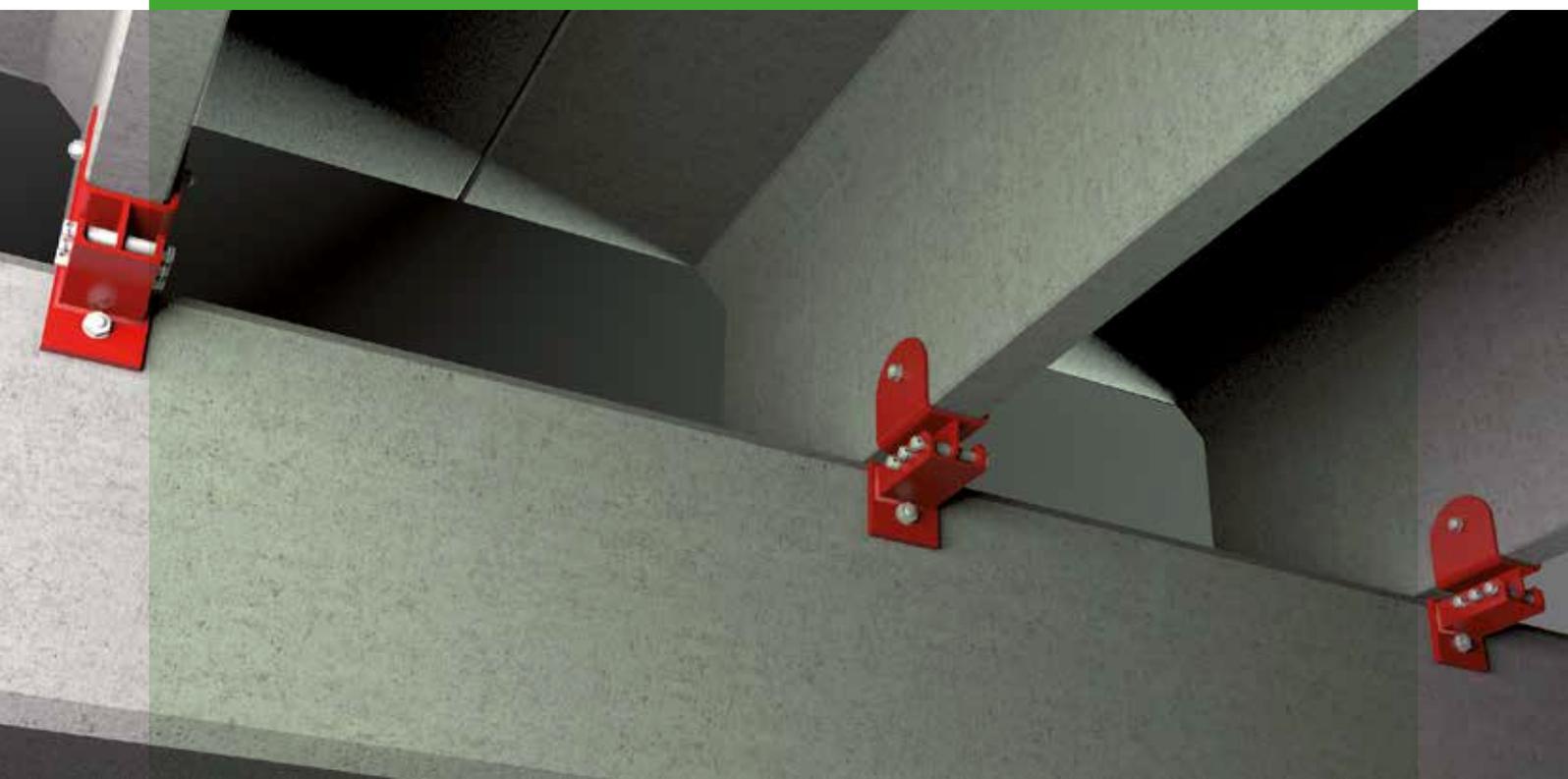




composite engineering

SAFE+

ANTI-SEISMIC DEVICES



ANTISEISMIC DEVICES



Born from Fibre Net's twenty years of experience in seismic engineering, SAFE+ anti-seismic devices have been developed and engineered in accordance with UNI EN 15129, as seismic safety devices for existing prefabricated buildings in reinforced concrete and precast concrete.

The SAFE+ systems, which have the dual function of mechanical connection between structural and non-structural elements and dissipation of seismic energy, create a "dynamic constraint" between the elements, improving the structure's ability to respond to seismic stresses while maintaining the building's functional operation.



Recent earthquakes have underscored the vulnerability of prefabricated and precast reinforced concrete buildings, primarily intended for industrial use, which were designed and constructed between 1950 and 2000 without specific anti-seismic measures. These structures no longer meet the current safety standards.

From a business perspective, seismic vulnerability translates into a series of risks:

- destruction of production facilities and machinery
- loss of warehouse
- production stoppage, loss of orders and market share
- total or partial loss of the property
- loss of business assets.

Added to this is the social responsibility towards workers.

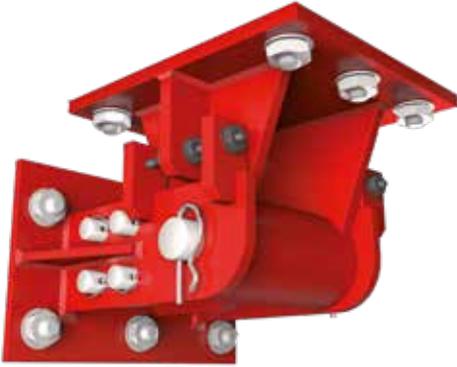
The Legislative Decree 81/2008 identifies, in fact, the seismic risk among those to be included in the DVR and places the obligation on the employer to protect workers in the company.



APPLICATION AND ECONOMIC ADVANTAGES

In an effort to enhance the safety of industrial sheds, adopting SAFE+ anti-seismic devices offers an effective solution that does not interfere with ongoing production activities because:

- It does not require structural modifications to the building but maintains its original static scheme and stiffness.
- It improves the seismic capacity of the structure.
- It is easy and quick to install with minimal dust or fume production.
- It can be programmed for independent areas without interfering with ongoing activities.
- In the event of an earthquake, unlike other devices, SAFE+ does not need to be replaced; simple maintenance is sufficient to restore the system's full functionality.
- It reduces maintenance costs.
- It protects the value of fixed assets (plants, machinery, materials).
- It allows for an increase in the value of the property.
- It allows for a reduction in insurance premiums.
- It reduces the risk of accidents related to the inadequacy of the building.
- It contributes to protecting the health of personnel and the activities located there.

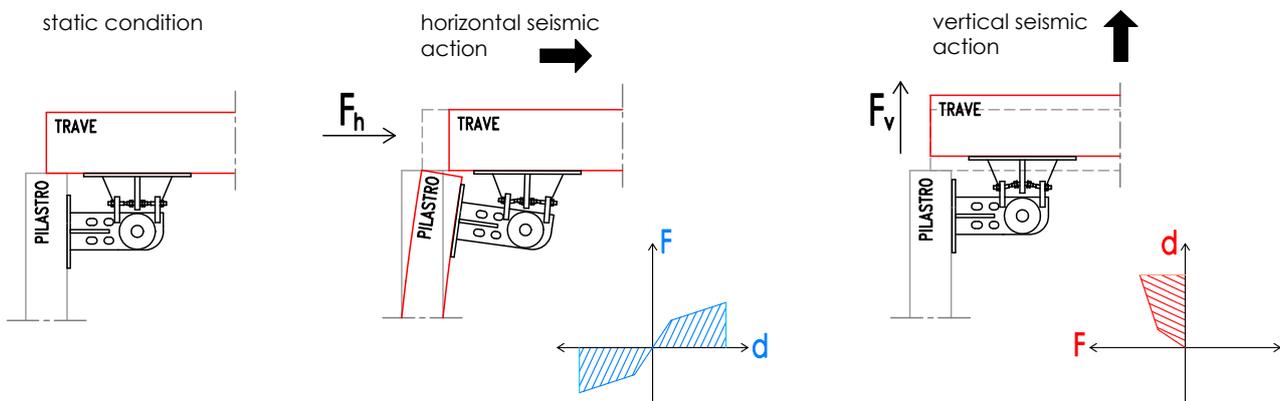


SAFE+ Model A

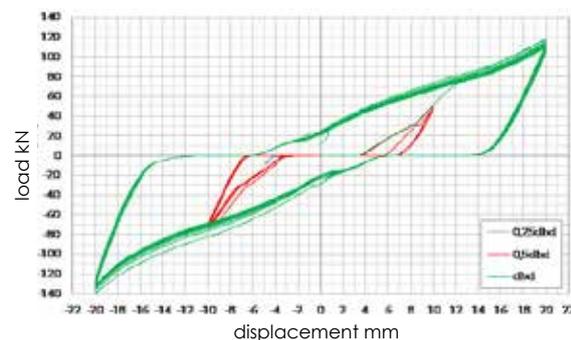
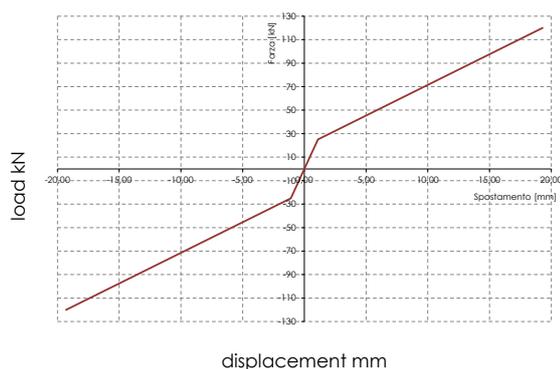
Combined anti-seismic device, with a function of mechanical fuse connection + energy dissipater + damped mechanical constraint, classified as a non-linear behavior device NLD according to EN 15129/2009 standard .

It was born to connect the roof beams to the pillars of prefabricated warehouses in the absence of a connection between the elements. The high mechanical characteristics of the system allow for application on structural and non-structural elements, under conditions of high seismic stress . It responds to seismic stresses ensuring the displacements due to thermal actions to which the various elements of the structure are subjected; upon reaching the maximum displacements, the device comes into operation, modifying the response of the structure.

For limited displacements SAFE+ Model A works as a "mechanical fuse" , subsequently and up to 20 mm the device behaves as a "hysteretic dissipater" . Beyond this deformation, and to avoid loss of support, the function of " damped mechanical constraint" is activated through the presence of an elastic cushion that attenuates the transfer of seismic violence from the beams to the columns.



Device behavior **SAFE+ Model A** subjected to cyclic testing at 0.1 Hz (Ref. University of Bergamo experimentation)



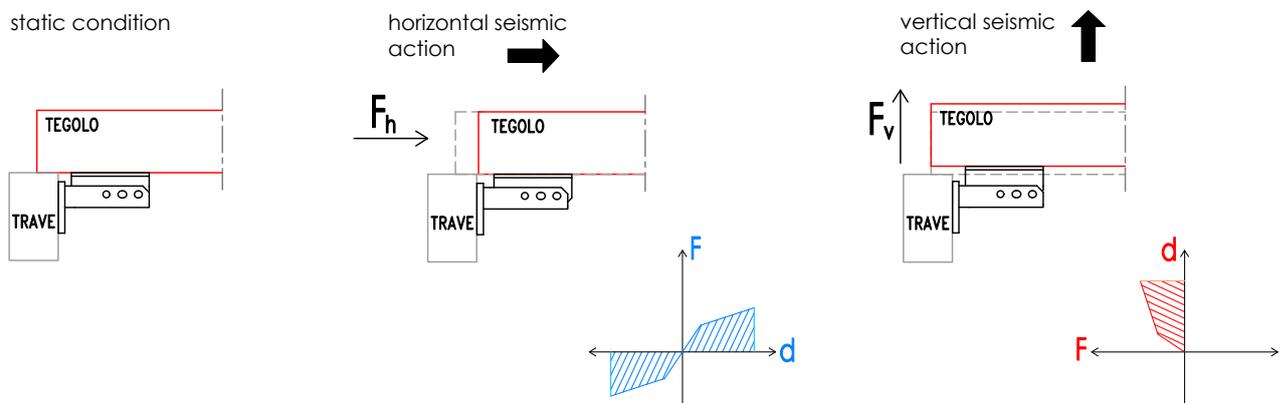


SAFE+ Model B

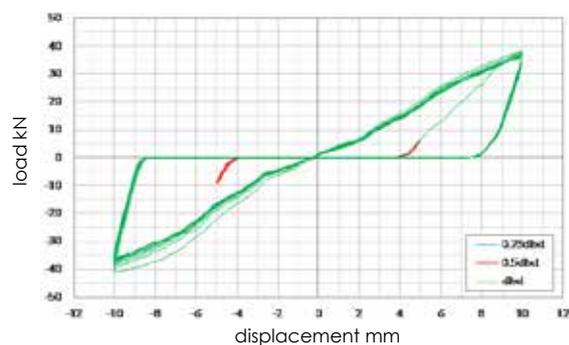
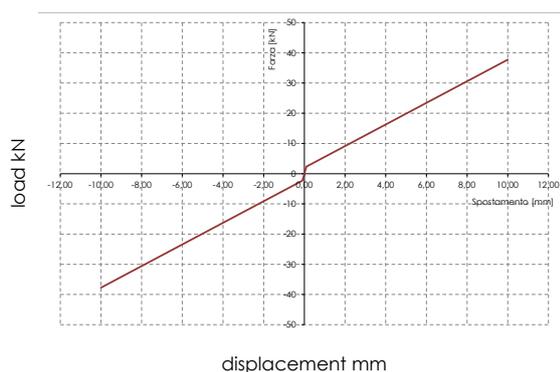
Anti-seismic device with energy dissipation function + elastic mechanical constraint, classified as device with non-linear elastic behavior NLED according to EN 15129/2009 standard .

Engineered to connect both the roof tiles to the main beams and the infill elements to the columns/beams, on industrial sheds. It responds to seismic stresses ensuring the displacements due to thermal actions to which the various elements of the building are subjected, beyond which it activates the dissipative function by modifying the response of the structure.

For displacements up to 10 mm it is designed to work as a "hysteretic dissipator", beyond such deformation, and up to 16.5 mm, the function of "mechanical constraint" intervenes.



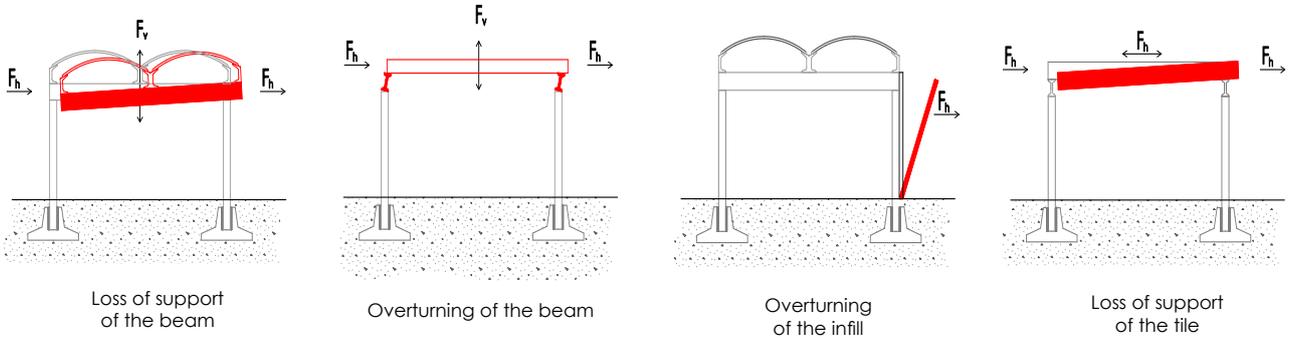
Device behavior **SAFE+ Model B** subjected to cyclic test at 0.1 Hz (Ref. experimentation University of Bergamo)



WHAT HAPPENS IN CASE OF EARTHQUAKE?

The loss of support, due to slippage or overturning, of horizontal structures from the supporting elements is one of the most frequent causes of damage and/or collapse of prefabricated buildings in reinforced concrete and precast concrete; this phenomenon occurs due to lack or inefficiency of mechanical constraints between elements such as:

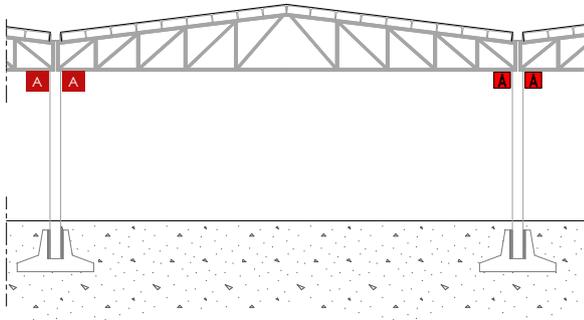
- covering - beam
- beam - column
- structure beam and column - infill



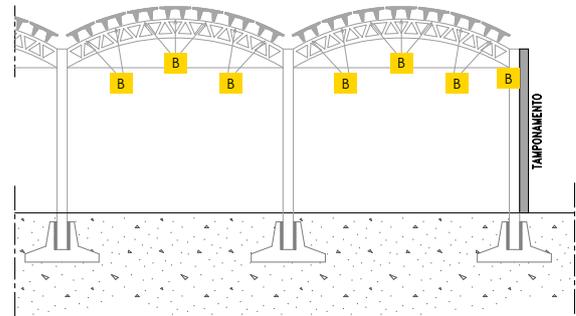
WHERE DO SAFE+ SEISMIC DISSIPATORS APPLY?

The purpose of SAFE+ devices is to guarantee an effective dynamic constraint between structural and non-structural elements which, in the event of an earthquake, guarantees safety conditions for workers and assets present in the structure. The choice and their positioning is the result of a careful evaluation of the structural characteristics and points of vulnerability of the building.

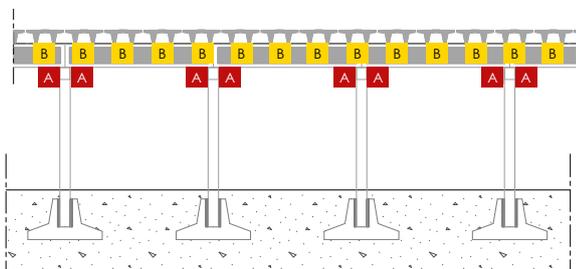
Below are some examples of different types of industrial buildings with intervention hypotheses.



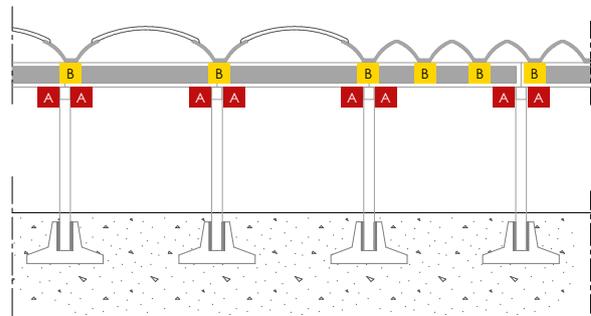
Single-storey structure with truss roof beams



Single-storey structure with arched truss beams



Single-storey structure with flat roof with wing-shaped elements



Single-storey structure with discontinuous flat roof

Note: the above proposals are to be considered purely indicative and illustrative. Each specific project must be subject to evaluation by a qualified technician.

The SAFE+ anti-seismic systems were developed and patented in collaboration with engineer Giovanni Bulferetti



Fibre Net S.p.A.
Via Jacopo Stellini, 3 - Z.I.U.
33050 Pavia di Udine (Ud) ITALY
Tel. +39 0432 600918 - Fax +39 0432 526199
www.fibre.net.it - info@fibre.net.it



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ISO 9001:2015 standard



ISO 14001
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