Fire protection on building sites in Construction/Erection All Risks insurance
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“Fire protection” clause
Construction/Erection All Risks insurance
There has been a marked increase in the number of extremely serious fires on building sites in the last ten years.
Introduction

This publication takes a detailed look at fire hazards on building sites with the goal of helping to prevent serious fire damage in buildings and industrial plants. It uses serious cases of fire damage to highlight the fire hazards which arise at different stages of construction. It also considers the severe property damage and consequential losses such as production loss or loss of market share.

The protection of human life is, of course, of prime importance. In this connection, reference should be made to the statutory regulations applying in the respective countries.
The high frequency of extremely serious fires on building sites has been a cause for alarm amongst insurers and reinsurers since the mid-eighties. Various buildings and industrial plants have been affected. The following examples illustrate this development:

1987:
Property damage in the Neurath power station near Cologne, Germany exceeded CHF 50 million. It was one of several fires in flue gas scrubbing towers at waste incineration plants and power stations.

1990/1991:
Property damage alone from fires in two office buildings in London (Broadgate Development Complex and London Underwriting Centre) amounted to CHF 80 million and CHF 270 million respectively.

1991:
A fire at the Sikkel galvanizing plant in Genk, Belgium caused property damage amounting to CHF 140 million.

1992:
Property damage to the EXPO world exhibition’s Spanish pavilion in Seville, Spain amounted to CHF 22 million.

1995:
Property damage to the Dan Hotel in Eilat, Israel totalled CHF 9 million.

1996:
A fire at the Winbond semiconductor factory in Hsinchu, Taiwan caused property damage amounting to a record CHF 315 million.

1997:
Property damage to the 36-storey President Tower office and hotel complex in Bangkok, Thailand amounted to approximately CHF 24 million.

1997:
The catastrophic fire at a semiconductor factory in Hsinchu, Taiwan caused property damage amounting to an unprecedented CHF 490 million. As in the previous three examples, work on the plant was nearing completion.

Fires in buildings and plants which are often on the point of completion do not only cause property damage (usually insured), but also involve very high consequential losses (loss of production, loss of market share, cost of renting alternative buildings etc). The owner rarely has insurance cover for these types of losses. They must, therefore, be borne by the owner unless there are means of obtaining at least partial compensation by contractual penalties or liability claims.
2 Causes of fire

An analysis of these losses of varying sizes reveals the following:

a) The working conditions on a building site are fundamentally different from those in the operational industrial, commercial or administrative sector. They may be characterized as follows:

- constant change as construction work progresses;
- the presence of temporary installations, which are rarely of the same standard as permanent ones;
- the combination of a large variety of jobs being performed simultaneously and usually by various contractors;
- the constant rotation of contractors and personnel, which means that it is rare for a well-coordinated team to work together for any length of time;
- the “typically” hectic activity brought about by difficult planning and coordination, and also partly by the enormous pressure to meet deadlines;
- unforeseen circumstances, such as unfavourable weather or, as often happens on building sites, delays in deliveries, which call for a great deal of improvisation;
- the necessity, whether planned or not, of storing materials in areas where building work is being carried out.

b) There has been a marked increase in the use of building materials with a high fire potential, especially insulation and, in certain applications, anti-corrosive cladding. Moreover, such construction materials often produce aggressive (chlorous) combustion gases.

c) The values concentrated in the relatively limited space of a building or plant are often extremely high.

d) Not only industrial plants, but also hotels, office buildings and exhibition halls often have large open areas (atria). Such areas allow fires to spread more easily.

e) A price war has developed as a result of the poor economic situation in general and especially in the construction industry. One of the simplest solutions is to cut back both on security and preventive measures.

f) Arson is another danger which should not be overlooked.
Welding work is believed to have caused the fire in the Spanish pavilion for the EXPO world exhibition in Seville.
3 Fire hazards in different phases of construction

During the construction of a building or industrial plant, the following phases should be considered separately and proper measures taken for each:

- setting up the building site;
- preliminary building work;
- interior work and equipment installation;
- testing and commissioning.

We recommend that the individual fire hazards also be analysed for the following cases:

- conversion or renovation work;
- building site installations;
- on-site storage of building materials.

**Setting up the building site**

The main fire hazards during this phase of the construction project are due to:

- the assembly and, in particular, the start-up of on-site electrical installations;
- the use and storage of flammable liquids and combustible gases;
- excavation work near existing gas pipes and electric power cables;
- the temporary storage and disposal of inflammable waste.

Adequate fire protection measures should be introduced as soon as work on the building site is started.

**Preliminary building work**

This phase of construction is characterized by the widespread use of combustible auxiliary materials such as scaffolding and formwork of wood, and plastic tarpaulins. The fire potential also increases due to the inflammable materials used in construction: insulation, seals, insulated cables and pipes, covercoats etc.

The fire hazard is also increased by certain types of work carried out in this phase such as welding, flame-cutting, grinding and coating (eg with bitumen). Smoking on building sites also constitutes a danger.
Interior work and equipment installation

This phase is generally considered to pose the greatest risk. The risk of fire and the concentration of values increase continuously as building work progresses, reaching a peak at the project’s completion stage when the building or plant is handed over.

The severity of fires increases considerably too, due to the materials used in the secondary work (wood, cork, plastics, insulation materials), floor-coverings, ceilings or any kind of installation made of flammable materials as well as the associated packing materials. The use of inflammable solvents, detergents, glues and paints also constitutes a hazard.

The risk of fire also grows in the final phase of construction as a result of the specific work carried out (spray-painting, staining, gluing, welding, flame-cutting, grinding), the fact that various jobs are performed simultaneously and the pressure to meet deadlines.

Testing and commissioning

The risk of fire can be extraordinarily high in the testing and commissioning phase of a project, depending on the type of facility in question. The electrical installations are tested for continuity, then put under load, and the plant is put into operation for the first time. Sometimes the use of inflammable fuels, lubricants and materials is also involved. The plant’s operational reliability and safety installations should be checked by means of specific tests carried out under abnormal, even extreme, operating conditions. Overheated technical units or parts of the plant may present a further danger until the cooling and regulating systems function correctly or are put into service. Leaks in gas or oil pipelines may also occur, especially in hydraulic systems.

Conversion and renovation work

There is usually a higher risk of fire during conversion and renovation work than in the final completion stages of new projects because, unlike today, wood was once a commonly used building material. The fact that the buildings being converted or renovated are often still in use, at least partially, presents another difficulty.
The extent of the damage in this galvanizing plant in Genk, Belgium, is primarily due to the large number and high density of pipes and tanks made of synthetic materials.
Building site installations

The installations on building sites are mostly of a provisional nature and of light-weight construction. They contain substantial amounts of combustible materials.

Using such provisional installations in an inappropriate manner or not in accordance with their purpose may cause electrical overload or overheating in equipment.

The provisional heating installations found on many building sites also constitute a considerable fire risk.

On-site storage of building materials

The storage of materials and equipment waiting to be used or installed leads to a high concentration of values in a confined space. Packaging materials considerably increase the fire potential in these storage areas.
4 Essential fire protection methods

In order to limit the risk of fire as much as possible, all building sites should be protected by appropriate measures with the aim of:

- preventing fires, i.e. eliminating as far as possible any potential fire hazard;
- minimizing losses, i.e. limiting or avoiding the spread of any fire which has broken out despite all of the precautions taken.

Such measures may be differentiated according to the following areas:

- building design;
- arrangement of construction site equipment and provisional structures;
- fire protection equipment;
- organization of the building site.

**Building design**

A fire can be prevented from spreading if:

- buildings are divided into fire areas using fire walls and suitable doors so as to prevent, or at least delay, the spread of any fire;
- fire-resistant or non-flammable building materials are used where possible.

**Arrangement of construction site equipment and provisional structures**

The following points should be taken into account in this matter:

- Individual building site installations (offices, accommodation, workshops, warehouses) must be at a sufficient distance from each other and the buildings under construction to prevent a fire from spreading.
- Storerooms and depots for flammable gases and liquids should be set up according to the relevant regulations. They should be sufficiently ventilated.
- Work involving the use of combustible gases and liquids (cleaning agents, paints and lacquers, solvents, glues etc) should be performed outdoors if feasible. Where this is not possible, the locations intended for this type of work should be sufficiently ventilated.
- A safe distance should be maintained between any heating or lighting equipment and combustible materials or building elements. In addition, it is essential that heat emitted by this equipment be removed and all risk of fire due to an accumulation of heat within the devices be eliminated.

- Rubbish piles and formwork stores should be kept to a minimum and placed at a sufficient distance from the buildings under construction and the building site installations so as to contain any fires that may break out in them.

Fire protection equipment

Efficient fire protection equipment ensures that fires can be combatted in a rapid and efficient manner.

This means that as soon as work starts on the building site:

- Suitable alarm mechanisms such as telephones, fire alarms, sirens, paging systems etc should be installed. Fire drills should be practised involving the local fire brigade as well as the building site employees.

- An adequate number of suitable fire extinguishers should be distributed throughout the building site. Their locations should be clearly marked in accordance with safety regulations and employees should be instructed in the correct use of this equipment.

- A supply of water specifically for fire-fighting purposes and appropriate for the fire load in question should be ensured.

These measures must be adapted according to the developing situation resulting from progress in construction so that:

- the supply of water for fire-fighting always corresponds to the fire load of the entire building site;

- the fire protection and fire-fighting systems planned for the building under construction are installed and put into operation as early as possible;

- building site employees are trained in the use of fire protection equipment.
Organization of the building site

Suitable organizational measures also help to prevent fires or, if necessary, to fight fires effectively. The first step is to ensure that the building site is monitored and checked.

- As part of on-site safety organization, one person should be nominated as being responsible for fire protection and given the necessary authority.

- During daytime working hours, checks should be carried out on people and vehicles entering the building site.

- If required, security personnel should be employed during working hours, or at night or on non-working days. Security patrols should be carried out outside working hours, the first patrol to be just after work finishes each day.

The following measures reduce the risk of a fire breaking out:

- All regulations relating to work involving an open flame (welding, cutting, soldering, annealing, heating, thawing etc) should be strictly applied. Checks should be carried out to ensure that these procedures are being followed.

- Smoking bans must be laid down and clearly indicated, and checks made that they are being strictly adhered to.

- The removal of waste from the building site should be monitored and expedited if necessary.

If a fire breaks out despite these precautions, fire-fighting may be facilitated if:

- the local fire brigade is informed of the necessary emergency procedures before work starts on the building site, and contact with them is established and maintained throughout the entire construction period;

- written procedures for the event of a fire are drawn up and on-site staff informed accordingly. The staff’s level of information should be checked periodically;

- access roads reserved for the use of the fire brigade are clear;

- on large building sites, an emergency plan with a crisis committee is drawn up and the effectiveness of this emergency planning tested by means of periodic fire drills.
Strong smoke emissions hamper fire-fighting operations at this hotel and office complex in Bangkok.
5 Conclusions for the insurer

The protective measures mentioned are of enormous importance for both preventing fires and containing them as far as possible if they should break out (unfortunately an ever-present risk).

The insurer should check the protective measures taken as part of his periodic inspections of the building site. As part of the preparations for his visit, the engineer appointed by the insurer should familiarize himself with both the project in hand and its specific problem areas. He should also draw up a detailed checklist of all the points to be analysed so that the inspection may be carried out as systematically as possible.

These inspections should take place in the presence of the building site manager or the fire protection officer. Their purpose is:

- to analyse the current state of the building site;
- to compile a list of weak points;
- to work out measures for improvement;
- to increase the policyholder’s awareness.

It is worth attaching the “fire protection” clause (see page 18) to the Construction/Erection All Risks policy for building sites over a certain size with a considerable fire exposure. This clause is based on Swiss Re’s CAR/EAR policy and must, if necessary, be adapted, revised or modified according to the type of policy used or the project characteristics.

We recommend that the maximum value of goods stored in any place or sector should not exceed the following limits:

- 2% of the building cost for normal cases;
- 5% of the building cost if large units of equipment are involved.
In accordance with article 1 of the General Conditions, the insured must adhere to the following conditions with regard to fire hazards:

1. Fire prevention and fire-fighting organization must be suitable both to the construction project and the local conditions. Effective measures are to be implemented as soon as the building site is set up.

2. The building site installations are sufficiently far away from each other and at a suitable distance from the building under construction.

3. Building and assembly materials are stored in separate places and at a sufficient distance from each other in order to avoid a high concentration of value in one place or sector. The value in any of these places and sectors should not exceed [ ] Inflammable substances (liquids and gases) are to be stored separately.

4. Waste is to be systematically removed from the building site and deposited at a safe distance from both the building under construction and the building site installations.

5. The building site and access to it are to be suitably monitored.

6. Compliance with clearly indicated no-smoking bans is to be monitored and enforced.

7. The following measures are to be implemented in case a fire does break out:
   a) installation of a fire alarm;
   b) installation of fire-extinguishing equipment suitable to the type of site, such as extinguishers and systems suited to the requirements and equipped with hoses and nozzles. The systems should have sufficient water pressure and reserves;
   c) training in fire-fighting for building site staff.

Sufficient fire-extinguishing devices and a direct link to the alarm system should be available at any location where work with an open flame is carried out, so as to be able to fight a fire as soon as it starts. All fire-fighting measures should be coordinated with the local fire brigade, the exception being arrangements which affect building sites in remote areas.

8. The permanently installed fire prevention and extinguishing devices are to be put into operation as building work progresses. This equipment must be in operation once the secondary work is in its advanced stages and the plant is commissioned.

9. The legal regulations regarding fire protection are to be observed.

If, in the case of fire damage, it appears that the insured has been seriously negligent in the application of the provisions of this clause, the insurer reserves the right to reduce the amount of the claim or reject it entirely.
A copy of the “fire protection” clause is provided as a separate sheet in the rear cover flap of this brochure.
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