Fire prevention on construction sites

CFPA-E Guideline No 21:2021 F

CFPAEUROPE

FOREWORD

CFPA Europe develops and publishes common guidelines in order to achieve similar interpretation in the European countries and to give examples of acceptable solutions, concepts and models. CFPA Europe has the aim to facilitate and support fire protection, security and protection against natural hazards across Europe, and the whole world.

The market imposes new demands for quality and safety. Today, fire protection, security and protection against natural hazards form an integral part of a modern strategy for survival, sustainability and competitiveness.

These Guidelines are primarily intended for the public. They are also aimed at rescue services, insurers, consultants, safety companies and the like so that, in the course of their work, they may be able to help manage risk in society.

These Guidelines reflect best practice developed by the national members of CFPA Europe. Where these Guidelines and national requirements conflict, national requirements shall apply.

This Guideline has been compiled by the Guidelines Commission and is adopted by all members of CFPA Europe.

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CFPAEUROPE®

European Guideline

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Key words:

1 Introduction

Already at an early stage, the conditions for fire safety during construction of buildings should be clear so that all parties involved in the project can do the right thing from the start and find a good balance between fire hazards and fire protection. CFPA Europe has therefore developed this guideline.

These guidelines describe the necessary measures that should be considered during the design phase. In this way, fire safety can become a natural part of the operation during the construction phase. The measures need not be burdensome or involve major changes in work processes or procedures. All requirements in this guideline may not be relevant in all construction projects. The most important thing is that the client and contractor agree on the terms that apply in the current project.

The guideline is intended for construction work including refurbishment. Target group are clients, developers, contractors, rescue services, fire consultants, insurers, and anyone else who can contribute to increased fire safety on construction sites.

The guideline focuses on larger buildings and thus may not be relevant for small buildings such as single or two-family houses or similar, nor do they deal with the specific problems and fire protection solutions for construction works underground.

Every year, many fires occur on construction sites. In these fires, people are at risk, property is lost, and companies are affected by loss of production.
In the construction industry and in many other industries, the ambition for fire safety is rarely higher than achieving the requirements made by the legislation. The focus should be to create a safety culture where safety is an obvious part of the work where everyone has enough competence to adapt protection to the risks of the business.

Here are some examples of challenges that need to be addressed during construction:

- Disorder, waste and dust
- High fire load
- Combustible surface layers on building parts
- Blocked escape routes
- Unfinished or punctured fire compartmentations
- Fire doors kept open
- Use of open flames, heating devices or other sources of ignition
- Active fire protection systems that are not completed or are taken out of service
- Insufficient fire protection of supporting building elements
- Lack of control
- Unclear responsibility
- Linguistic confusion
- Human factor

2 Definitions

BCP – Business continuity planning

Client - A person or company for whom a project is carried out.

Construction sites at high altitudes – In this guideline, the concept refers to construction sites where:

- the top floor is higher than what rescue services can reach using ladder vehicles (normally buildings over eight floors).
- Rescue services, due to the height or other characteristics of the building, must fight the fire from inside the building.

Escape Route – An escape route shall be an exit directly to the street or equivalent or an exit to the terrace, courtyard or similar from which street or equivalent can be easily reached. An escape route can also be a fire compartment in a building leading from a room to such an exit.

Evacuation alarm – Alarm button push system and alarm devices or equivalent that may call for evacuation on the entire construction site.

Evacuation signal – Signal calling for the need for evacuation.

Evacuation signs – Indicative marking refers to signs which, in the event of evacuation, provide guidance so that the evacuation is not hindered by difficulties in orienting themselves in the building.

Fire compartmentation – Secluded part of a building within which a fire throughout or part of a fire can develop without spreading to other parts of the building or other buildings.

Fire detection and alarm system – System that automatically detects a fire and transmits signal to the functions that depend on the alarm, such as evacuation alarm sirens and other fire protection functions.

Fire hydrant – Connection where rescue services can connect to the municipal water mains network for fire water supply. Fire hydrants must not be blocked in connection with construction work.

Fire protection manager – The highest manager at the workplace or the person appointed by the management to coordinate fire protection work.

Fire resistance classes – Some building parts are divided in classes depending on their resistance to fire. The most common are as follows:

R (load bearing capacity), E (integrity), I (insulation) and W (limited radiation).

The classes: R, RE, E, EI or REI are accompanied by a time requirement 15, 30, 45, 60, 90, 120,

180, 240 or 360 minutes.

Classification can be combined with the designation C - (for doors with door closers).

The current classification does not distinguish between un-combustible and combustible building parts when assessing fire technical class.

Fire reaction classes - The following classes are used for material, claddings, and surface finishes. The most common are as follows:

A1, A2, B, C, D, E Fire reaction class

A1 has the highest requirement and cannot be combined with any of the supplementary classes. Classes A2, B, C, and D are always combined with one of the following supplementary classes: – s1 the structural element may only emit a very limited amount of smoke. – s2 the structural element may emit a limited amount of smoke – s3 no requirement on limitation of smoke – d0 burning drops or particles may not be emitted from the structural element – d1 burning drops or particles may be emitted in a limited amount – d2 no requirement regarding restrictions on burning drops or particles. Fire reaction class E is the lowest class and is combined with the supplementary class d2 if burning drop requirements are not met.

Fire risk – Anything that can cause a fire to occur and leads to a consequence.

Fire safety inspector – The person appointed by the fire protection manager to carry out, among other things, monitoring of fire protection.

Fire safety expert – Person who has verified competence to assess appropriate fire protection measures. Usually, the fire consultant hired in a construction project.

Hot work – Special rules apply to hot works carried out at a temporary workplace. These may include work with tools/machines that emit heat or sparks, such as welding, soldering, grinding, cutting, or heating with a hot air gun. The rules include competence requirements for performers, fire watchers and permit handlers.

Temporary buildings – During the work, temporary buildings such as barracks, freight containers, caravans, movable and divisible buildings can be used, for example, as offices, workshops, staff spaces.

Temporary electricity plants — Electricity plants for, for example, construction and demolition sites, markets, trade fairs and stalls, mobile and transportable workplaces.

European Guideline

3 Fire protection requirements

3.1 Rules and recommendations

3.1.1 European legislation

The minimum requirements for health and safety on construction sites is regulated by the EU-directive 92/57/EEC, *"minimum safety and health requirements at temporary or mobile constructions sites".* These requirements should be integrated in the national legislation of the EU-member countries. In the directive you can find the following text regarding fire safety.

Article 3. Emergency routes and exits
3.1. Emergency routes and exits must remain clear and lead as directly as possible to a safe area.

3.2. In the event of danger, it must be possible for workers to evacuate all workstations quickly and as safely as possible.

3.3. The number, distribution and dimensions of emergency routes and exits depend on the use, equipment, and dimensions of the site and of the rooms and the maximum number of persons that may be present.

3.4. Specific emergency routes and exits must be indicated by signs in accordance with the national regulations implementing. Such signs must be sufficiently resistant and be placed at appropriate points.

3.5. Emergency routes and exits, and the traffic routes and doors giving access to them, must be free from obstruction so that they can be used at any time without hindrance.

3.6. Emergency routes and exits requiring illumination must be provided with emergency lighting of adequate intensity in case the lighting fails.

Article 4. Fire detection and fire fighting

4.1. Depending of the characteristics of the site, the dimensions and use of the rooms, the on-site equipment, the physical and chemical properties of the substances present and the maximum potential number of people present, an adequate number of appropriate fire-fighting devices and, where required, fire detectors and alarm systems must be provided.

4.2. These fire-fighting devices, fire detectors and alarm systems must be regularly checked and maintained. Appropriate tests and drills must take place at regular intervals.

4.3. Non-automatic fire-fighting equipment be easily accessible and simple to use. The equipment must be indicated by signs in accordance with the national regulations implementing Directive 92/58/EEC. Such signs must be sufficiently resistant and placed at appropriate points.

3.1.2 Other rules and recommendations

To obtain robust and resilient conditions at construction sites developers and contractors should also consider other aspects than just health and safety. Construction industry rules, standards, joint codes of practice or other recommendations are used to varying degrees in different countries. In these cases, it is not a question of legal requirements and it is up to the client or other stakeholders to claim and follow up on compliance with the rules.

3.2 Own ambition

How far to implement fire protection measures beyond the minimum requirements of the legislation is an issue that the client decides, possibly after co-advice with his insurer. If the client is not the final user of the building, the ambition level of the future user should also be requested. After a risk assessment, the level of protection is determined. It is then checked that all requirements under laws and regulations are met. The client should, during work, follow up that the contractors live up to the level of ambition.

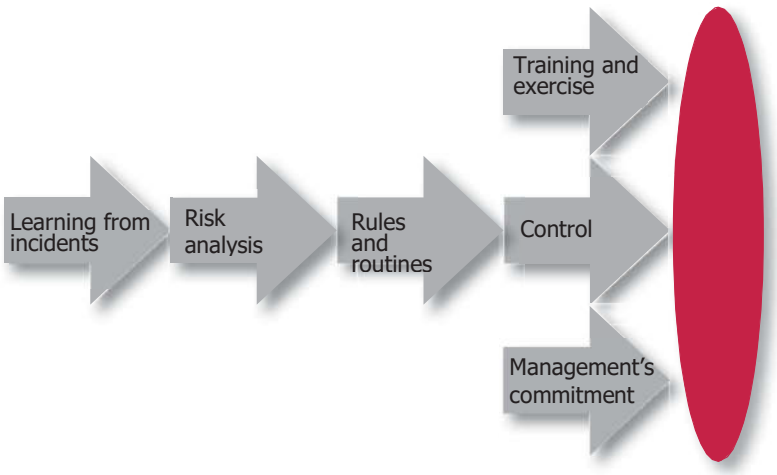
4 Management's commitment

4.1 Safety culture

Simply put, safety culture is about the general view of safety among those working on the site. There is no "Quick fix" to create a safety culture, but through a consistent way of working you can get far. Broadly speaking, it is a question of creating a forgiving approach in which reporting of mistakes and incidents is promoted. This is so that others can learn from the mistakes so that they do not repeat.

- Through experience from incident reporting and monitoring, risk analyses can be carried out with high quality.
- Rules and procedures can thus be created based on actual risks.
- Risk awareness can be conveyed through information, training, and exercises.
- Compliance with rules and procedures can be followed up by self-monitoring.
- The most important success factor for really succeeding in creating a safety culture is management's commitment.

Examples of management's commitment may be that supervisors give signals that safety is important by carefully to following policies, rules, and routines and to participate in exercises, training, and information events



Another way of creating management engagement procedures is to have fire safety as a standing point on the agenda at construction meetings.

4.2 Incident management

Having an idea of when, where, and why incidents occur, is an asset in all kind of prevention work, not least in terms of fire safety. This can be done by systematically documenting all cases of fire incidents. Many organizations have systems for reporting incidents, vandalism, and other deviations where fire incidents can also be managed.

An important factor in making the system work is that there is a feedback to the person who reported an incident and that persons responsible for fire risk assessment have access to the data.

4.3 A systematic approach

Quality work is based on the so-called PDCA cycle. PDCA stands for Plan, Do, Check and Act. Put simply, it is a question of evaluating what you do to find improvement measures.

The systematic approach is based on constant learning and continuous improvement. In practice, it also means that fire protection work needs to be documented to a reasonable extent. Read more about Fire protection management system in CFPA-E Guideline No. 1

4.4 Policy

A policy or guideline is a position and how management views the fire safety work. A fire safety policy may be included in a comprehensive policy that covers several aspects of health and safety. To gain legitimacy, it must be subscribed under by the CEO or equivalent. The ambition should be to create a policy that is simple and concrete. The policy may, among other things, suggest the measures expected to be carried out by anyone working on the construction site, see section 5.3.2.

4.5 Ensure fire protection competence in connection with procurement

Basic prerequisite for creating a firesafe construction site is that the client of construction projects in connection with the procurement ensures that contractors with the right skills are hired in the project. Among other things, the person appointed as fire protection manager Fire protection organization

For natural reasons, it is difficult to impose the same status on the technical fire protection during construction as when the building is completed. This makes it even more important that there is an organization that has continuous control over fire safety, both on fire hazards and protection systems.

4.6 Responsibility

To a varying degree, responsibility for fire safety rests on everyone working on the site. Anyone with specially appointed tasks also has a responsibility to perform their duties properly. The client or developer have the overall responsibility for fire safety on the construction site- until the tasks are transferred to someone else.

Regardless of who is given the task of coordinating fire protection work on the construction site, the principle is that responsibility for organizational measures, such as training, planning and follow-up, follows with the managerial responsibility of each contractor.

Fire protection measures are made not only to achieve satisfactory personal safety. The measures are also implemented to prevent or limit property damage, inside the construction site and out of it. The cost of a fire can be very large. If a subsequent investigation reveals that a contractor has failed to comply with rules, he may suffer major financial consequences.

4.7 Coordinate fire protection work

According to European directive 92/57 EEC, one or more person(s) shall be appointed by the client or the project supervisor to coordinate the safety and health matters on the construction site. The coordinator(s) for safety and health matters during the project execution stage should among other things, organize cooperation between employers, including successive employers on the same site. The purpose of the coordination of their activities is to protect workers and prevent accidents and occupational health hazards.

Fire protection work needs to be coordinated between different sub-contractors in the same way as health and safety. Since fire protection is to some extent a health and safety issue, it may be appropriate for practical reasons that the same person manages fire safety and health and safety.

When a building, or parts of a building, begins to be put into service, the fire protection organization needs to be reviewed. During a period, there can be different contractors and staff from the company moving in, working in the same premises.

4.8 Allocation of tasks

Since it is not possible to predict who detects a fire, it is reasonable that certain measures should be carried out by all persons working on the construction site. Other tasks in the fire protection work are carried out by specially appointed persons.

On smaller construction sites, fire protection work can be carried out by one person. In larger projects, tasks should be allocated to several persons. Tasks should be delegated in writing but may be a part of a job description.

4.8.1 Client/contractor

Normally the client or developer has ultimate responsibility for the health and safety on the construction site. Although some jobs have been transferred to another party by agreement, there is still an obligation for the ultimately responsible to monitor the conduct of the work about safety.

4.8.2 Everyone who works at the construction site

Construction workers at the site should be capable of carrying out the following actions:

- comply with the rules and procedures established
- fix or report fire hazards detected
- evacuate from the building when the evacuation signal is given
- save people in danger if it does not put a risk of their own lives
- warn people on the construction site using the equipment available
- alert the rescue services
- extinguish a small fire using available firefighting equipment.

4.8.3 Fire protection manager (health and safety coordinator, se section 4.7)

One or more persons shall have the following tasks:

- responsible for information about fire safety
- responsible for continuous updating the site safety plan
- appoint employees who can carry out tasks in fire protection work
- responsible for coordinating hot works permits
- plan exercises and information sessions so that everyone on the site can gain knowledge of risks and routines and can act properly
- contact the rescue services if necessary and invite them to orient themselves at the site
- responsible for the maintenance of fire protection equipment
- continuously identify and minimize fire risks on the construction site
- compile documentation of checks carried out and measures
- follow up on the compliance of established fire safety rules and routines.

4.8.4 Person performing fire safety inspections

There should be one or more persons responsible for performing self-monitoring, compliance with rules and procedures, for example:

- escape routes, emergency signs and temporary emergency lighting (if any)

- permanent and temporary fire compartments
- evacuation signaling equipment (functional control)
- firefighting equipment
- accessibility for rescue services
- temporary electrical installations such as charging stations for example, charging stations for electrical equipment
- use and storage of gas cylinders and flammable products.

4.8.5 License operator for hot works

The role of the licensor for hot works is to is to issue permits for hot work before the work begins. To live up to this, control procedures are needed before, during and after the work carried out. The task of being a license operator may not be passed on without the clients or developers written consent.

- The licensee operator, in connection with any work where hot works are carried out, checks compliance with safety rules.
- The permit is documented by completing and signing the permit/control list for hot works on site.

4.8.6 Person responsible for flammable liquids and gases

The extent of the manager's responsibilities depends on the organization. It is the licensee who has ultimate responsibility for the law being complied with. The manager's responsibility is to:

- ensure that the handling of flammable goods is carried out in accordance with applicable law and regulations in the assigned area[1]
- be the contact person of the supervisory authority
- handle documentation
- ensure that there are procedures for detecting and addressing deficiencies
- inform persons handling flammable liquids and gases about risks and
- protective measures.

4.8.7 Person responsible for explosives

The extent of the manager's duties depends on the organization. It is the licensee who has ultimate responsibility for compliance with the law. The manager's task is to work to ensure, for example, compliance with the following points:

- ensure that the activities are carried out in accordance with applicable law and regulations in the assigned area
- be the contact person of the supervisory authority
- responsible for documentation
- ensure that there are procedures for detecting and addressing deficiencies
- ensure that only authorized persons have access to explosives
- ensure that personnel working on explosives have the necessary training

[1] For example, Regulation (EC) No 1272/2008 on classification, labelling and packaging of substances and mixtures and ATEX-directives (99/92/EC and 2014/34/EU).

4.8.8 Evacuation leader

If justified and practicable, evacuation leaders may be appointed. The task of being an evacuation leader should be linked to a function that is always in place when operations are ongoing. The evacuation leader's task may be to

- if possible, check that the evacuation signal has been noticed of everyone
- organize persons at the assembly point and compile information
- report information to rescue services when they arrive
- report information to the fire protection manager
- participate in planning and evaluation of evacuation routines and fire drills

5 Fire risk management

The first step to create good fire safety is to become aware of the fire risks that need to be managed on the construction site. The next step is to assess whether the risks that have been identified are acceptable or if specific measures are needed to minimize them.

Since the building technical fire protection is unfulfilled during the construction stage, this means that a large part of fire safety is based on the existence of functional rules and procedures for fire safety during the construction phase.

Fire risk management is a part of the planning and design process and shall also be a part of the work in the construction phase. A challenge when it comes to risk management on construction sites is that the conditions are constantly changing and that there are several contractors working in parallel at the site. In practice, this means that risk management is largely about coordinating contractors so that their activities do not affect each other in a manner that leads to fires or other accidents. Read more about coordination in section 4.7.

The risks that are common on construction sites and the rules and routines that may be relevant for managing the risks are set out in section 6.

Read more about fire risk assessment in CFPA-E Guideline No 4, Introduction to Qualitative Fire Risk Assessment.

6 Fire safety rules and routines

6.1 Arson

Arson should be included in the risk analysis for the site and preventive measures should be included in the fire safety plan. Many of the efforts against arson also are effective measures against vandalism and theft. In addition, measures to make access for unauthorized persons more difficult also reduces the risk of injury to children and youngsters at the construction site.

6.1.1 Recommended measures for protection against arson:

- Prevent unauthorized access using fences and gates to construction sites and by securing all door and window openings to buildings.
- Pay attention to signs of attempted burglary and vandalism.
- Lighting of the site reduces the likelihood of unauthorized access
- Store flammable liquids and gases in locked spaces
- Have a safety distance or other appropriate protection between building and combustible materials (see also section 7.6)
- Avoid piles and other flammable material near fences
- Security

6.1.2 Measures to consider whether the risk of arson is particularly high:

- Installation of security cameras (CCTV)
- Monitoring outside normal working hours
- Burglary alarm
- Fire detection and alarm system
- Security
- Information to neighbors where to turn when unauthorized people are observed at the construction site.

Read more about measures against arson in CFPA-E Guideline No 01:2021 S

6.2 Flammable liquids and gases

Anyone working with flammable liquids and gases should have the knowledge required for safe handling and know the safety rules that apply in the workplace.

The rules should, among other things, include the following requirements:

- Flammable liquids and gas cylinders should not be stored together.
- Oxygen cylinders, where present, should be stored separated from combustible materials.
- Warning signs should be available and clearly visible at the entrances to the storage sites for flammable liquids and gas cylinders.
- In areas where there is a risk of explosive atmosphere, explosion protection documentation shall be drawn up, containing fire safety measures in both the field of work and installations.
- Fire extinguishers shall be placed at entrances to storage areas.

Containers with flammable liquids and gas cylinders shall preferably be stored in open spaces that have been fenced safely, protected from sun and away from pits, drains and low-lying areas. The working area of construction cranes also needs to be considered so that falling objects can not cause damage to tanks or gas cylinders.

When stored indoors, the space must be well ventilated directly to the open air.

Gas detection and alarm systems could be installed to reduce the risks.

6.3 Explosives

Explosives in the form of explosives and ignition capsules/explosive caps and so-called cracking cartridges occur in some construction work sites. Explosives should be handled and stored accordingly to national legislation.

6.4 Hot work

Where possible, methods other than hot works shall be used. If hot work must be carried out, it is important to find out which rules need to be followed. National legislation, requirements from insurance companies and companies' internal rules must be considered. Only persons with documented knowledge should be allowed to perform the task. Special safety rules shall be followed when the work is carried out.

Hot work should only be carried out provided that a permit is written on the spot by a person appointed as the permit responsible. Read more about fire safety basics for hot work operatives in CFPA E Guideline No 12 2012 F

6.5 Electrical installations and lighting

The installation of power supplies and cables for temporary electrical installations organized for construction and demolition sites shall be carried out by an authorized electrical installer or by an authorized electrical installation company according to national legislation.

Continuous and special control of the temporary electrical installations shall be carried out throughout the construction process. Continuous control is easy to implement and should be included in the daily routines.

Here are some issues that are important to consider when it comes to electrical installations on construction sites.

- Each electrical central shall contain the main switch for the separation of the incoming current. The main switch shall be able to be locked in a separate position, for example with a padlock or by placing behind the lockable housing.
- If possible, in addition to those controlling security and fire alarm systems, the main switch shall be switched off when work is completed. All equipment should be disconnected when not in use.
- Electrical cables, especially in temporary installations, should be protected from damage. Cables should not be placed over or along the pedestrian and driving paths of the construction work site. If it must be done, special protection shall be arranged against mechanical damage. Cables should be hung up from ground level to be protected against damage that may occur due to activities on the construction site.

- If portable or temporary lighting is required, it shall be placed at a safe distance from combustible material, flammable material. Halogen lamps that generate high heat and may ignite combustible material must not be used.
- If heating fans are used, these should be suspended on the wall or placed so that flammable material cannot come near.
- Electrical installations in areas where flammable liquids or gases are stored or handled and where there is a risk of explosive atmospheres shall be Ex-classed according to explosion protection document.
- Special charging stations should be organized for rechargeable electrical equipment. The charging station shall be arranged in such a way that a fire in charging equipment or batteries is not at risk of spreading to the surroundings.

6.6 Building materials and waste

Escape routes shall be kept free of obstacles such as building materials and other objects that may impede or impede evacuation. The entire width of the route shall be free.

Piles of combustible building materials should be minimized in a direct vicinity of a building. Places for piles of combustible building materials can be prepared- and stated in the site safety plan.

Waste that is flammable and can contribute to a rapid fire-spread, such as oily rags and plastic foam, should be collected in special containers with tight-fitting un-combustible lids.

Recommendations for safety distance between building and combustible objects, such as waste containers, can be found in a Guideline from CFPA, Safety Distance between Waste Containers and Buildings.

The following protection distances are recommended:

- 2.5 meters between building and bins or other smaller be-holder with combustible material
- 4 meters between building and single 600-litre plastic waste vessels, steel waste containers and other combustible objects not exceeding 1.5 meters wide and high
- 6 meters between building and groups of plastic waste containers, hand-operated trolley with packaging and other combustible pre-targets not exceeding 4 meters wide and high
- 8 meters between building and waste containers, detached garbage room, caravan, stacks with pallets and other combustible objects no more than 6 meters wide and high.

Indoors, building materials and waste should not be stored in escape routes such as stairwells. It is important to continuously clean on all floors and to drive away filled containers.

The site manager should establish that whoever takes in packaging also takes out his packaging. Unless specially appointed staff continuously clean.

6.7 Plastic foam insulation

A review of fires on construction sites that has caused serious damage shows that it is strikingly often hot works that has been ignition source and plastic foam insulation provide the combustible material.

In general, noncombustible insulating materials, such as rockwool, should be taken into consideration instead of plastic foam insulation. If plastic foam insulation is considered as necessary, then insulation with the best possible reaction to fire classification, should be taken into consideration.

The fire can be rapid, and the development of smoke can be considerable. Plastic foam insulation generally contains a lot of energy that develops during a fire. For example, expanded polystyrene (EPS) develop as much power per unit of weight as diesel. A fire in plastic foam can spread due to the heat that develops from the fire, but also by decomposing in the heat to unburned fire gases that spread rapidly through cavities with the heat upwards. The hot fire gases can be ignited in the cavities when exposed to oxygen.

So-called thermoplastics such as EPS (expanded polystyrene) melt and drop and thus spread the fire even downwards. Thermosets such as PIR (polyisocyanurate) do not melt in the event of fire. These plastics charcoal but they are still decomposing and contribute to the fire through the pyrolysis gases generated from the heat.

The thermoset plastics are generally considered to be better from a fire point of view for the above reasons. The disadvantage is that they often have a high nitrogen content, which causes hydrogen cyanide gas in the event of fire. Hydrogen cyanide leads to unconsciousness at relatively low levels and is thus a very high health risk for people at risk of exposure to these fire gases.

Risk awareness needs to be high during both the design and execution stages when cell plastics are to be used in production, especially in façade installations. This applies to fire safety during the construction phase, but also to ensure the work in such a way that a long-term good fire protection is ensured for the building.

A safety distance of 20 meters between large piles of plastic foam insulation and the nearest building should be sought.

Due to different circumstances, the above measures may be difficult to maintain. In these cases, a fire safety expert can assess which solution is acceptable and whether risk mitigation measures are required. For example, piles can be covered with fire protection cloth or equivalent.

6.8 Scaffolding and weather protection

Before work starts with scaffolding and weather protection, the employer shall find out the conditions at the workplace and assess the specific risks there. Furthermore, the site manager shall receive the necessary information.

The risk assessment should include checking whether the arrangements in any way have affects the evacuation safety of the construction site or any other ongoing activities in the building. Research have shown that openings in the cover due to the heat from the fire do not normally occur until the flames reach the roof. When the hole is large enough to let out smoke, the conditions for evacuation are probably already critical.

In the case of a renovation project in which the premises are used during construction work, it should be possible to easily remove the weather protection completely or partially for smoke ventilation.

The risk assessment should also consider whether there is a need to arrange for smoke ventilation, in cases where the weather protection consists of a dense canvas that forms roofs and walls to protect the construction site against rain and snow, especially if plastic foam is used in the façade structure.

The smoke ventilation arrangement, for example, can be made in such a way that the cover is completely or partially removed with a wire, by pulling it from the ground. Smoke ventilation devices should be marked by signs for the rescue service.

The fire characteristics of the fabric used as weather protection should be in accordance with any national legislation.

6.9 Temporary buildings and similar

Before determining the site safety plan, the risk of fire spread should be assessed, and safety distances adapted between buildings and temporary buildings. Spaces under temporary buildings should not be used for storing combustible materials. Detailed fire safety recommendations about temporary buildings can be found in Annex II.

Motorhome pitches and similar temporary accommodations should be separate from the construction site so that there is no risk of fire spread in case of a fire. In the area of temporary accommodation, there should also be a distance between each accommodation unit. The minimum distance between each caravanette should be at least four meters.

6.10 Smoking

General smoking ban should apply with exception for specially designated places outdoors. Designated locations shall be marked with signs. Any designated locations shall be available at a safe distance from combustible material and be fitted with garbage can for debris and separate ashtrays.

6.11 Heating Equipment

Any heating equipment should, as a minimum, comply with provincial and local regulations and be installed, used and maintained in accordance with the manufacturer's instructions. in addition, the following advices should be considered.

- Heating equipment, if necessary, is allowed only if provided by the construction manager and previously approved by the fire protection manager. The introduction of heating devices by personnel is forbidden.
- Heating equipment should not be used near combustible materials.
- Personnel should always be required to be in attendance when the heater is running.
- The heating device should be restrained to minimize the risk of it being knocked over or being incorrectly located.
- Heating equipment should be regularly inspected.
- Heaters should not be covered with wet or damp clothing. Coat stands and drying racks should be fixed in place a safe distance from heaters.
- Paraffin or gas heaters should be avoided where possible.
- Where possible, a system planned so that heating equipment remains outside the building(s) under construction should be considered.
- Heaters used in temporary buildings should have enclosed elements, be fixed in position (preferably above floor level) and be thermostatically controlled.

7 Emergency planning

The construction industry is among the activities worst affected by accidents at work. For this reason, it is particularly important that, in addition to preventive work, there are procedures for dealing with fires and other accidents. This may be how events should be handled acutely but also at a later stage. Contractors shall within their own business have preparedness and routines for first aid and crisis support needed considering the nature, scope, and specific risks of their activity. It should be ensured that workers are aware of the routines of first aid and crisis support at the place of work. First aid equipment should be available at the construction site.

Furthermore, each organization should have its own procedures for, among other things, crisis support, media management and information for staff and relatives.

A basic prerequisite is that all staff at a construction site can make a first extinguishing operation. This requires no special organization as it is not possible to know in advance who first detects a fire.

7.1 Alarming

In places where workers may have trouble detecting a fire and evacuating, there should be procedures to warn of fire. Alarming can be done through manual devices such as compressed air-sirens or a fire detection and alarm system that can also be activated manually (see also section 14.2).

7.2 Evacuation

The evacuation strategy should be described in a fire safety plan (see section 9.1) which describes, among other things, signs and other markings for evacuation, emergency lighting for evacuation, evacuation alarms/evacuation signaling. Evacuation should take place at an early stage in the event of a fire. The construction site should have access to escape routes in such a way as needed for everyone on the construction site to be able to evacuate quickly and safely.

The number of escape routes and their distribution and dimensions shall be depleted- as set according to the construction site conditions. A fundamental principle when it comes to evacuation is that there should be two independent escape routes. The independence of the escape routes means that a fire can prevent evacuation via only one of the escape routes. Evacuation should be possible directly out to the street or equivalent. The walking distance to the nearest stairwell or door directly to the open air shall not normally exceed 45 meters. Since evacuation takes place via stairwells, it is essential that the stairwell maintains its function as a fire compartmentation even during a major part of the construction phase. Outside the stair tower can be one or more of the escape routes. In these cases, it is important that the stair tower is not obstructed by the same fire as an internal stairwell.

For smaller premises operating only one escape route, this can normally be accepted even during construction phase.

When specific solutions are required, it is important that fire experts are hired. Information to the municipality's rescue services should be considered in these cases.

The following rules for the evacuation of construction sites should be followed if they do not conflict with any national regulations:

- Escape routes requiring lighting shall have emergency lighting with enough illumination in the event of a failure of ordinary lighting.
- Escape routes and connecting routes and doors leading to them shall be free from obstacles so that they can be used without inconvenience at any time.
- Evacuation doors should be opened outwardly in the escape direction. They must not be locked or bolted in a way that prevents them from being easily opened in an emergency. Sliding doors or revolving doors must not be present in escape routes.
- Assembly points should be marked with signs. These signs shall be durable and placed in suitable places.
- If evacuation has taken place, all contractors/managers shall check whether staff who were on the site have evacuated. They shall then also forward this information to evacuation leaders or rescue services as soon as possible

7.3 Emergency response plan

It is in everyone's interest that rescue services can make an effective extinguishing operation even when a fire occurs when the construction site is unmanned. In the case of major construction projects, it is therefore appropriate that the rescue service should be able to access essential information. This can be solved by supplementing the latest version of the site safety plan with

specific information and agreeing with the rescue services on the best way to share the information. Rescue services should also be invited to visit the construction site.

Examples of additional input information for the site safety plan:
- rescue service access, firefighting shafts, fire lifts
- emergency suspension for gas or flammable liquids
- sprinkler installations
- protective objects/spaces
- position of hydrants, dry risers' inlets and wet risers
- storage space for flammable gas
- storage space for flammable liquids
- storage space for explosive products
- storage of chemicals
- high voltage installations
- contact details to responsible persons

8 Training and information

Everyone working on the construction site shall have training and knowledge enough to be able to carry out the work without unnecessary risks. Basic training shall be provided by the respective employer, but site-specific conditions for fire safety need to be communicated through the fire protection manager on the construction site.

The content of training and information can be broadly covered by the following headings, but the extent may vary depending on the target audience. People with specific tasks in the fire protection work need to have deeper knowledge.

Written fire safety rules and routines shall be available to read on an information board or similar.

To test if the routines work, fire drills should be carried out.

It is recommended to verify the basic fire safety knowledge of those who are working on the site by performing written or oral tests.

9 Documentation

Fire safety at the construction site needs to be included as a factor in the planning and design stage and throughout the construction phase there should be a fire expert that can provide an important support for assessing fire risks and proposing risk mitigation measures. By integrating fire safety into health and safety work, the routines can be rationalized, and unnecessary duplication of work can be avoided.

The documentation may consist of:
- Fire safety plan
- Site fire safety plan

9.1 Fire safety plan

It is a way of reporting fire protection throughout the construction project. A fire safety plan should contain information about:

- Management's commitment
- Fire protection organization
- Fire risk management
- Fire safety rules and routines
- Emergency planning
- Training and information
- Control system
- Evaluation
- Fire protection installations

9.2 Construction phases and fire protection

Construction work can often be divided into phases where fire protection becomes more extensive for each phase.

For example, the work can be divided into the following main phases:

- open frame construction at ground level
- construction work with open frame in several floors
- construction work with dense frame with scaffolding
- construction work with dense frame with scaffolding and interior
- construction work with dense frame and interior

9.3 Site safety plan

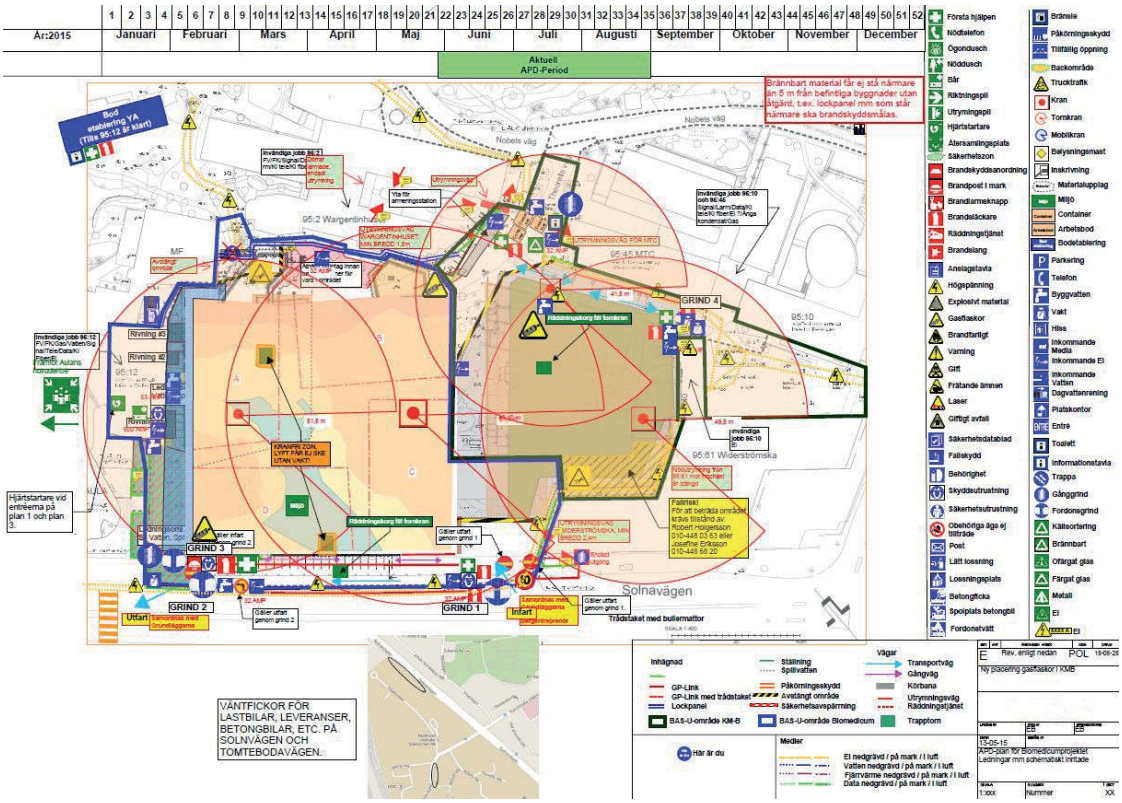
It is advisable to continuously update a site safety plan with information about fire safety, such as fire extinguishing equipment and assembly point in case of evacuation.

Since a construction site is under constant development and is going on for a relatively short time, it´s natural that the need for safety information may vary depending on phase and the nature of the project. The site safety plan can therefore be more extensive the longer the project progresses as both fire risks and protective measures increase.

The following fire safety information should be described in the site safety plan:

- activation of evacuation alarms or equipment for evacuation signaling
- assembly points
- existing and completed fire compartmentation
- temporary buildings
- storage of construction material
- storage of flammable liquids or gases
- waste containers
- firefighting equipment
- driving routes for rescue services

- hydrants



Example of Site safety plan

10 Control system

The need for a control system is since fire protection equipment and installations are not used in daily work and are therefore not naturally controlled. Through control, any errors and deficiencies shall be detected so that everything works properly if a fire occurs. The same applies to fire risks that can be difficult to detect if you do not have such a focus and risk awareness. The control system includes that there are procedures for who should perform the controls and how often they should take place. The verification of the technical fire protection installations is facilitated if there are drawings and checklists showing their whereabouts and how to check them.
In the context of training and information, it is important to clarify that regular checks do not take responsibility from everyone, to fix or report fire hazards detected.

Checks carried out should be documented. Identified fire risks can be illustrated with photos.

In these checks, it is important that those carrying out the checks have knowledge about common fire risks and know what rules and routines that apply. The frequency of regular checks should be according to the level of fire risk.

Control of fire risks and compliance with rules and procedures can often be done in connection with health and safety checks.

See "fire safety inspections" in Annex C

11 Evaluation

The evaluation and the corrective measures that may need to be taken are the most important part in the long term to develop the most efficient work.

The management of the developer and the respective contractor is ultimately responsible for the part of the work they have at their disposal and should therefore deal with the follow-up in such a way that they demonstrate their commitment to the issues and those who work with them. What has been good can then be taken advantage of and what has been less good can be improved.

When the follow-up is carried out, it may be useful not to lock themselves into detail issues. Shortcomings that often recur may have other underlying causes than the obvious ones. This may include, for example, the culture of working groups where deviations from rules and routines are rewarded.

Questions related to follow-up may be:

- Do deviation reports and remarks indicate any kind of system failure?
- Compliance with policies, rules, and routines? If not, what could be the cause?
- Are all tasks carried out in the fire protection work? If not, need resources
- or ambition to be adapted?
- Does everyone have enough competence to carry out their duties in fire protection work?
- Do the results of the documentation match your own observations on site?

12 Permanent fire protection installations

The construction project should be planned so that the building's permanent fire protection installations can be completed as soon as possible. Examples of such measures is:

- escape routes, two independent escape routes shall be sought
- fire compartmentation, particularly in escape routes and separation between floors
- indicative marking and emergency lighting
- fire protection of supporting frame
- lightning protection
- fire detection and alarm system
- fire extinguishing system
- risers
- fire ventilation

13 High-rise construction sites

Fire protection during construction phase needs to be investigated particularly carefully in construction work in tall buildings that reach higher than the rescue services ladders (normally about 23 meters).

Evacuation from the highest levels to a safe place can take a long time. Rescue services ladder vehicles do not normally reach higher than the eighth floor. A rescue operation may be further hampered by problems with the water supply high up in a building. Further measures are therefore needed, particularly to ensure evacuation safety. Examples of such measures are:

- Internal stairwell is continuously completed to the building's current height
- external staircase (stair tower)
- external lift (after special assessment)
- fire detection and evacuation alarms
- fire extinguishing water supply

Contact with the rescue services should be considered in complex construction projects.

14 Fire protection installations and equipment

14.1 Firefighting equipment

Firefighting equipment shall be provided sufficiently according to the relevant legislation. The equipment shall be located near the exits on each floor and marked with a fire equipment sign. Firefighting equipment must be easy to access. If they are outdoors, they should be weather protected. Inside a building under construction a fire extinguisher should be available within 25 m.

All portable equipment shall be checked once a year by a qualified person and the date of service shall be documented.

The choice of equipment needs to be adapted to the business. Powder extinguishers are generally the best option as they extinguish all kinds of fires even in cases where it is not possible to get close to the fire. Powder extinguishers are also not as vulnerable for cold as foam extinguishers. In cases where large amounts of plastic foam insulation occur on the site, the powder extinguishers should be supplemented with foam extinguishers or water hose, since it has been shown that powder does not always have enough cooling effect to completely extinguish these fires.

14.2 Fire alarm and detection

14.2.1 Manual evacuation alarms

Manual devices for evacuation signaling can be used provided that:

- signal is clearly distinguished in the locations concerned, despite background noise
- signal can be identified as evacuation alarms
- the alarm can be activated from several places.

Examples of manual devices for evacuation signaling are compressed air-driven siren or personalized radio system.

An evacuation alarm consisting of alarm push buttons and alarm devices can be wirelessly connected on a construction site. Alarm devices and activation buttons should be available on each floor.

In noisy environments, examples of accompanying measures may be that the alarm is passed on wirelessly to ear protection and that the power to noisy equipment is automatically broken when alarmed.

14.2.2 Fire detection and alarm systems

In some cases, there may be a need for a fire detection and alarm systems. In addition to alarm push buttons and alarm sound devices, the system also includes detectors indicating smoke or heat development. In addition to safer escape conditions, an early detection of fire also provides better conditions to extinguish a fire at an early stage. The alarm does not need to be diverted to the rescue services but should be automatically forwarded to suitable persons who can alert rescue services.
Fire detection and alarm systems can compensate for a high level of risk, here are some examples of a high level of fire risk:

- many workers are staying at the site at the same time.
- there is a risk of a rapid fire spread due to large quantities of flammable liquids or gases or other combustible and energy-rich products.
- walking distance to escape routes are long or otherwise insufficient.

Specially designed wireless systems adapted for use on construction sites are available in the market.

15 Construction work in parallel with other activities

When construction or maintenance work is operating in parallel with other activities in a building, the risk of both personal and property damage increases. This also applies when new buildings areas are gradually put into operation. Experience from disaster fires has shown that the fire often starts in an unprotected space where the fire has time to grow strong before it is detected. At the next moment, the rapid spread due to the ignition of unburnt fire gases can result in that people in adjoining rooms don´t have time enough to escape before critical conditions arise.

If parts of the building's protection system are disconnected or have not yet been fully operational, it is important that measures are implemented to compensate for the deficiencies. In practice, this means that a fire expert needs to participate in the design stage when a fire safety plan is made.

Particularly focus may be needed on the following actions:

15.1 Evacuation from both the construction site and the existing business

Evacuation conditions must be a top priority for both existing activities and the construction site. Temporary escape routes should be arranged if ordinary escape routes cannot be used. Evacuation of an existing workplace through a construction site should be avoided. It is difficult to guarantee safe evacuation conditions and it will be difficult to prevent unauthorized persons from entering the construction site. If temporary routes cannot be solved, the existing activity may need to be discontinued or restricted while the construction project is in progress.

15.2 Disconnection of fire detection and alarm systems or sprinkler systems

Disconnection of the active protection systems of the building should be avoided as far as possible. If it still needs to be done, the following questions can be asked:

- Can the existing system be replaced by a temporary system?
- Will the system be disconnected, and the site be unmanned at the same time?
- Can the disconnection and connection of the fire detection and alarm system be handled in a simple manner in connection with breaks and similar?
- Can the disconnection be limited only to the areas involved in the construction work?
- Can controls of, for example, fire dampers or fire ventilators be affected?
- Who needs to be informed about the disconnected system?
- Is the sprinkler system or fire detection and alarm system a prerequisite for the building for the existing building's fire protection according to the building codes?

Insurers may also need to be consulted as the sprinkler system may be a prerequisite for insurance.

15.3 Protection against fire spread between construction site and an existing business.

When a construction site is separated from ordinary ongoing activities, it should be done with a holistic view of the protection of the premises in relation to the level of fire risk. The fire technical class on the temporary compartmentation should be adapted to the level of risk and is set out by fire safety plan. Separation should normally be lowest in class EI30 in walls, joists, doors, and penetrations.

If buildings or parts of them are in use or put into service when building work is in progress, measures must be taken to protect residents and users against fires and other accidents.

An example of when a precautionary principle should be applied is when additional insulation in a façade should be installed in apartment blocks with residences. The starting point should then be that mainly noncombustible building materials are used. Plastic foam insulation should only be accepted if the relevant parts of the building have been evacuated alternately that the risks have been assessed by experts and methods have been adapted and other measures have been taken to minimize the fire risks.

15.4 Information procedures between existing businesses and contractors

The main contractor is often appointed as responsible for health and safety at the construction site. Contractors need to provide information on the risks involved and be informed about the fire protection rules and other conditions they need to consider.

When it comes to smaller work of a limited extent, such as ongoing maintenance and repairs, it is important that contractors have continuous communication with the person appointed as fire protection manager at the premises.

15.5 Interface between construction work and existing business

A documentation of who does what in the fire protection work is needed to avoid confusion or unnecessary duplication of work in the interface between construction work and existing business. For example, this may be:

- routines for information
- management of building materials
- control of compartmentation between construction site and existing activities
- disconnection and connection of fire detection and alarm systems
- control measures when the place/premises are left unmanned.

16 European guidelines

Fire

Guideline No 1:2015 F	-Internal fire protection control
Guideline No 2:2018 F	-Panic & emergency exit devices
Guideline No 3:2011 F	-Certification of thermographers
Guideline No 4:2010 F	-Introduction to qualitative fire risk assessment
Guideline No 5:2016 F	-Guidance signs, emergency lighting and general lighting
Guideline No 6:2021 F	-Fire safety in care homes
Guideline No 7:2011 F	-Safety distance between waste containers and buildings
Guideline No 8:2004 F	-Preventing arson – information to young people
Guideline No 9:2012 F	-Fire safety in restaurants
Guideline No 10:2008 F	-Smoke alarms in the home
Guideline No 11:2015 F	-Recommended numbers of fire protection trained staff
Guideline No 12:2012 F	-Fire safety basics for hot work operatives
Guideline No 13:2006 F	-Fire protection documentation
Guideline No 14:2019 F	-Fire protection in information technology facilities
Guideline No 15:2012 F	-Fire safety in guest harbours and marinas
Guideline No 16:2016 F	-Fire protection in offices
Guideline No 17:2014 F	-Fire safety in farm buildings
Guideline No 18:2013 F	-Fire protection on chemical manufacturing sites
Guideline No 19:2009 F	-Fire safety engineering concerning evacuation from buildings
Guideline No 20:2012 F	-Fire safety in camping sites
Guideline No 21:2012 F	-Fire prevention on construction sites
Guideline No 22:2012 F	-Wind turbines – Fire protection guideline
Guideline No 23:2010 F	-Securing the operational readiness of fire control system
Guideline No 24:2016 F	-Fire safe homes
Guideline No 25:2010 F	-Emergency plan
Guideline No 26:2010 F	-Fire protection of temporary buildings on construction sites
Guideline No 27:2011 F	-Fire safety in apartment buildings
Guideline No 28:2012 F	-Fire safety in laboratories
Guideline No 29:2019 F	-Protection of paintings: transports, exhibition and storage
Guideline No 30:2013 F	-Managing fire safety in historic buildings
Guideline No 31:2013 F	-Protection against self-ignition end explosions in handling and -storage of silage and fodder in farms
Guideline No 32:2014 F	-Treatment and storage of waste and combustible secondary raw -materials
Guideline No 33:2015 F	-Evacuation of people with disabilities
Guideline No 34:2015 F	-Fire safety measures with emergency power supply
Guideline No 35:2015 F	-Fire safety in warehouses
Guideline No 36:2017 F	-Fire prevention in large tents
Guideline No 37:2018 F	-Photovoltaic systems: recommendations on loss prevention
Guideline No 38:2021 F	-Fire safety recommendations for short-term rental -accommodations

Natural hazards

Guideline No 1:2012 N	-Protection against flood
Guideline No 2:2013 N	-Business resilience – An introduction to protecting your business
Guideline No 3:2013 N	-Protection of buildings against wind damage
Guideline No 4:2013 N	-Lighting protection
Guideline No 5:2014 N	-Managing heavy snow loads on roofs
Guideline No 6:2016 N	-Forest fires
Guideline No 7:2018 N	-Demoutable / Mobile flood protection systems

Security

Guideline No 1:2010 S	-Arson document
Guideline No 2:2010 S	-Protection of empty buildings
Guideline No 3:2010 S	-Security systems for empty buildings
Guideline No 4:2010 S	-Guidance on keyholder selections and duties
Guideline No 5:2012 S	-Security guidelines for museums and showrooms
Guideline No 6:2014 S	-Security guidelines emergency exit doors in non residential premises
Guideline No 7:2016 S	-Developing evacuation and salvage plans for works of art and -heritage buildings
Guideline No 8:2016 S	-Security in schools
Guideline No 9:2016 S	-Recommendation for the control of metal theft
Guideline No 10:2016 S	-Protection of business intelligence
Guideline No 11:2018 S	-Cyber security for small and medium-sized enterprises

Annex A Requirements for fire safe construction site

Introduction

Every year, many fires occur on construction sites or during refurbishment. In these fires, people are at risk, property is lost, and companies are affected in many ways.

In the construction industry and in many other industries, the ambition for fire safety is rarely higher than achieving the minimum level, which is the requirements made by the legislation. The focus should be to create a culture where safety thinking is an obvious part of the work where everyone has enough competence to adapt the level of fire protection to the fire risks of the business.

A1 Purpose and scope

The purpose of the firesafe construction site framework is to make requirements in the construction process easily clear and follow up the measures necessary to achieve adequate fire safety on a construction site.
The regulations are intended for construction work inclusive refurbishment and rebuilding work. It is primarily aimed at insurers and clients of works and in the next stage to construction contractors, rescue services, consultants, and anyone else who can contribute to increased fire safety on construction sites.
National legislation is continuously renewed, which may mean that this regulatory framework contains requirements that may conflict with national laws and regulations. In these cases, national laws and regulations shall apply.
However, these requirements are voluntary commitments between parties, and nothing prevents agreements on a higher level of fire safety than those found in laws and regulations.
The requirements are not considered for single- and two-family houses or equivalent smaller construction works, nor do they specifically deal with the specific problems and fire protection solutions that may occur in construction work underground.

A2 Requirements for firesafe construction site

A2.1 Management's commitment

- The main contractor shall have a policy established by the management that includes fire safety.
  Note: The policy may be part of the main contractor's safety and health policy.
- The main contractor shall have incident reporting systems.
- Fire safety shall be a standing point at construction meetings.
  Note: Examples of cases under this point may be fire incidents and reported deficiencies from self-con- trolls.

A2.2 Fire protection organization

- The construction site shall have a documented distribution of tasks relating to fire protection.
- The developer or principal contractor, who has taken over the coordination responsibility for the construction work by agreement, shall appoint a fire protection manager.
  Note: Level of competence of fire protection manager, see section 2.6.3.
- At least one fire protection surveyor shall be designated. Note: The fire protection surveyor is the person or persons who practically monitor that fire protection is at a reasonable level.
- If hot works occur at the construction site, a license manager shall be appointed.
  Note: The level of competence of the license manager see section 2.6.4.
- If large quantities of flammable liquids or gases are handled at the construction site, a person should be appointed to manage the risks.
  Note: Level of competence, see section 2.6.5.
- If explosive is handled on the construction site, a person should be appointed to manage the risks. Note: Level of competence, see section 2.6.5.
- The construction site shall have job descriptions for people with tasks in the fire protection work.
  Note: All persons who have been given specific tasks in the fire protection work must have job descriptions so that there is no doubt about what should be done.

A2.3 Risk management

- Fire risk assessment shall have been carried out and mitigation measures shall have been taken.
  Note: Risk mitigation measures may consist of rules and routines, see section 2.2.
- Fire protection manager shall continuously obtain information on fire risks from all subcontractors.

A2.4 Rules and routines

- Rules and routines shall be available describing measures and how they should be carried out.
  The following risk mitigation rules and routines shall be documented unless there are no obvious reasons and client/developer have granted exceptions:
  - measures against arson
  - management of flammable liquids or gases
  - management of explosives
  - hot work
  - electrical installations and lighting
  - management of building materials and waste
  - scaffolding and weather protection
  - fire safety in temporary buildings and similar
  - disconnection of fire alarms and/or sprinklers
  - smoking

- heating equipment

A2.5 Emergency planning

- The construction site shall provide information on measures in the event of a fire or other emergency.
  Note: The information should include at least:
  - alarming
  - evacuation
- Supervisors shall have crisis management procedures when staff are affected in the event of a workplace accident.

A2.6 Training and information

- The site manager shall have procedures for information about fire safety at the construction site.
- Contractors shall have procedures for training employees.
  Note: All contractors involved in the construction project shall be able to report the existence of procedures for training staff in hot works and other training relevant to fire safety.
- Fire protection manager must have undergone training in management of fire protection. Certificates of examination training shall be presented.
  Note: The training shall cover at least, responsibility, fire risks, routines, and other fire protective measures.
- Everyone who has been assigned to issue permits for hot works shall in addition to training in hot work, have supplementary knowledge regarding the permit management.
- The manager of flammable liquids/gases or explosives shall have completed training in the subject.

Note: Training shall cover at least national legislation and other regulations, labelling and provide an understanding of the risks and the task of the manager.

A2.7 Documentation

- Documentation of the construction site's fire protection shall be available.
  Note: The documentation normally consists of
  - fire safety plan
  - Site safety plan
- Installation and supervision of electrical installations shall be carried out by a qualified electrical installer.
- Permits for flammable liquids/gases or explosives must be provided according to national legislation.
- Activities carried out according to the fire safety plan, such as internal inspections, training and exercises, should be documented and archived.

A2.8 Control system

- Procedures should be available for self-monitoring of fire protection.
- Self-checking shall be carried out at specified intervals.
  Note:Interval and scope of self-control shall be adapted in line with the size and complexity of the construction site.
- Deficiencies detected during self-checks shall be documented and rectified without delay.
  Note: It should be clear what the deficiency consists of who found the shortage, who is responsible for the defect being rectified, when the shortage is to be addressed and when it is done.

A2.9 Evaluation

- Procedures must be in place to follow-up to fire protection work.

A2.10 Other fire protection installations

- On the construction site, it shall be possible to activate an alarm signal for all concerned.
- In specific cases, fire detection and alarm systems should be installed that can also be activated manually.
  Note: Examples of specific cases are:
  - many workers are staying at the same time on the site
  - there is a risk of a rapid fire spread due to a large quantity of flammable liquids/gases or other combustible and energy-rich materials.
  - escape routes are long or otherwise inadequate
- Emergency exit sign shall be present in and to the escape routes.
  Note: For construction sites on the ground floor and where each room have escape facilities directly into the open air, no emergency exit signs are needed.
- Escape routes without daylight inlet should have emergency lighting.
  Note: The lighting strength from emergency lighting shall be be at least 1 lux in walkways.
- Each floor shall have at least two independent escape routes.
  Note: That escape routes should be independent of each other means that a fire can only obstruct one of the escape routes. Outside the stair tower can be one or more escape routes.
- An assembly point during evacuation shall be decided. The assembly point should be marked with a sign.
  Note: The location of the assembly point should also be described in the site safety plan.
- Fire extinguishers shall be available. The walking distance to the nearest extinguishing equipment shall not exceed 25 meters. The place for fire extinguishers is marked with signs. Note: Fire extinguishers normally shall be at least 6 kilograms of powder.

A2.11 Construction or demolition work in parallel with other existing activities

- Risk assessment shall be carried out continuously.
  Note: The risk assessment includes considering whether existing activities must be closed or restricted.
- Responsibilities between existing activities and construction areas shall be clarified. The documentation should include procedures for
  - disconnection of fire alarms (if any)
  - disconnection of extinguishing systems (if any)
  - hole-taking and seal in fire compartmentation boundary
  - changed conditions for evacuation from existing activities

  Note: The person who is the fire protection manager for the existing business needs to communicate with the person who is responsible for the fire protection in the construction area about the interface between these activities.

Annex B Fire protection of temporary buildings on construction sites

B0 Introduction

When establishing temporary buildings on construction sites, the available space is often very limited. This means that they must be placed near the buildings being constructed and sometimes even on top of each other. The risk of personal injury both for construction workers and surrounding residents, as well as rapid fire spread, are obvious unless certain preventive measures are taken.

This annex provides examples of solutions that, according to CFPA-E, offer adequate fire safety concerning temporary buildings unless there are higher requirements in national legislation.

This annex replaces the CFPA-E Guideline No 26:2010 Fire protection of temporary buildings on construction sites

The aim is to make it easier for property owners, developers, administrators, project managers and companies that establish or manufacture temporary buildings.

The guidelines do not include:

- temporary buildings for residential purposes or any form of temporary building other than on construction sites
- establishment in two levels with a building area greater than 200 m2
- establishment on three floors or more

It is advisable to enlist a fire consultant or other expert in the design of the fire protection.

The following describes recommended fire protection requirements for temporary buildings on construction sites unless there are higher requirements in national legislation or industry regulations.

B1 Fire protection organization

Fire safety is based on a combination of technical and organizational measures. Since the temporary building establishment is a part of the construction site, the fire protection organization is covered by the organizational measures described in section 4-12 of these guidelines that are covering fire protection work on the construction site.

B2 Fire protection requirements

B2.1 Evacuation

European Guideline

B2.1.1 Access to escape route

From a temporary building there shall be access to at least two independent escape routes. The escape route is a door directly to the open air. Windows may in some cases be accepted as an alternative escape route. For establishment in several floors, the escape route should be supplemented by stairs. This applies even if windows are the alternative escape route.

Walking distance to escape route should not exceed 45 m. If the walkway to two independent escape routes partially coincides, the common part counts equal to 1.5 times its true length. If a staircase is part of the walkway to an escape route, the 4 times the level difference is added to the walking distance.

Walking distance (A x 1.5) + B ≤ 45 m

B2.1.2 Exceptions to basic requirements for two escape routes

Temporary buildings can in some cases be designed with only one route. Only one escape route can be accepted in ground floor of a temporary office building if the walking distance is a maximum of 30 meters and the room serves a maximum of 50 people. When only one escape route is available, there must be no risk of the escape route being blocked in case of fire inside or from the outside. There must be no obvious risk that a fire may occur and develop without it being detected at an early stage, from any place in the premises.

B2.1.3 Doors in escape route

Doors in or to an escape route shall normally be outward opened in the direction of escape. Door shall have an opening measure of at least 0.80 meters. When people stay at the work site, evacuation should normally be possible without using a key. Handles and knobs can be the opening device in the escape routes in temporary buildings. Pushbars on doors are requested where occupancy is high, according to the fire risk assessment.

B2.1.4 Window as escape route

Windows in temporary buildings are often provided with window grids to protect against burglary and vandalism. Getting a window with grids to act as an escape route brings difficulties. If grids are to be installed for the windows intended for evacuation, it is very important that the requirements for opening ability are filled. One way to solve this may be to put a side-hung grid on the inside of the window that can be opened from within without key or code.

Considering the grid problem for windows, it is better to use only doors as escape routes.

If windows are to be used as an alternative escape route, the following conditions should apply:

- that the lower edge of the window is no more than 2.0 meters above the ground
- that the window serves a maximum of 30 people
- that the width and height of the window are at least 0.5 and 0.6 m respectively; however, the sum of width and height must be at least 1,5 meters
- that the window is easy to open from within without a key or other tool.

Furthermore, it is important that evacuation through the window is not hindered by scaffolding, containers or similar. In cases where the bottom of the window is located more than 2 m above ground, the escape route shall be supplemented by stairs or stair towers.

B2.1.5 Ladders

Fixed or loose ladder is not accepted as a part of an escape route.

B2.1.6 Evacuation staircase or exterior corridors

Exterior corridors can form a common part of otherwise separate escape routes. The distance between stairs that serve the exterior corridor should not exceed 30 m. In cases where only one staircase serves the loft aisle, the distance from door to stairs should be limited to 15 m.

B2.1.7 Evacuation over roofs

Evacuation via roof of temporary buildings should be assessed by fire experts. In this case, the fire risk assessment should contain at least a part concerning the fire resistance of the roof and of its bearing structure.

B2.1.8 Evacuation alarm

Rooms within temporary building establishment where people stay more than temporarily behind closed doors and where you have to pass through the corridor or other space to reach the escape routes need to have an alarm device that is automatically triggered when smoke develops in the corridor. Automatic fire detection and alarm systems should normally be installed where rooms accommodate more than 30 people or rooms for ten people with a walking distance exceeding 10 meters.

Wirelessly connected smoke alarms can be used where the risk level is low as in office operations and where evacuation conditions are straightforward.

B2.1.9 Evacuation signs

Temporary buildings should be provided with illumination signs and supplemented with illuminated/transparent signs as they are in areas without daylight inlet. Where illuminated signs are required, these shall be equipped with emergency current providing the intended lighting for at least 60 minutes.

B2.2 Fire spread

B2.2.1 Measurements against fire spread

Fire-rated surface layers and cladding, fire compartmentation division and fire-technical installations are examples of measures that may limit the development and spread of fire inside a room in a building. Other factors that may affect a fire process are loose furnishings and other combustible materials.

'Surface layer' means the outer part of a building part that may be exposed to fire impact at an early stage by a fire. The surface layer inside the walls and ceiling of the temporary buildings should be D-s2,d0 or better. The requirement means that the surface layer may be combustible to a certain extent, emit a certain amount of smoke but not drip in the event of fire. Examples of such finishes are wood paneling.

No specific fire compartmentation is required for temporary buildings in one floor, unless walking distance to escape route or other reasons justifies the need of fire compartmentation.

For larger temporary building establishments, special assessment and opinion by fire experts are required.

There are no specific legal requirements for loose interior design and other combustible materials. The reasonable need from this aspect is handled in the context of systematic fire protection work.

B2.2.2 Protection against fire spread between temporary buildings and other buildings

Fire spread should mainly be accomplished by limiting the level of radiation. This can be achieved, for example, by:

- Place temporary buildings and buildings at sufficient distance from each other
- Take measures to limit the risk of fire spread between temporary buildings and buildings.

When planning for temporary buildings they should be placed so that fire cannot spread to or from the temporary buildings or other existing building.

No specific measures to protect against fire spread between temporary buildings and building objects or other building sites are normally required if there is a safety distance of at least 8 meters. The distance of protection should be free of other combustible materials. To set a temporary building closer than 8 m, additional measures are normally required.
For protection against fire spread between temporary buildings and adjacent buildings, account needs to be taken of the design of the adjacent building and possibly ongoing activities.
It is important to note that walls and ceilings in a temporary building do not meet any fire protection requirements until compliance is verified.

If the temporary building must be placed closer to a building than 8 meters an assessment by a fire expert is needed with instructions on the complete measures that should be undertaken. Examples of accompanying measures may include:

- The temporary building is equipped with a fire-rated cladding.
- Window openings are carried out in fire technically classified glass or no window openings towards the affected building.

Examples of design in exterior walls facing each other.

- Fire doors or no doors against the building concerned.

- When placing temporary buildings next to the façade where the building's façade is higher than the temporary buildings, action is required unless the attic is fire rated at least EI30. Normally, an altitude of 5 m on the higher façade above the temporary building.
- roofs are protected against fire spread if the distance between building and shed is less than 8 m.

B2.3 Firefighting equipment

B2.3.1 Fire extinguishers

When selecting hand fire extinguishers, it is important to choose an extinguisher that has enough extinguishing efficiency against the expected fire. Since you can rarely know exactly how much a fire can get, it is always best to have as large extinguisher as possible that can handle all kinds of fires. Normally, 6 kilos of powder extinguishers are recommended as these have the widest use and can withstand cold better.

Hand fire extinguishers should be placed clearly visible and clearly excellent. The walking distance to an extinguisher should not exceed 25 m. The exact location is also depending on where persons are and where exits and normal walking swaths are located.

There should be at least one extinguisher per floor, normally placed directly inside the front door.

2.3.2 Access for rescue services

Temporary buildings and containers should be placed so the access of rescue operation and efficient firefighting is accounted for. This means, for example:

- accessibility of rescue services' ladder vehicles and equipment, especially when the existing building has ongoing activities.
- Temporary buildings are not set up so that the roads to the construction site become unnecessarily long.
- fire hydrants and/or gas shut-off in the street or sidewalk is not blocked

Annex C - Checklists

C1 Fire safety inspections of construction site

The following checklist can be helpful during inspections of the fire safety on the construction site. Inspections should take place regularly during the construction project. It's up to site managers to determine the frequency. Inspections of measures against arson are appropriate to carry out the day before the holiday.

European Guideline

Evacuation	Make sure that
Escape	– escape routes are not blocked – evacuation routes outside the building are passable and safe
Doors in and to escape route	– door can easily be opened from the inside without key, code or card – the door can be opened in the escape direction, at least 90 degrees – the outside of the door is not blocked by, for example by snow – locks are open during the operation period when additional burglar-resistant locking is used
Evacuation signs	– the sign is clearly visible from relevant locations in the premises – illuminated signs are in function and lighting works – the emergency current function works for those who have this function
Emergency lighting	– emergency lighting in escape routes works in a minimum of 60 minutes in case of power failure

Fire spread	Make sure that
In a fire-compartmentation	– combustible surface layers on walls and ceilings have been minimized – combustible material indoors is stored to a limited extent or stored in special fire compartments.
Walls of fire compartmentations	– no holes, cracks, and leaks and similar can be detected in the wall. – penetrations in walls for pipes, cables, ventilation ducts and similar are sealed – Fire compartmentation between construction area and other ongoing activities fulfils the intended function according to the fire safety plan
Doors in fire compartmentations	– doors to stairwells that make up escape route have door closer – doors with door closers closes completely when opening the door about 1 dm and releasing it.
Safety distances	– safety distances between containers, temporary buildings, piles of buildings material and buildings are sufficient

Alarm and extinguishing devices	Make sure that
Evacuation signaling	– evacuation signaling device is available and works
Sprinklers	– any extinguishing system in operation is undamaged and sprinkler heads are not shielded
Fire extinguishers	– the extinguisher is in the intended location and is not blocked – pressure manometer shows green field – sign for extinguishers is in place and is visible – extinguisher has undergone annual checks
Accessibility for rescue services	– fire hydrants have not been blocked by containers, temporary buildings or similar – risers are accessible (if any)

Fire risks	Make sure that the following rules and routines are followed:
	– measures against arson – management of flammable liquids and gases – management of explosives – hot work – fire safety related to electrical installations and electrical equipment – management of building materials and waste (including plastic foam) – scaffolding and weather protection – fire safety in temporary buildings and similar – disconnection of fire alarms and/or sprinklers – Smoking

Information	
Prevention	- Site safety plan is available and up to date with relevant information – Fire safety rules and routines are available to all
Emergency planning	Emergency procedures are available to all

C2. Handover of temporary building establishment

Once the temporary building establishment has been installed on site, a handover should be carried out by completing a checklist. This checklist can be used as proof that the establishment has been carried out according to what has been agreed and that what is ordered has been installed.

Deviations in the checklist may be due to it has not been ordered or that the tenant orders products from another supplier. Other deviations may be that the planned establishment has not been able to be performed because the intended place has changed.

Checklist	And	No *comment*	Sign
The establishment meets evacuation safety as regards: – Walking distance – Indicative marking – Special evacuation fittings mounted on evacuation doors – Only stairs as escape routes – Windows used as escape route – Loft walk is used as escape routes – Evacuation plans are set – Windows rated next to escape routes (stairs)			
Special fire compartmentation			
Protection against fire spread between buildings – Adequate safety distance – Other action			
Fire extinguishing device – Fire extinguishers – Fire blankets			
Measures taken for the accessibility for rescue services to existing buildings (e.g. residential buildings, etc.)			
Operation and maintenance instructions handed over			
The establishment is built according to site safety plan			

Deviations/Other comments:

Company (lessor):
Name: Date: Sign: