



# Estimation of Direct and Consequential Damages due to Fire and Explosion. Maximum Exposed Value and Probable Maximum Loss. Support Tools

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The technical aspect of the insurance activity require the determination of what will be the maximum economic loss which would result from a disastrous accident in each of the risks carried in the portfolio. The "estimation" of Losses, a much more adequate term than "Calculation" covers two concepts very commonly employed in the insurance sector terminology but, often in an unconnected manner, which causes very distinct interpretations, sometimes leading even to lack of confidence, when in fact they should be concrete values for all insurers and reinsurers in national and international markets.

The objective of this article is to clear up certain concepts used in very distinct ways, and to point out some useful tools and models which can help make many estimations less subjective.

**Maximum Exposed Value.** This is defined as the maximum possible loss due to a major accident, including material losses as well as business interruption or loss of profits, under the most unfavorable conditions, to a specific insured property or group of insured properties.

In order to be able to estimate this value, the underwriter must have knowledge about compartmentation and the fire resistance characteristics of building components, and bring together the possible evolution and behaviour of the fire taking into account the total failure of own fire protection measures (fire brigade/manual and automatic fire detection and control systems) and external measures (public or private fire services). Thus, the duration of the incident will be marked by the speed of combustion of the materials and products involved in the fire. Given the hypothesis of a free-burning, unattended fire, it is vitally important to estimate the duration of the fire instead of the fire resis-

tance of the compartmenting elements; this explains why arson (various points of origin) should not be considered in the estimation. Once the various possible fire situations have been determined, it is necessary to have a valuation of the insured goods by material damages (buildings, installations, machinery and fixed and floating stocks) as well as having defined the loss of profits resulting from each accident scenario (Gross Loss and indemnity period). Therefore, it is not only necessary to have the valuation of the risk in question but also the distribution of these values in the location, as it is obvious when material damage losses and losses due to business interruption exist (the latter often exceeding the former), the combination of both which would produce the maximum loss must be defined.

And last but not least it must be pointed out that exceptional risks such as airplane crashes, unlikely domino effect situations or catastrophes should not be considered.

**Probable Maximum Loss.** This is defined as the maximum expected loss by direct material damage and business interruptions resulting from an accident, "carefully" considering the efficiency and effectiveness of own and external fire protection measures under normal operating conditions of the insured property.

This aspect is extremely important as the underwriter must take into consideration the existing means of protection and how these would affect the reduction of the resulting damage and loss of profits and operational capability, taking into account their adequacy to the risk, design, and maintenance and capabilities of the human elements. It is obvious that the involvement of the underwriter must far exceed just a meeting with the plant manager; he must be able to adequately inspect

the systems that could potentially correct the relation of the maximum exposed value (VME) to the PML. In order to be able to do this he must have sound technical training, as upon this will depend a more concrete knowledge of the behaviour of the risk when an accident does occur. At the same time he can periodically advise the insured on the adequacy of and improvements to these measures, which in turn would reduce percentage-wise the PML in relation to the VME. This is the reason that inspections of risks and the consequent insurance are so important.

As can be deduced from the preceding paragraphs, the inspector must have deep experience, training and common sense in order to determine the PML. At this time there are a number of technologies and computer tools which allow a great deal of objectivity to be applied to determined estimations which normally are handled much too conservatively. We refer here to commonly used values such as safety distance which lead to considering the risks independently in regard to fire and/or explosion. Regarding fire, mathematical models are available which properly used and taking into account decisive aspects of the fire's overall behaviour (products involved in the fire, wind direction at the site, and materials which could be affected) permit estimation in a much more realistic manner the degree of spread and, thus, the potential degree of damage to exposures, and these can be included in the PML or considered independently from the postulated accident scenario. Also, in the case of gas or vapour explosions and the determination of the corresponding effects on the surrounding area, tools are available which permit the estimation of the extent of the pressure waves, which related to the destructive forces of the gases or vapours, and having available the valuations of the supposed affected property (buildings, etc.) to combine with these, it is possible to technically estimate the VME and PML values.