

FIRE PREVENTION FOR EAR AND CAR RISKS

Gerhart Ebner
Wiener Städtische Versicherung

IMIA, Scotland
September, 1994

C O N T E N T S

0. Starting Position
1. Possible Solutions
2. Viewpoint of the Insured
3. Objectives
4. Risk - a Contemplation
5. Factors Influencing a Risk
6. The Fire Risk at Building Sites
7. Measures
8. Outlook
9. Annex

0. Starting Position

... or why this topic concerns us!

These past few years have been characterized by a series of spectacular large-scale losses in the fields of both construction and erection projects. Was this accumulation of large-scale damage merely coincidental or does it reveal a catastrophic tendency for insurance in the fields of construction and assembly?

As the losses of recent years have shown, it is impossible to pinpoint large-scale damage to a certain type of construction or erection projects; it has involved the most varied industrial plants and construction projects. However, civil engineering projects are an exception. The causes of damage are just as varied. The spectrum reaches from technical defects, dangerous works not carried out with the necessary care, unpredictable combinations of perils, faulty operations and grossly negligent observance of safety regulations all the way to arson, a topic also known to insurers of finished buildings.

If at all, we can ascertain a temporal concentration of losses, that is according to building phases. This concerns large-scale damage occurring either during or immediately after installation of the construction site (mainly to equipment and stored material) as well as damage during the final phase of construction or assembly works.

In recent years insurers have therefore intensified their concern for this topic. Münchener Rück, for instance, published a revised version of its 15-year old Clause 112 "Special Conditions for Fire Fighting Equipment", which takes conclusions from the portrayed development of damage into account as well as the "Joint Code of Practice on the Protection from Fire of Construction Sites and Buildings Undergoing Renovation", which was worked out in England; Schweizer Rück published its own booklet on "Protection from Fire on Construction Sites"; the Association of Property Insurers in Germany (Verband der Sachversicherer in Deutschland) organized a seminar in 1994, which was dedicated exclusively to fire protection on construction sites; and, as mentioned earlier, the "Joint Code of Practice on the Protection from Fire of Construction Sites and Buildings Undergoing Renovation" was worked out in England with the support of the Association of British Insurance, the Chief and Assistant Chief Fire Officers' Association and the London Fire Brigade.

The fact is that we have the know-how to reduce the number of losses due to fire and to lessen their consequences. However, the question is whether this will suffice to prevent such catastrophic fire-related losses in future, is there more we can do or will we have to expect this tendency to continue unabatedly?

The two observations - tendency towards large-scale damage with existing know-how to limit losses - contradict each other only at first glance. Sections 1 and 2 will briefly deal with this phenomenon.

1. Possible Solutions

... or what can we insurers do?

The strategy of an insurer may be directed towards short-term success in the sense of quickly improving the portfolio, e.g. by means of selective/restrictive underwriting. But there may also be attempts to improve the risk situation in general - a long-term endeavor and a thorny path to follow. Whilst the strategy of selective/restrictive underwriting leads to (massive) losses in sales, the second option may lead to massive losses in revenue, due to continuous indemnity payments and high costs for consultancy and information.

In their extremes, neither version will be acceptable to the majority of insurers. We will have to find the best mix from the possible solutions listed as follows:

- ❖ Advice and information for all parties involved in the construction project
- ❖ Know-how transfer towards fire risk management
- ❖ Selective underwriting
- ❖ Contractual obligations to reduce risks
- ❖ Monitoring compliance with these obligations
- ❖ Sanctions for disregarding these obligations (both when and before a loss occurs)
- ❖ PR-work (e.g. protection from fire as environmental protection)

2. From the Viewpoint of the Insured

... or why many things are not done!

I would now like to briefly discuss the diverse interests of potential parties insured:

By profession, I am a civil engineer and worked for more than a decade in the construction of hydro-electric power plants, mainly carrying out the tasks of a designer and/or representing the interests of the owner.

For the **designer** and the representative of the **owner's** interests, the aim is to optimize

- ❖ Functionality and quality
- ❖ Costs
- ❖ Construction time (keeping to schedules)

In **planning and executing** a construction project, the designer encounters a multitude of problems which can interfere with the aforementioned aims. Risks of fire also endanger some of these aims. However, as the probability that fires occur on construction sites is low, despite the increased risk of fires there, designers and owners' representatives often pay little attention to fire risks. The quality of the designer is (currently) not measured in terms of fire protection and definitely not in terms of fire risk management at the construction site. Has success not confirmed this? In over more than 30 years and approximately 100 building projects, our company has never encountered a single damage caused by fire.

For the **owner**, the interests are different. The main goal of an owner is to have the project ready for operation on schedule. Any major fire can seriously endanger this. Nevertheless - and I believe this is due both to financial considerations and to lack of information - most building projects have no explicit definition of fire protection at the construction site, let alone the demand for fire risk management.

Another important group of insured parties are the **contractors**. Their goals are easy to define: quality (avoid cases of warranty and indemnification, subsequent orders), timeliness (avoid penalties) and profits! Due to the current fierce time and cost pressures, however, quality and most of all safety are often pushed to the background. These problems apply even more to **subcontractors**.

What then is the current attitude towards fire protection or even fire risk management? I would like to answer this question in a somewhat provocative manner:

In the knowledge of having fulfilled or, to the extent possible, circumvented all pertaining obligations or imperative standards imposed by the authorities, which are usually considered as impediments, the readiness to take for further measures is extremely low. The risk is definitely not recognized to its full extent and can - due to its low probability - easily be dismissed.

3. Objectives and Realization

... or what is the purpose of these considerations?

Normally, the objectives are stated at the beginning of a study. However, in the course of preparing this paper, I diverted from the original idea to list fire risks and potential measures on construction sites, because of the considerations in Sections 0 to 2. Therefore, it is not the aim to compile the most comprehensive list of dangers and measures.

The aim is to structure

- ❖ **the risks with regard to their influenceability and**
- ❖ **the measures with regard to their practicability.**

Not the measures are of prime concern, but the possibility to implement them (effect before content) !

... and how are we going to achieve that?

If we succeed in finding satisfactory answers to the following three questions, it should be feasible to reach the stipulated aims as fully as possible.

1. What is the risk and by which factors is it influenced?

Analysis of the risk structures and the possibilities to influence and change them.

2. What shall we strive to achieve?

The operative aims with the biggest chances of success.

3. What measures do we have to take to reach our aims?

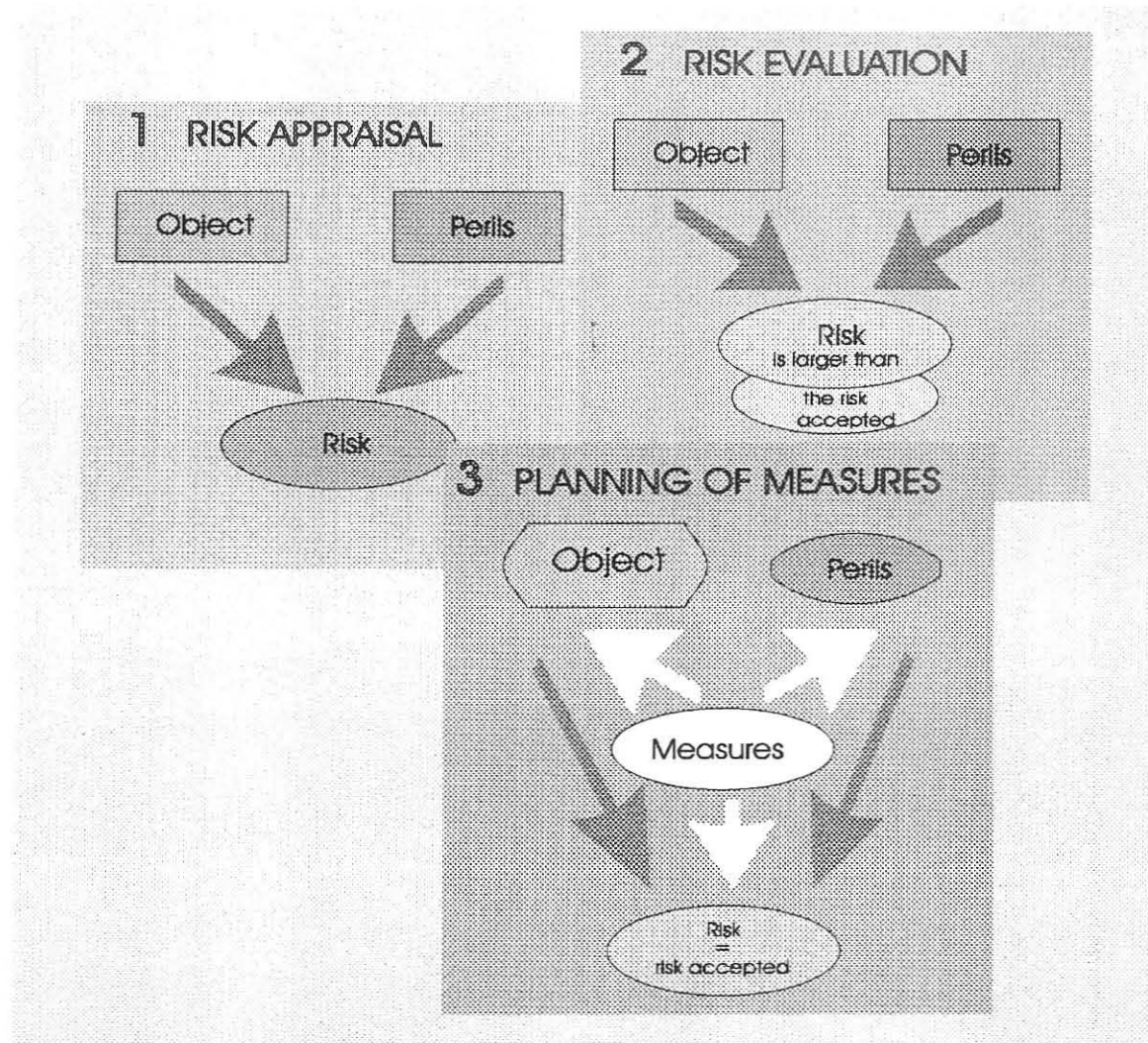
The main points of the current know-how in fire protection and assessment of the chances of success for their realization.

4. Risk - a Contemplation

... or when a peril turns into a risk

The goals of this section are to get an overview of the procedure to be followed in risk appraisal, risk evaluation and in the planning of measures, as well as to explain the terminology used.

Therefore please permit me a brief theoretical input and forgive the simplicity thereof.



Risk needs two basic elements: both the peril and the object. Thus, we define risk as the possibility that an object suffers damage due to some peril. We quantify risk by the function of probability of occurrence and potential extent of damage. Peril is the potential to damage an object and it is characterized by its probability of occurrence and its potential of destruction. Object is any material or immaterial value. It is characterized by its (monetary) value and its vulnerability with regard to the respective peril.

5. Factors Influencing a Risk

The planning of measures requires knowledge of the risk structures. What influences the risk and how and by whom can perils and objects be altered?

In this section I would like to outline the main factors influencing risks with catchwords. By and large, they are always the same. However, the degree of effect and influenceability varies with every building project.

Environment

- ❖ Social environment
(Attitude towards the building project, unemployment, tramps, drug addicts, etc.)
- ❖ Natural environment
(vegetation, frequency of lightning strokes, etc.)
- ❖ Industrial environment
(dangerous plants, warehouses, infrastructure, etc.)

Concept of Construction

- ❖ Architecture
(fire zones, accessibility, etc.)
- ❖ Intended use
(excitement value, usage prior to transfer, etc.)
- ❖ Due dates

Execution of Construction

- ❖ Materials used
(fire burden, fire hazard, potential for damage, etc.)
- ❖ Technical equipment
(fire hazard, concentration of worth, etc.)
- ❖ Complexity
(clear and transparent organization, risk of modifications and synchronization, etc.)

Owner

- ❖ Attitude towards safety
- ❖ Financial situation
- ❖ Harmonization of interests with the insurer

Designer, Site Management

- ❖ Technical know-how
- ❖ Attitude towards possible risks
- ❖ Authorization by the owner
- ❖ Independence, ability to succeed
- ❖ Presence at building site
- ❖ Design of fire protection

Contractors

- ❖ Number of contractors
- ❖ Relationship between contractors
- ❖ Financial situation of contractors
- ❖ Quality of employees
- ❖ Order situation (adequate prices, definition of performance, etc.)
- ❖ Age of technical equipment
- ❖ Attitude towards fire protection
- ❖ Clearly defined scopes of duties
- ❖ Site layout (crowded working space used by several contractors, limited transparency and overview, etc.)

Fire Protection during Construction

Quality and efficiency of the constructional, technical and organizational fire protection with regard to

- ❖ responsibility
- ❖ risk assessment
- ❖ planning of measures
- ❖ fire detection
- ❖ fire fighting

Unknown Factors and Coincidences

6. The Fire Risk at Building Sites

For the purpose of Section 4, "Risk - a Contemplation", let me here once more point out the importance of being aware of the practical fire risks at building sites.

❖ Perils with a high probability of occurrence ...

Among all perils, man occupies first rank: negligence, carelessness, overrating, overstraining, insufficient training, faulty estimation of consequences, and intent are the sources of most of the damage at construction sites.

❖ ... together with objects easily damaged ...

- ◆ encasings and molds
- ◆ building material (insulation, plastic laminations, etc.)
- ◆ combustible process materials (bonding agents, bitumen, cleaning materials and solvents, etc.)
- ◆ waste and packaging materials
- ◆ gases for heating, welding, etc.
- ◆ tar and bitumen processing equipment
- ◆ etc.

❖ ... and valuable objects ...

- ◆ electrical and mechanical installations
- ◆ high-quality facade and/or interior lining or paneling
- ◆ electronic equipment
- ◆ machinery
- ◆ office equipment
- ◆ etc.

... create the high fire risk at building sites.

This fire risk is further heightened by the technical hazards. Overloaded site installations, tests and putting into operation of the plants and the electrical equipment, temporarily employed (loan) aggregates, gas, oil and other media lines, self ignition of polluted chemicals, etc. in combination with usually insufficient measures of fire prevention and fire fighting result in an excellent "risk cocktail".

7. Measures

... or why fire protection should be considered in time, so that it is available when needed.

In 1990, the Wiener Städtische Group, for which I am active, formed a risk consulting company. During an internal discussion of a very complex fire protection concept a free-lancer co-opted for a special problem asked, "Do you really want the customer to implement some of your proposals?" Upon our astonished glances he went on to explain, "With this massive organizational and financial burden, which practically 'smothers' the customer, the reaction will frequently be that problems are tackled only pro forma or not at all."

This made us revise our concept. Measures involving great efforts and costs but causing only slight improvements were eliminated. The remaining proposals were grouped into "absolutely necessary measures" and "recommended measures". We worked out and presented a staggered plan for implementing the measures and all of the "absolutely necessary measures" were indeed implemented.

I believe that in enforcing fire protection measures this has to be taken into account. You cannot shower an object having catastrophic fire protection - and many construction sites fall into this category - with all kinds of possible and desirable obligations. In so doing, the goal is pushed to an unreachable point in the distance - the implementation then often lacks both plan and motivation, and the results are sobering.

Is it thus not a question of convincing the right people of the purpose, necessity and feasibility of these proposals and to make them your extended hand with regard to implementation? True, it is necessary to impose regulations and obligations, but these have to be examined as to their respective purposefulness and feasibility, and whether they can be checked and/or sanctions imposed. It must be considered that in many countries the legal and contractual conditions make it very difficult and/or impossible to enforce implementation by means of sanctions (representation clause, obligations violating public policy, etc.)

The proposed measures always need to be viewed from the aspect of their effectiveness. It does make a difference whether the insurer and the respective insured agree or disagree on the measures to be taken (risk minimization versus cost and time), what possibilities the insured has to exert any influence at all (influence of the owner over the contractors), in which way the insurer can exert influence and if the time factor allows to propose and/or dictate such measures for a specific building project (in most cases insurers have no influence over planning, site layout, etc.)

However, as a classifications in this respect would be extremely confusing, we do not supply one. For the classification of the measures we have chosen the following subdivisions:

- ❖ Advising and influencing
- ❖ Contractual obligations and recommendations
- ❖ Monitoring compliance with contractual obligations and recommendations
- ❖ Sanctions for violating the contractual obligations
- ❖ PR-work

a. Advising and Influencing

The insured parties should be convinced of the necessity to have fire protection, also to safeguard their own interests. As the influence of the individual insureds varies greatly during the individual phases of decision making and construction, our considerations are grouped according to the following aspects:

Owner and Designer

As many risk determining decisions are often made - mainly by the designer and the owner - long before the first contacts with the insurer are established, it is possible to advise and influence only indirectly, that means independent of a specific building project. In addition, the influence both the designer and the owner have in the planning phase is rather large, but much less so in the building phase.

This is a pity, as the interests of the owner and the designer (could) largely coincide with those of the insurer. As direct counseling is often impossible, the insurers could become more active with publications, lectures, information for professors and students, etc. **An extremely promising activity would be to supply designers with material on fire protection that meets tendering requirements.**

Site Manager and Site Supervision

The site managers and supervisors of works can be contacted in due time - from the chronological point of view. In addition to offering them information and support with regard to fire protection, they should be made aware of their extreme responsibility and the potential consequences of fires.

Contractors

In most cases contractors accept advice only if obvious improvements can be achieved without increasing the time or cost pressure. The contents of such advice is similar to the "Contractual Obligations and Recommendations" outlined below.

b. Contractual Obligations and Recommendations

Contractual obligations and recommendations should be

- ♦ **plausibly geared to the respective construction project and**
- ♦ **worded as precisely as possible.**

Why do we make these demands? Because we are convinced that these demands will make it much more likely to achieve our aim, the "realization of obligations and recommendations" we desire.

A further aspect for these demands are the inspections and sanctions. A general wording, such as "... as early as possible ..." or "... by means of appropriate measures ..." on the one hand often does not convey the meaning, and on the other hand it allows the insured undesired leeway and room for interpretation.

When making these demands, we were fully aware of the difficulties (degree of preciseness?, efforts and expenditure, etc.) and consequences (fire risk management versus regulations). Nevertheless, I believe they can be realized with complex building projects. Whenever we demand from the insured to appoint an agent in charge of fire protection at the building site, we should make an appropriate contact person available to him. The latter could support him in assessing the fire risk and deciding on the measures to be implemented in the initial phase of the building project. Before and/or during installation of the building site, the implementation of the measures could be discussed and adapted to the critical end-phase.

In a building project worth ECU 50 million and with a premium of ECU 75,000, expenses would have to be estimated at 2 - 4 percent of the premium. In view of the fact that fire damage amounts to approximately 30 and 70 percent of total losses in civil engineering, such a capital expenditure seems to be justified and promising, even without increasing the premiums. For standard structures, standardized obligations in connection with an information brochure could be worked out.

These measures, which are grouped according to their effects, are listed below in catchwords, some of them with short explanations. For the most part, the Clauses mentioned earlier (Annex) provide the wording that can be used in the contract.

❖ Responsibility for Fire Risks

Person in Charge

The person responsible for the fire risk should always be a natural person. With smaller building sites, this could be the site manager himself, with larger sites a special person should be appointed Site fire Safety Coordinator (possibly with co-opted persons and/or support).

Tasks of the Site fire Safety Coordinator

- ♦ to assess the fire risk
- ♦ to work out and regularly adapt a fire protection plan in relation to the progress of works
- ♦ to coordinate all those involved in the construction with regard to fire protection
- ♦ to instruct and train all those involved
- ♦ to contact the local fire brigade, possibly inspect the building site with them
- ♦ to report on all studies, inspections, tests, control rounds and training measures with regard to fire protection
- ♦ to maintain contact with the insurer's contact person
- ♦ to plan safe evacuation measures in case of fire (emergency plan)

❖ Decreasing the Probability of Fire

- ♦ Storage of explosive, highly combustible and highly inflammable materials in compliance with the regulations (e.g. airing and ventilation, storage structures and impacts in case of fire)
- ♦ Execution of works with fire hazards in the open, at safe distances from endangered areas
- ♦ Open air work places for the handling combustible liquids and gases in safe distances from endangered areas
- ♦ Speedy removal of combustible materials such as packaging material, wall plate clippings, excess trusses, etc.

- ♦ in-process storing of combustible or explosive building materials, process materials, etc. outside the appropriate storage facilities only in amounts absolutely necessary (depending on their dangerous nature, the amounts required per week/day/half day/hour)
- ♦ Definition of non-smoking zones, marking and inspection thereof
- ♦ Safeguarding against arson (fenced-in building site, gate guard, inspection rounds, monitoring cameras, etc.)
- ♦ Tidiness at the construction site
- ♦ Placing and inspection of dangerous building components (power supply, motors and engines, etc.)
- ♦ Permit system for hot works
- ♦ Lightning protection system
- ♦ Observance of safety distances from devices that emit sparks and/or heat

❖ **Confining the Spreading of Fire**

- ♦ Casing and scaffolding material made of not or hardly combustible material
- ♦ Establishing fire compartments by tying in the building components of the final fire compartments; temporary bulkheads where necessary; attention to roof constructions; attention to "bridges" (foils in front of facade scaffolding, temporary cable lines, etc.)
- ♦ In-process storage of waste material, combustible building material, process materials, construction parts, etc. in such a way that they do not interfere with establishing fire zones
- ♦ Separation of temporary structures, such as site office, workers' accommodation, workshops, storage of structures to be erected in order to warrant sufficient fire protection

❖ **Fire Detection and Alarms**

- ♦ **Fire Detection:**
Technical fire detection systems (either temporary devices for the construction phase or sectional putting into operation of the building's fire alarm system); control rounds outside working hours
- ♦ Installation of sufficient numbers of push-button call points and/or instruction to report local fires immediately via telephone or radio to the site manager and/or fire protection agent
- ♦ **Alarm:**
A sufficient number of alarm devices (sirens, horns, loudspeakers, etc.) must be provided, escape routes and organizational measures for an efficient evacuation must be planned

❖ Fire fighting

- ♦ supply of fire extinguishing substances, adequate for the respective structural section
- ♦ sufficient supply of fire fighting equipment suited for the respective fire zone
- ♦ ensure water supply (temporary pond, pumps, hydrants located throughout the site, sufficient reels, hoses and jets, minimum pressure, etc.)
- ♦ work out the final fire protection system in advance, to the greatest extent possible; put it into operation section by section and integrate it into the provisional fire fighting system
- ♦ recruit a works fire brigade from among the workers at the site for initial fire fighting measures
- ♦ increase awareness of fire protection in the persons involved in the building project
- ♦ regular training and fire fighting rehearsals (training in handling the fire fighting appliances; if possible, training on "real" objects, e.g. insulation material, casing material, evacuation of gas cylinders, etc.)
- ♦ work out a call-out procedure for the fire team on the basis of the site installation plan and coordinate it with the public fire brigade
- ♦ make sure that the fire brigade is properly instructed (marking of the construction site, pilot vehicle, etc.)
- ♦ restore fire fighting capability

c. *Monitoring Compliance with Contractual Obligations*

Imposing obligations without providing checks for their compliance does not appear to be very sensible. Checks should be made not only in large-scale construction projects but also in standard projects (in the latter case, possibly only at random, for cost reasons).

d. *Sanctions in Case of a Violation of Contractual Obligations*

In case of serious violations of contractual obligations, massive sanctions should be threatened or imposed (e.g. temporarily increased deductibles, restriction of cover or indemnification, etc.)

e. *PR-Work*

In many countries there is an insufficient level of fire protection at construction sites. Continuous PR-work can support a positive development on a medium and/or long-term basis. It should be a challenge for each one of us to contribute or initiate positive changes in our own countries.

8. Outlook

It would be nice if I could conclude this paper by giving a very positive outlook for the future.

Although I do not have the reputation of being a Cassandra, I cannot detect more than a silver lining at the horizon. An accumulation of large-scale fire damage can happen again at any time.

However, there is one circumstance which makes me optimistic, namely that we ourselves can contribute much to improve the situation. So let's begin as fast as possible.

9. Annex

- a. Clause 112 published by Münchener Rück
- b. Brandschutz auf Baustellen (Schweizer Rück)
- c. The Joint Code of Practice on the Protection from Fire of Construction Sites and Buildings Undergoing Renovations
- d. Schadensstatistik der Münchener Rück