a fixed anchor device, such as an access way, so that the fastener also acts as an element of anchorage strength. This will make it possible to create a substantially simpler assembly of products.

Does the installation require special tools or expertise?

No. The Pisko® SafeLine wire system can be installed completely without special tools. Normal wrenches and screwdrivers are enough. Therefore, the usual know-how of construction work is also sufficient for the installation. When connecting stainless steel bolts and nuts, it is advisable to use a tool with low speed and without impact features in order to avoid them getting stuck due to rapid heating of the fasteners before the desired fastening tension is reached.

Additional components can also be connected to the system with manual compression machines on site, but this is not a prerequisite for safe implementation.

If the wire holder bracket is bent, should its use be prohibited?

Not necessarily. In this case, the wire holder bracket should be carefully inspected for permanent damage and the fastening checked. The condition of the wire rope itself must also be inspected. Sometimes the wire holder bracket may slightly yield along the user's movements if the wire has been loaded while in use, but this does not automatically mean that the fastener is damaged.

If the bend of the fastener makes normal use difficult, the wire holder bracket can be straightened manually. A prerequisite for continued use is that the fastener does not show clear and significant deformations, which may have been caused, for example, by a fall or misuse. The condition and tightness of the fixing elements must also be checked in this connection. If the bracket shows strong steel elongation, rupture or tears, especially in the ring-shaped elements of the bracket, micro-fractures, etc., the damaged parts of the system must be replaced. If the wire is frayed or has broken threads or similar, it must also be replaced in the area of the damaged part (length of wire to be replaced = damaged section + the section of the nearest adjacent wire holder brackets). In most situations requiring replacements, the roof walkway is also permanently deformed.

Is it possible to use, for example, hot-dip galvanized bolts and nuts in installation?

No. Installation must be done with A2 or A4 grade stainless steel fasteners to avoid the risk of galvanic corrosion between the components to be fastened and the fixing elements. Piristeel supplies custom-made stainless steel fasteners with special treatment for the Pisko® SafeLine system to ensure smooth installation.

Can the system be used in the winter?

Yes. The system is designed so that there are as few moving parts as possible, so it is also possible to use it in the winter. If the system is covered with snow and ice, it is natural that cleaning must be carried out before use. When climbing up a ladder, the stopping mechanism should be checked and, if necessary, cleaned if there is a suspicion that the ice is preventing normal operation.

Is it possible to connect to the system over the ridge of a ridged roof?

The type testing of the system includes drop tests to the direction of the roof inclination. The safety wire system is meant to travel next to the user, and it will only stop the fall, not prevent the fall. It is not meant to be used by leaning against the safety rope. When there is a need to temporarily work over the ridge of a ridged roof, more suitable solution is to fix a rope fastener to the walkway in relevant places, in addition to Pisko® SafeLine. When installed correctly, SafeLine system is able to handle the loads caused by falling on the ridge side, but the system is not meant to be used in such manner.

Does thermal expansion affect the functionality of the system?

Thermal expansion is a physical phenomenon that has an impact on all metals and materials – also on wire ropes. The thermal expansion coefficient of stainless steel is slightly higher than that of carbon steel.

Example calculation: The change in length of a 10-meter-long wire with an 80 degree temperature change is approximately 13 millimeters (slightly more than one centimeter).

In addition to thermal expansion, the length of the wire is affected by a one-time structural stretching that causes the wire to stretch over time. For the 10 meter wire in the example calculation, the stretching is almost equal to the change in length due to thermal expansion. Therefore, thermal expansion does not need to be taken into account in the installation, instead the wire is always installed as tight as is technically possible. Structural stretching also causes the length of the wire to increase slightly between fasteners over time. The resulting slight slack in the wire rope is normal.

How can the wire be extended?

The most recommended way is to implement wire extensions with products including wire end terminals supplied by Piristeel Oy. The extension can also be implemented at the construction site by means of a special compressible extension terminal (part number 34315). Work site extensions are to be carried out particularly carefully according to the specific compressible extension terminal installation instructions.

What tools are recommended when working with the wire?

Cutting of the wire rope is easy when proper hand tools are used. Suitable tool for cutting is Milwaukee M18 BLTRC-0X cutting machine (Milwaukee product number: 4933471150). M18 BLTRC Spare blades (Milwaukee product number: 4932471372) are also recommended. The best setting to cut the stainless steel rope, provided by Piristeel Oy, is M10. The cutting machine is originally designed to cut rebars, so when using it to cut stainless steel wire rope, the service time between blade changes might be shorter than normally.

The recommended way to secure the cut end of the wire rope is to crimp a dedicated wire end protector (Piristeel product number: 34325) to the end of the wire. In order to achieve a good and clean result, a crimping tool, such as Milwaukee M18 HCCT-201C is needed (Milwaukee product number: 4933451194), together with Crimp Die R22 Cu 35 crimping jaws (Milwaukee product number: 4932451757). Both recommended tools are battery powered and can be operated easily by hand. More information and product support regarding the tools is available from official Milwaukee retailers.

The same crimping tool is recommended for work site extensions when using the compressible extension terminal. Alternatively a device with at least the same compression power and identical crimping jaw geometry can be used.

Does the system need to be inspected regularly?

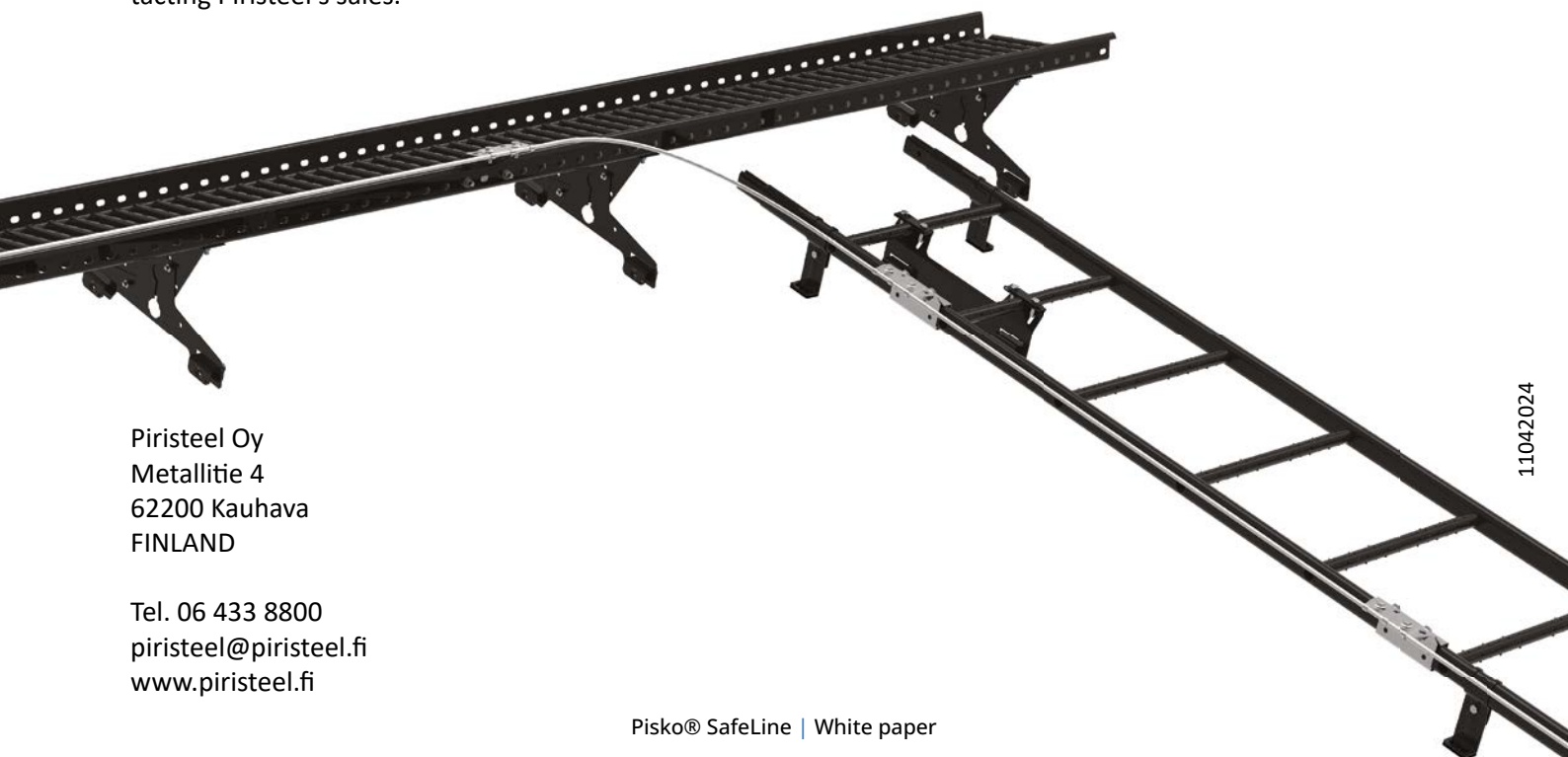
Constancy of performance of fixed construction products used as a safety product in buildings can only be ensured by regular inspection activities. Products implemented in accordance with Class 2 should be inspected annually. The inspection of the Pisko® SafeLine wire system is carried out at the same time as the inspection of other access ways. The annual inspections can be recorded in the dedicated inspection form or in the Pisko Pro application, for which the inspectors authorized by Piristeel Oy will receive user IDs free of charge.

Where can I find the installation instructions?

On Piristeel Oy's website <https://piristeel.fi/en/>

Where can I find more information about the system?

From the Piristeel Oy's price list, website (www.piristeel.fi), the ProdLib library (www.prodlib.com) and by contacting Piristeel's sales.



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