PREVENZIONE UMBRIA
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TARGETED PREVENTION PLAN FOR FALLS FROM HEIGHTS IN BUILDINGS

Regione Umbria

2020/2025 Regional Prevention Plan

INDEX

Summary of the Targeted Prevention Plan contents.

In overseeing and regulating temporary and mobile construction sites, the preventive approach relies on identifying strategies that promote efficient, suitable, and equitable practices and methodologies across the geographical region.

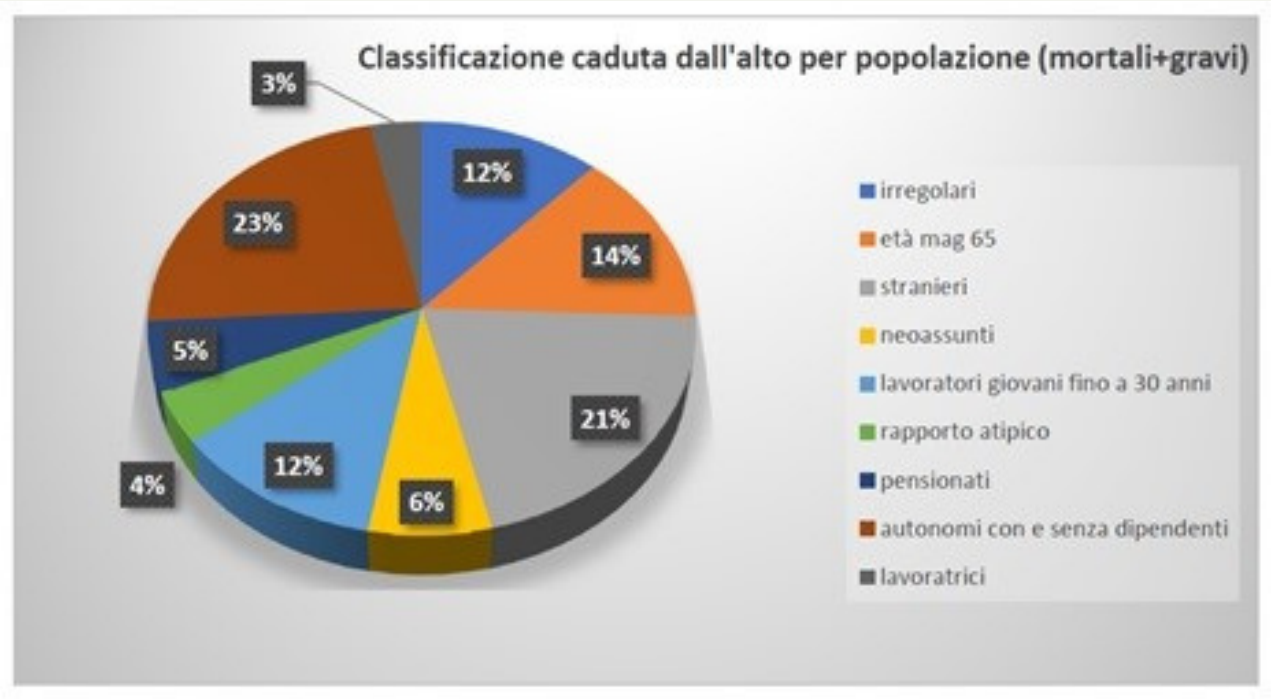
Regarding supervisory activities, the primary goal is to enhance quality and consistency by increasing the utilization of enforcement tools, including control methodologies tailored to the construction industry. This involves implementing best practices for supervision, especially in preventing the risk of falls from heights.

In this context, institutional bodies' proactive approach acknowledges the targeted prevention plan as the tool capable of synergistically organizing supervisory and assistance activities for companies. The targeted plan is designed as a participatory territorial model in the prevention of health and safety risks at work, to be implemented in the Regions by local health authorities' prevention services following the reference standard outlined in the PNP 2020 - 2025 and examined in this study.

INAIL data from the INAIL Infor.Mo system pertaining to the years 2010-2018.

Accidents at work caused by falls from heights remain a common occurrence, often resulting in severe consequences. These accidents are typically attributed to losing balance on elevated surfaces or the failure of non-load-bearing roofs.

The construction sector is significantly impacted during elevated work phases on construction sites, encompassing activities beyond construction itself, like gutter cleaning, and roof inspections. To provide a detailed analysis, data from the INAIL Infor.Mo. system for 2010-2018 was examined. During this period, there were 656 fatal falls from heights, with 392 in construction, and 491 serious incidents, including 243 in construction. The ensuing graphs illustrate the worker categories affected by falls from heights.



Out of the cases analyzed, 217 resulted from falls from heights due to the collapse of non-load-bearing roofs, with 145 being fatal and 72 classified as serious.
Falls from heights constitute approximately one-third of fatal workplace accidents, predominantly transpiring in small businesses (71% in establishments with up to 9 employees), notably within the construction industry (54% of incidents on construction sites).
The primary determinants of incidence are:

- Incorrect operating methods often result from procedural errors such as traversing non-walkable surfaces, losing balance due to fixed building components, or scaffolding.
- Incorrect utilization of the portable ladder.
- Failure or improper utilization of essential PPE.
- Environmental factor: failure to prohibit dangerous passages, lack of reporting; lack of fixed protections; absence of anchor points for lifelines, parapets, and protection at heights; portable ladder setup problem.

Experienced operators with over 3 years of seniority and aged over 50 have a high occurrence of fatal accidents resulting from falls from heights, possibly due to a tendency to underestimate risks.

The primary factors that may result in a fall from a height are:

1. Non-load-bearing roofing breakthrough (23.2%);
2. Portable ladder falls accounted for 17.3% of incidents.
3. Descend from a stationary point on the building's elevation (12.5%).
4. Falls from scaffolding, fixed scaffolding, and temporary works in general account for 10.1% of incidents.
5. Entering apertures (10.1%);
6. Falling from height while using lifting equipment (8.3).

Best practices as a preventive measure.

Even minor tasks can pose a risk of falling from a height, such as maintaining and cleaning technological systems, flues, glass, skylights, gutters, assembling and maintaining antennas, satellite dishes, air conditioning systems, replacing glass, coverings, tiles, restoring roofing or facades, maintaining photovoltaic panels, replacing fixtures, performing tinsmith work, and conducting roof inspections.

Legislative Decree 81/08 defines good practices as organizational or procedural solutions in line with current legislation and standards, voluntarily adopted to enhance workplace health and safety by reducing risks and improving working conditions (Legislative Decree 81/08, art. 2, paragraph 1, letter v). These practices are processed and compiled by various entities such as the Regions, the Higher Institute for Prevention and Safety at Work (ISPESL, now INAIL), the National Institute for Insurance against Accidents at Work (INAIL), and joint bodies. They undergo validation by the Permanent Consultative Commission, subsequent to a technical assessment by INAIL to ensure broad dissemination.

Legislative Decree 81/08 incorporates best practices as part of the overall measures to safeguard the health and well-being of employees in the work environment (art. 15, paragraph 1, letter t)). This is especially crucial in the construction industry, where clients and employers must prioritize implementing measures that ensure sustained enhancement of safety standards.

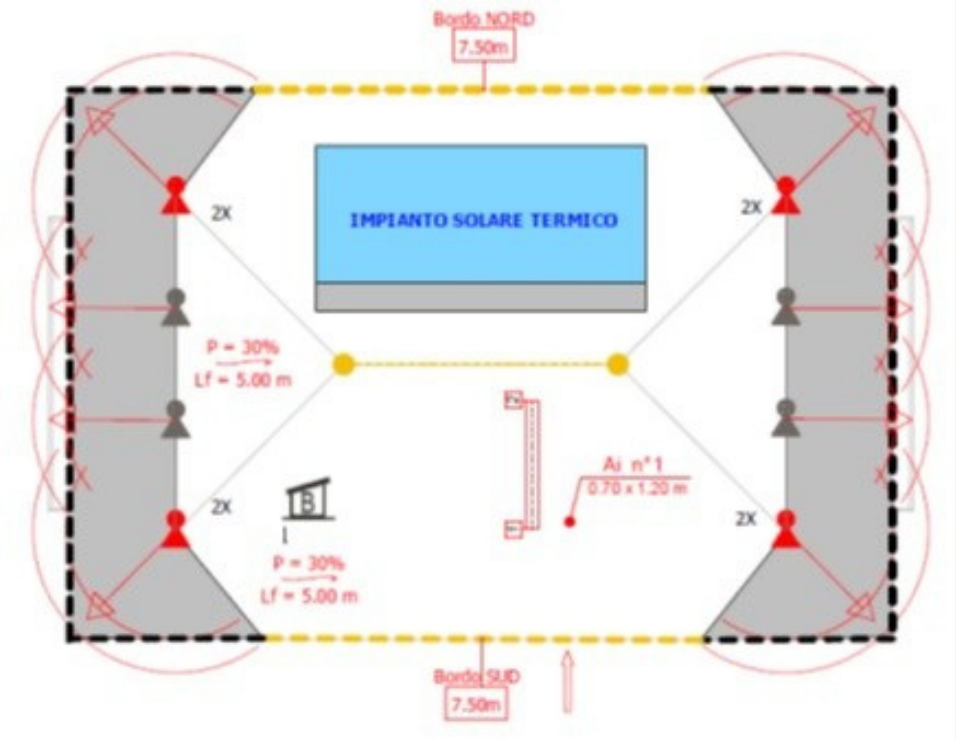
Considering the significance attributed by lawmakers to best practices and to promote their voluntary adoption by businesses, it is anticipated that companies implementing such practices or undertaking improvement measures aligned with them, endorsed by the Permanent Advisory Commission for occupational health and safety, and disclosed on the Ministry of Labor's website (link: https://www.lavoro.gov.it/temi-e-priorita/salute-e-sicurezza/focus-on/Buone-prassi/Pagine/Buone-prassivalidate-dalla-Commission-Consultiva-Permanente.aspx), may qualify for a reduction in the INAIL premium rate following the initial two years of operation by completing the relevant application form as per the guidelines provided on the INAIL website.

This compendium of best practices was formulated to execute the Predefined Program PP7 - Prevention in the construction sector of the National Prevention Plan 2020/2025, as established by DGR 1308 dated 29.12.2020. It serves as a key instrument for shaping the Targeted Prevention Plan (PMP).

After the seismic events in 1997 and 2016, the Umbria Region underwent substantial reconstruction of buildings in the affected areas. This led to the activation of multiple construction sites, facilitated by national incentives provided by the government for seismic retrofitting and energy efficiency. These initiatives included the installation of systems on roofs and facades, effectively converting them into functional workspaces for construction firms, installers, and maintenance personnel.

To uphold proper supervision in construction, the Umbria Region had previously endorsed guidelines to prevent falls from heights through Resolution of the Regional Council n.1284 dated 28 October 2011. These guidelines aim to establish criteria, intervention methods, and control measures to be implemented from the design stage onwards. They apply to both new and existing buildings (renovations), as well as interventions on roofs or ventilated facades, to ensure the installation of safety devices for future maintenance activities.

The resolution entails drafting the technical document for the roof (ETC) and/or facades, an essential component of the file (referred to in art. 91 paragraph 1 letter "b" and in annex XVI of Legislative Decree 81/2008), detailing the specifications, features, and selection of the optimal access system for heights and building facades.



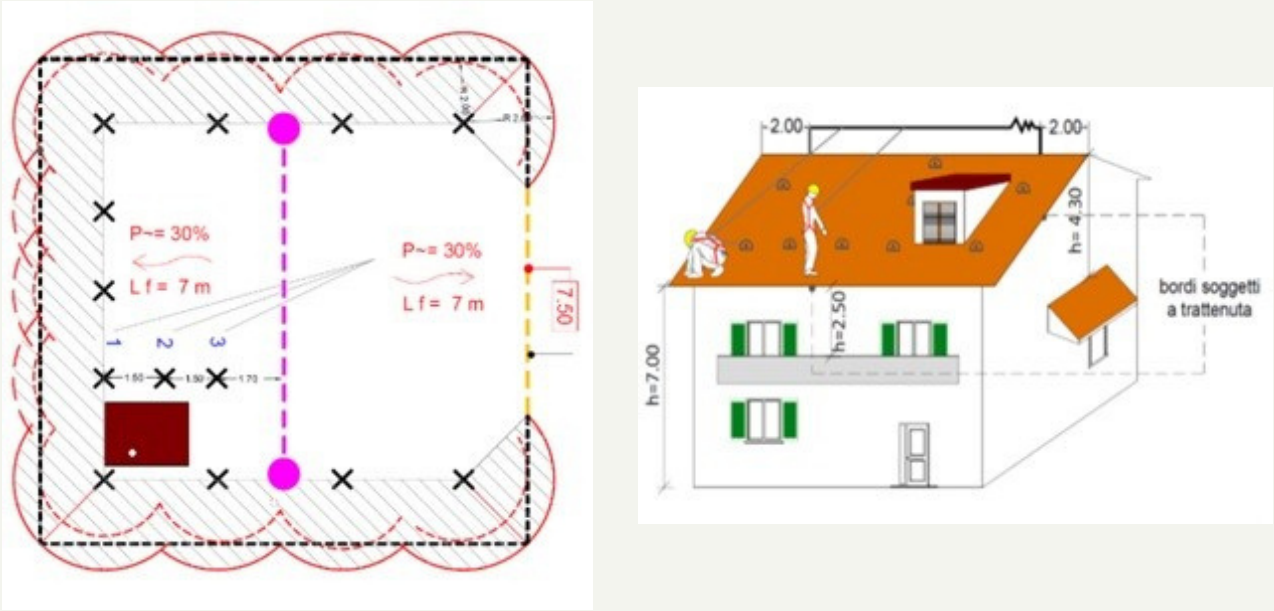
Technical document example for the roof - roof plan

Roof safety measures exemplified - legend

In summary, the guidelines or directives of DGR n.1284/2011, reaffirmed by Legislative Decree 81/2008 and additional regulations, have led to operational procedures and best practices in both design and implementation.

Safety planners and employers of companies that access heights are obligated to:

- Establish permanent height access systems.
- Install permanent fall protection systems or devices on roofs and facades, prioritizing linear options over punctual ones.
- Prefer collective protection systems to individual fall arrest devices.



Demonstration of roof safety precautions involving the installation of anchors and lifelines.

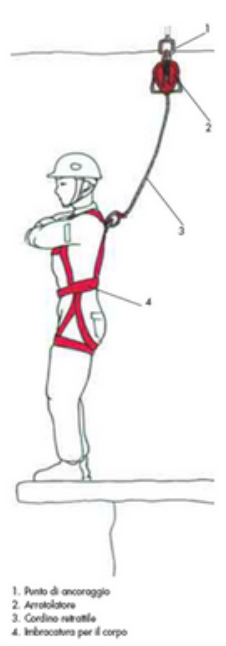
Working at elevated levels can subject employees to significant safety hazards. Specifically, the dangers of falling from a height account for a considerable portion of injuries, particularly those resulting in fatalities.

Working at height refers to any task that puts a worker at risk of falling from a height exceeding 2 meters above a stable surface (Art.107 Legislative Decree 81/08).

By analyzing the six primary accident dynamics in working at heights outlined in the preceding paragraph, along with the key risk factors that influenced them, we recommend preventive measures and best practices that companies should adopt to mitigate or, at the very least, minimize the risk.

When evaluating the risks associated with working at heights, it is essential to consider the appropriate ergonomic factors. This includes assessing the work location, selecting the most suitable equipment for the task at hand to ensure and uphold safe working conditions, and prioritizing Personal Protective Equipment (PPE) and Collective Fall Protection (CFP) systems such as parapets, scaffolding, platforms, safety nets, or under-bridge protection. In the absence of collective protection systems, as outlined in Article 115 of Legislative Decree 81/2008, workers must utilize individual fall arrest systems that meet technical standards and are appropriate for the task.

- Anchor points.
- Permanent rigid or flexible guides or lifelines.
- Harness
- lanyard;
- Energy absorber;
- Retractable mechanisms.



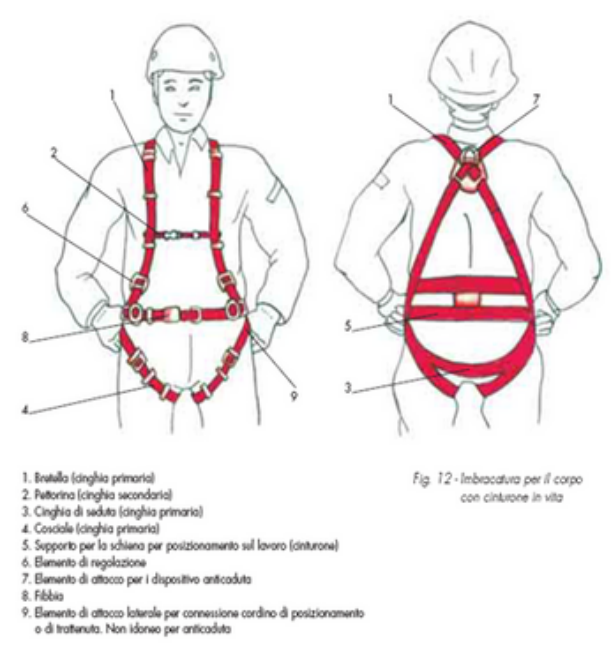
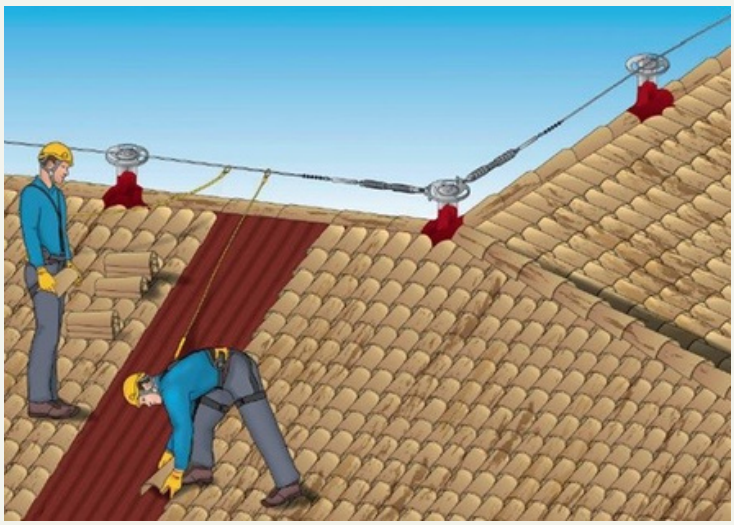


Fig. 12 - Imbracatura per il corpo con cinturone in vita

The EN 795 standard pertains to anchors for fall protection systems and covers the following categories:

- Structural Anchors Class A
- Temporary Class B Anchors
- Class C relies on adaptable anchors.
- Class D anchors on fixed rails.
- Class E deceased body anchors



Example of adaptable enduring linear anchoring (Source - INAIL technical notebooks - Anchors)

Prior to commencing work at elevated levels, the employer is required to adhere to the primary training and educational responsibilities outlined for each employee (Art. 37, 71 paragraph 7, and 73 of Legislative Decree 81/2008), offering specialized instruction on the proper utilization of tools and equipment. Additionally, it is crucial to uphold the effectiveness of Personal Protective Equipment (Art.77 of Legislative Decree 81/2008), machinery, and equipment (Art.71 of Legislative Decree 81/2008), by conducting maintenance, repairs, and replacements as needed, following the manufacturer's provided guidelines (information leaflet or operation and maintenance manuals).

Helmet - sliding device - descender cord

Safety harness

Fall arrester with retractable fe

Temporary lifeline connection with energy absorber for positioning.

If maintenance work is required on the roofing and/or facades of a building with safety installations, the adequacy of the installed system and its safety must be evaluated. This involves obtaining all essential information, certifications, and guarantees from the condominium administrator or property owner.

ATTENZIONE

LINEA VITA UNI EN 795/2002

Prima di accedere alle zone in "quota":

Consultare il manuale d'uso e manutenzione della "linea vita" prima del suo utilizzo.
Utilizzare esclusivamente i Dispositivi di Protezione Individuale indicati nel manuale.

Marca della linea vita e/o ancoraggio	Installatore	data installazione	Numero-matricola d'installazione

Numero massimo ammesso di utilizzatori contemporanei:

Data ultima verifica:

Nota: le manutenzioni programmate verranno compilate su appositi spazi nel manuale d'uso e manutenzione che in copia è disponibile presso questo cartello e/o da richiedere

In prossimità dell'accesso alla copertura, in posizione ben visibile, devono essere posizionati:

1. il cartello che avverte della presenza dell'impianto anticaduta e che indica il numero di operatori che possono accedere contemporaneamente all'impianto e le indicazioni
2. il manuale d'uso e manutenzione debitamente compilato e con allegato planimetria della linea vita e dell'eventuale progetto.

Analysis of injury dynamics risk factors

Upon analyzing the risk factors of injury dynamics individually, it is found that:

- **The roof collapse is primarily caused by inaccuracies in assessing worker resistance, procedures, and operational methods. This often occurs when individuals walk on non-load-bearing or unsafe surfaces, leading to loss of balance and falls onto hazardous areas like skylights. Key factors include neglecting to restrict access to dangerous zones, not implementing essential safety measures, lacking walkways with boards over frames, safety platforms, and neglecting the use of appropriate fall-prevention PPE equipment.**
- **Breakthroughs in non-load-bearing roofs can be distinguished as viable or non-viable according to the UNI 8088:1980 Standard (currently repealed pending replacement).**

Coverage violation

Preparation of the board with a lifeline fall arrest system.

- **Two viable roofs (intrinsically safe): Roofs that allow access and transit of people, along with portable equipment, without the need for additional safety measures, as there is no risk of falling people or objects from above, or slipping in normal conditions.**

Roof safeguarded by parapets

Metal grid for fall prevention

- **Inaccessible roofing (potentially hazardous): Roofing that requires specific means and safety measures to prevent falls and slipping.**

Operator connected to fall arrest system (lifeline, harness, etc.), preparation of walkways with boards, and utilization of safety nets (System S).

- **The primary factor contributing to worker falls from portable ladders is the improper or incorrect use of the equipment. INAIL's surveillance system has identified that around 17% of falls from heights result from inadequacies in specific use or conditions, such as the required altitude, support surface slope, or intervention duration. Additionally, structural issues and stability of the ladder itself, whether due to height or other factors, pose a significant risk of slipping. To mitigate these risks, ladders should be secured at the base, equipped with anti-slip devices at the bottom ends, and have retaining hooks at the top ends. Workers often operate in challenging ergonomic conditions with both hands engaged by tools, leading to a high likelihood of impact on the ground, typically on the shoulders or head, resulting in severe or fatal consequences.**

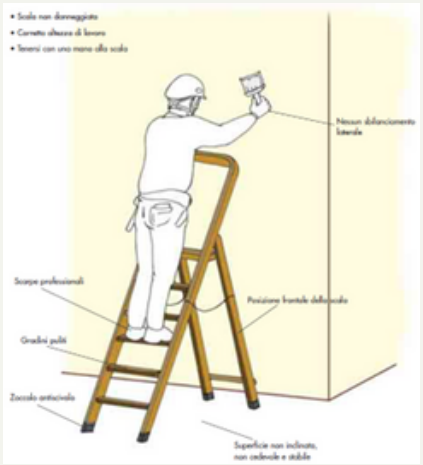


Illustration of proper application

Incorrect usage example: (INAIL technical notebooks - portable ladders)

Guidelines for utilizing endorsed ladders

Basic information, as per UNI EN 131-3 standards, that should be displayed through clearly visible pictograms on all support ladders includes the following:

- Read the guidelines.
- Maximum load capacity;
- Adjustment of the support angle is required.
- Position on a level surface.
- Avoid leaning over.
- Ensure the ground is free of dirt.
- Rest on a stable foundation.
- Extension of the staircase beyond the arrival point.
- Avoid descending the ladder on the side.
- Utilize the ladder in the appropriate orientation (if needed based on the ladder's structure).

Incorrect boarding and alighting procedure should be rectified.

Ensure proper ascent and descent protocol.

Each support ladder must be equipped with markings indicating that the top three rungs should not be surpassed.

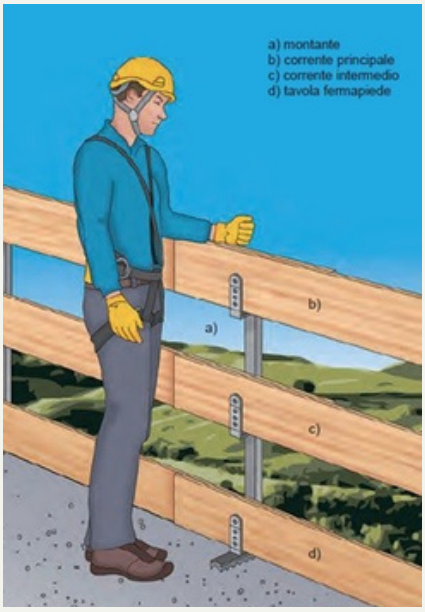
The marking can be positioned on the ladder upright or ideally on the initial rung or step that should not be crossed.

Legislative Decree 81/08 mandates that employees have continual access to assistance and secure handholds.

Example of a convertible ladder with three sections in an A-frame configuration supported at the base by another individual.

Mobile ladder with platform example, compliant with UNI EN 131-7.

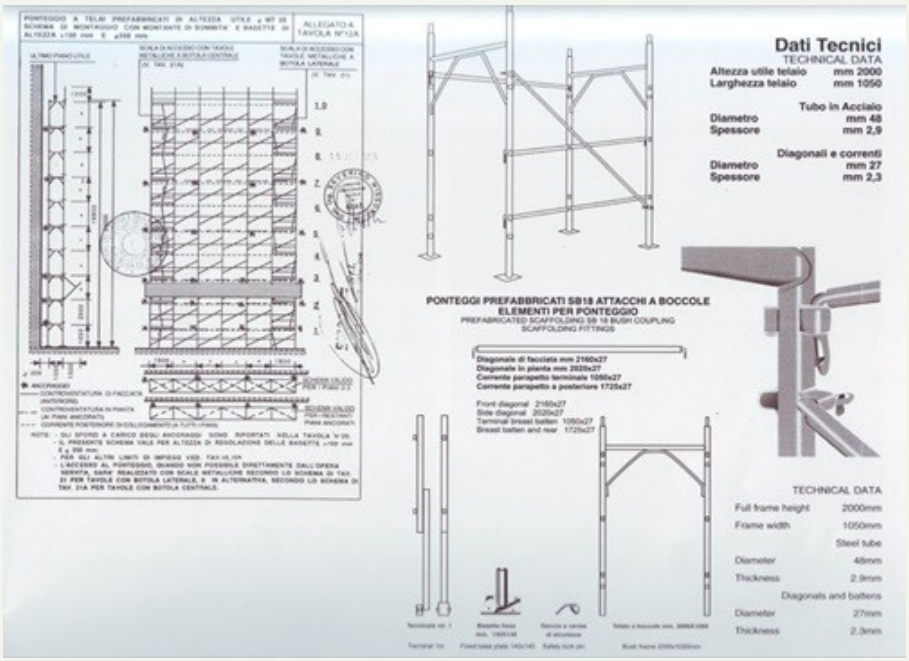
- **The second risk factor for falling from a height involves falling from fixed parts of buildings such as attics, worktops, roofs, terraces, balconies, and inside openings like openings or skylight gaps. The determining factors primarily relate to the worker's operating methods, which may include procedural errors leading to loss of balance, failure to use Personal Protective Equipment (PPE) either due to lack of supply or non-compliance, and notably, the absence of anchor points for life lines, inadequate protection of openings such as parapets or boards, and insufficient height safety measures.**



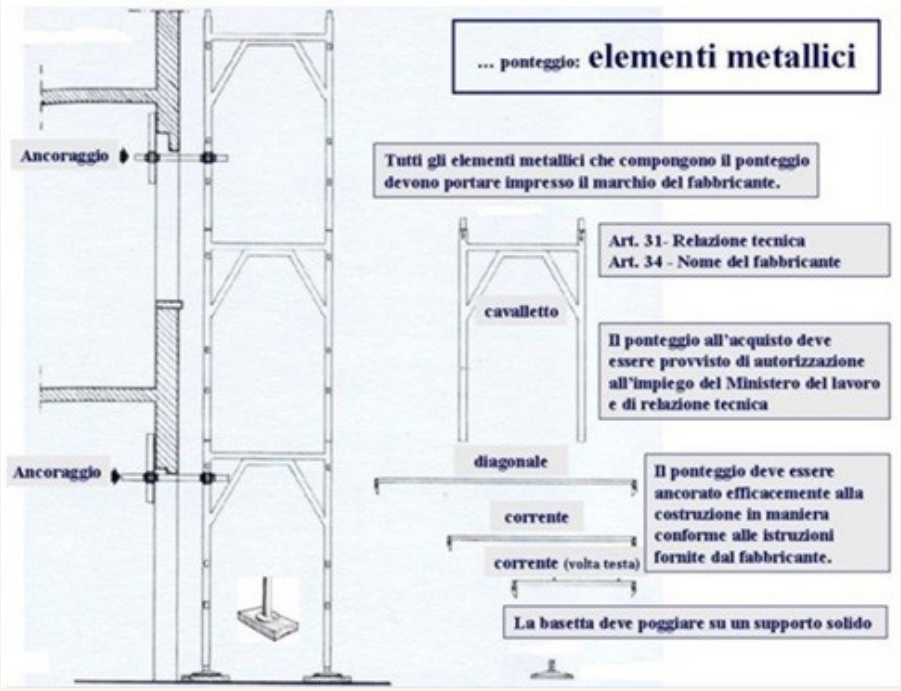
Components of Class B temporary parapet as per UNI EN 13374 (dimensions in mm)

Example of scaffolding utilized for edge protection.

- **Falls from scaffolding, whether fixed or temporary, are frequently caused by improper assembly of the temporary structure or its components during work stages (such as internal/external parapets, guardrails, etc.), resulting in hazardous fall hazards. The main issue often lies in the absence of adequate safety measures in over half of the cases. Additionally, worker-related factors, including non-compliance with safety procedures, contribute to the problem in two-thirds of cases.**

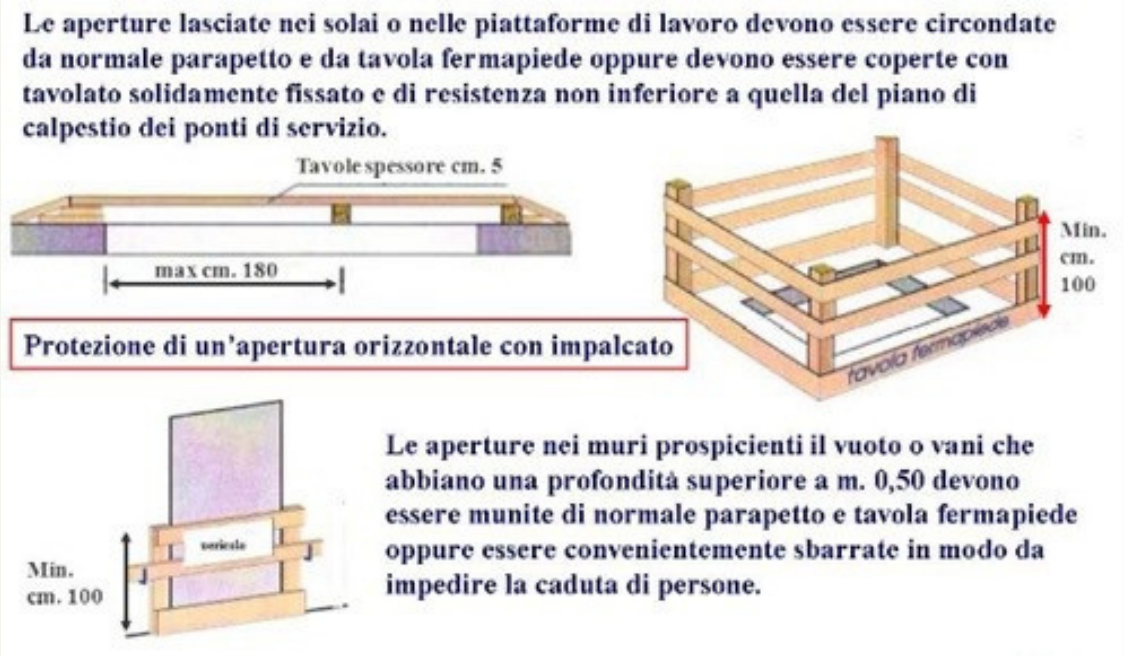


Ministerial authorization and assembly diagrams for prefabricated scaffolding are included in the booklet.



Vertical ladder scaffolding example.

- **Falls into elevator shafts or openings in attics are incidents resulting from unreported and unprotected void-facing openings, inadequately secured planking, or loosely anchored parapets.**

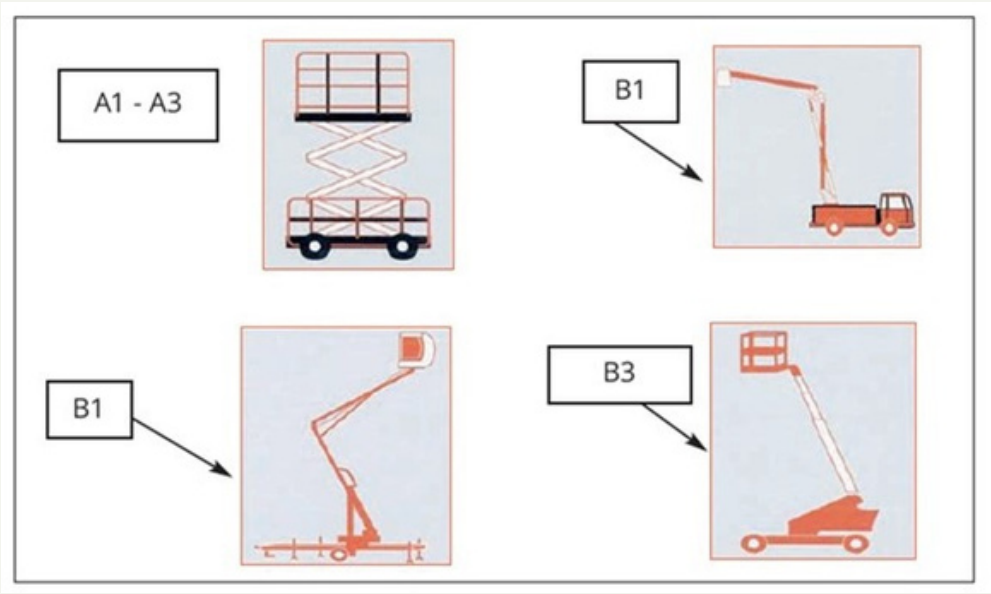


Protection of openings in attics and walls adjacent to voids or rooms.

- **The decline of operators from motorized lifting equipment (PLE, self-lifting platforms on columns (PLAC) or for work on ropes (acrobatic construction) is attributed to the growing utilization of lifting equipment for personnel to access elevated work areas, particularly for short-term tasks. This includes elevating platforms, machinery, and vehicles designed for working at heights.**

Portable Elevated Work Platforms (PEWP)

These machines are commonly referred to as aerial platforms or baskets and are categorized into different types (self-propelled with telescopic and/or articulated arm, self-propelled vertical pantograph machines, truck-mounted with telescopic and/or articulated arm, self-propelled spider-type tracked machines with telescopic arm and/or articulated, etc.).



PLE Classification Example

Working on the platform is only safe when conducted within the platform and when the operator wears a safety harness connected to the retaining rope inside the platform. Unfortunately, this is frequently not the case, with operators leaning over during a task and improperly utilizing the platform to reach the roof or another elevated area.

Fundamentally, three distinct categories of accidents involving lifting systems can be identified:

- Structural issues with the lifting system and/or improper installation;
- Landings from MEWPs on high levels resulting in falls into the void due to non-load-bearing surface failure or loss of balance.
- Failure to utilize PPE or improper utilization of PPE (restraint systems).

Pantograph elevator

Mobile elevating platform mounted on a truck

Platform elevation on tracked chassis

Self-climbing work platforms on columns (SCWPC)

Self-elevating platforms are available and installed in different configurations with one, two, or more columns for the transportation and positioning of individuals and materials for work.
They replace fixed scaffolding, leading to a significant boost in productivity for facade work while also simplifying and reducing fatigue in the process.
They can reach over 100 m of working height, encompassing tall buildings and structures.

Single-column elevated platform *Dual-column elevated platform*

Regarding rope work (interventions on building walls or rock faces for safety), causes stem from improper rope use, neglecting their use, and inadequate anchoring systems.

Illustration of a rope access system

Operator positioned on a rope while performing work.

When working in positions that require long suspension on a rope, it is essential to utilize ergonomic harnesses with integrated seats or install specialized ergonomic seats suspended from the work rope with adjustable clamps. The operator's positioning on the work rope should be carefully adjusted to ensure their weight is supported by the seat rather than the harness.

Preventive measures for working at height safety.

Preventive measures

- Prioritize the implementation of collective protection measures against fall hazards in line with the risk assessment. Ensure that fall prevention measures are in place before work commences and are accessible throughout the duration of the work.
- Assess if you possess the knowledge, skills, and experience necessary to conduct roofing work.
- In order to work safely, individuals who ascend to the roof or perform tasks on a facade should receive proper training to execute the work. This training enables them to identify risks, comprehend suitable work procedures, and proficiently perform the necessary tasks.
- Assess the roofing type before ascending by examining the underlying structure (roof or attic) for visible signs of weakness or deterioration, such as excessive curvature of load-bearing elements, extensive moisture stains, skylights, etc. If uncertain about the load-bearing capacity of the walking surface, ensure the adoption of suitable protective measures before climbing. For ventilated or continuous facades, also assess the integrity of the load-bearing structure, the optimal functioning of anchors, and other structural components.
- Carefully plan the work to be conducted at elevation to minimize time spent working in hazardous conditions.
- Assess the feasibility of completing the task by minimizing the time allocated for work on the roof or facade (e.g., preassembling required materials on the ground).
- Carefully assess the lower-intensity risks that could potentially lead to a fall, such as:
  - Inadequate footwear traction;
  - Eye glare;
  - Rapid cooling or freezing;
  - Decrease in visibility or field of vision;
  - Heatstroke or sunstroke;
  - Dizziness and/or balance disorders onset.
- Refrain from consuming alcoholic beverages, psychotropic substances, or narcotics before ascending to altitude.

- Avoid accessing the roof and facade during inclement weather conditions such as rain, ice, snow, or wind. This includes early mornings in the cold season and midday hours in the hot season. These conditions elevate the risk of accidents due to slippery surfaces or excessive heat.
- Pay careful attention to the materials and equipment you bring to high altitudes and observe the following precautions:
- Avoid discarding materials from above. To dispose of waste, utilize slides, lifting devices, or manually lower the material to the ground.
- Avoid collecting items that may fall.
- Restrict access to hazardous areas situated below or adjacent to the work areas.
- Utilize waste nets for safeguarding transit routes near areas prone to material falling from above.
- Whenever feasible, refrain from transporting bulky and weighty items to elevated locations.
- Ensure proper storage of all materials, particularly in windy conditions.
- Always notify the owner or administrator before accessing heights (roof or facade).
- Ensure the concurrent presence and support of a collaborator when accessing elevated areas such as roofs or facades.
- Equip yourself with communication equipment like a two-way radio or mobile phone after verifying the reception quality.
- Always notify a third party of your presence at height and report your presence prior to accessing any work area.

The Targeted Prevention Plan serves as an organizational tool.

The novel approach: the Targeted Prevention Plan functions as a tool capable of synergistically coordinating support and oversight efforts for companies in the construction industry.

The document and the associated self-assessment form used by companies in the construction industry are the outcome of applying best practices, involving a process of comparison, sharing, and integration to suggest solutions for safeguarding the health and safety of workers in a specific high-risk area - falls from heights. It serves as a collaborative operational tool aimed at promoting good health and safety practices, as well as methods for support, monitoring, and supervision. This output reflects the dedication of the working group led by the Prevention, Veterinary Health, and Food Safety Service of the Umbria Region, comprising professionals from the PSAL Services of the Local Health Authorities. It was deliberated upon with trade associations and representatives of the CTPs (CESF and TESEF).

The Targeted Prevention Plan comprises a series of three consecutive actions.

1. Support phase:
   - design
   - Entrepreneurship workshop
   - information/training
2. Supervisory Stage:
   - Companies' self-assessment
   - Supervision by local health authorities following examination of self-assessment and inspection forms in a sample of companies engaged in prevention interventions.
3. Evaluation of the effectiveness of implemented interventions, with a focus on analyzing the applied best practices.

Self-assessment form

To mitigate this risk within construction firms in the Umbrian region and minimize accidents, particularly those resulting in severe or fatal outcomes, it is imperative to educate employers in the construction industry about their responsibilities. An effective method for assessing these obligations and behaviors is through the use of a company self-assessment form.

When working at heights exceeding 2 m, appropriate scaffolding, or temporary works must be utilized to mitigate the risk of falls.

The self-assessment form originated from the National Prevention Plan 2020-2025 under the Predefined Program PP07 "Targeted prevention plan from the risk of falling from heights on construction sites." Completing and submitting it to the territorially competent PSAL Services is integral to the execution of the support activities conducted by the Prevention Department.

The form is designed for construction employers to gather data essential for comprehending the current organizational and management environment in which companies operating in tasks that may expose workers to falls from heights function. It also serves to assess the procedures for proper equipment adoption and usage, and to conduct regular inspections at the construction site.

The sheet is segmented into eight sections: the initial table is designated for general information collection, while the following ones vary based on the preparation type. The Employer's designated spaces for completion are located in the rightmost column.

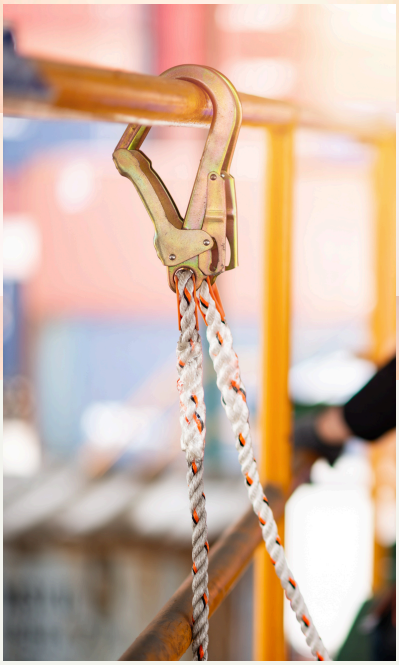
Utilizing the corporate self-assessment form

The self-assessment form is utilizable.

- Making it available and downloadable, as well as in editable format on institutional portal web pages;
- Sending it to nearby construction firms;
- Promoting the utilization of information acquisition by Joint Bodies for assistance purposes.

The data gathered from the returned forms by the companies are utilized for statistical analysis, as well as to plan specific support and monitoring activities on critical issues arising from the analyses.

Bibliography



INAIL Information

of the INAIL INFOR.MO system pertaining to the years 2010-2018.

Legislative Decree No. 81 of April 9, 2008.

Consolidation of health and safety at work.

INAIL Technical Manuals

- Anchors, 2014 version
- 2014 Edition of Personal Fall Protection Systems
- MEWPs at construction sites, 2016 version
- PPE guidelines for preventing falls from heights, 2004 edition
- 2014 Temporary Parapets
- Revised Scaffolding, 2014 Version
- Safety Nets, 2014-2018 Version

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