Risk management in civil engineering
advanced course
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RISKS AND INSURANCE POLICIES

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Abstract

In the context of the current course, we look at main aspects related to the identification of the different 'perils and threats' which stalk the business activity, in this case developping in the area of civil engineering, the analysis of its origin and consequences and the actions which have to be taken for its prevention and mitigation. All this related to Risk Management.

On the other hand, the concept of 'risk', because of its big number of meanings and its different uses in the colloquial language to refer to different concepts or situations ('run a risk', 'risk of change', 'high risk', etc.) has to be defined previously if we want to use it as a reference element in the context of Risk Management.

Risk and insurance

Taking this into account, we can say that 'Risk is the contingency or proximity of damage', which in some way identifies it with the concept of 'danger' or 'perils'. But we will also see that we can also define it in a certain area as 'Each of the contingencies which could be the object of an insurance contract'. This is the area of the 'insurable risks'.

But first of all we have to answer to the following question: Is the concept 'risk' quantifiable? Well, from a theoretical point of view, a risk would be the mathematical product of the probability (P) that a certain event ('peril', 'hazard') happens, multiplied by the effects or consequences (C) of the damage that could cause the event:

$$R = P \times C$$

On the other hand, the 'Insurance' is nothing else than a financial transaction by which a party, the policyholder (Insured), through a remuneration (the premium), promises to himself or to a third party a payment or a reparation in case of risk producing damages. The other party (the Insurer) who makes this payment, takes a set of risks, and is able to compensate them according to the statistical laws.

We could say that the Risk Manager of a certain company should decide within its planning which kind of risk could or should assume with charge to the own financial and operational capability of the company, and which others he should 'transfer' to a third person, using for example an insurance contract (policy). The general approach would be the following:

To retain -> Risks with high probability and low consequences

To transfer -> Risks with low probability and severe consequences

To take this decision, he will have to take in account not only the expected loss ratio, but also the costs of risks control and risks reduction, the costs of the financing of risks, as well as the unexpected costs.

Risk and insurance in civil engineering

If we classify the risks in three different categories: identified and known (assessable), identified and unknown (difficult to evaluate its consequences), and unidentified and unknown (surely we'll be surprised), we find that in civil engineering we will be almost always working with the last two categories (unknown, identified or not), due to the following points:

- each project is different from the previous, always showing different elements (ground conditions, climate, workmanship…);
- technological development and innovation are steady, both in machinery and in materials;
- frequently there is non-skilled labour in the lowest levels of the chain;
- use and maintenance are sometimes not as careful as they should.

Considering risk factors in civil engineering, we could classify them looking at their origin:

a) factors with an internal origin, which comes from the project and the execution of the construction works, and whose consequences depend only on this factors

b) factors with an external origin, which do not depend on the project and execution (natural hazards, acts of third parties), but whose consequences do depend in a certain way on them.

Among the different traditional ways to analyze the risks (deterministic, probabilistic, statistical…) it is very common, in the area of insurance activity around civil engineering, choosing the probabilistic analysis and especially the statistical analysis, which is based on the study of the historical 'loss-ratio' of a certain type of work.

However, because of the particularities of civil engineering that, as we have seen, makes very difficult to get a homogeneous and wide enough statistic base, it can be sometimes impossible to make a reliable analysis to determine such important aspects as risk transfer costs for a certain work. This forces to fill in the statistics, corresponding to the main types and typologies of civil engineering worldwide, with specific studies about the main risks that affect locally to our work, pondering the data of the global statistic. Of course, the prevention and security actions taken in the construction work are also a very important part to take into account to ponder the cost of the insurance.

Insurance policies in civil engineering

The possibilities of ensuring the risk of physical loss or damage in the work itself or its surroundings, or even economic loss arising from such damages, are quite wide and they are getting more and more sophisticated.

Inside the extensive field of this kind of insurances, divided in areas known as 'Insurance Branches' (Fires, Multirisks - in its various forms - Construction, Machinery Breakdown, etc.), one form of classification is looking at its period of coverage:

a) Annual policies

- (MB) – Machinery Breakdown
- (BI-MB) – Business Interruption, resulting from a loss covered under the MB policy
- (DOS) – Deterioration of Goods

- (EEI) – Electronic Equipment
- (CPM) – Contractors Plants & Machinery
- (CECR) – Civil Engineering Completed Risks

b) Temporary policies

- (CAR) – Construction All Risk
- (EAR) – Erection All Risks
- (CAR-ALoP) – Advanced Loss of Profit in CAR
- (EAR-ALoP) – Advanced Loss of Profit in EAR
- Comprehensive policies (BOT, BOO...)

c) Multi-annual policies

- Decennial (10 years cover)
- Inherent Defects (2, 3 or more years cover)
- ...

d) Special policies

- Off-shore Risks (Oil-Platforms, Undersea-Pipelines,...)
- Technological Risks (Manufacturer's Guarantee,...)
- Space Risks (Moon Shots, Space Stations, ...)

Looking at the insurances related to civil engineering we found out that the temporal policies go together with the realization of the project from the inception to the completion of works (including some time after the completion of works –maintenance coverage-, to cover risks which did not appear during the construction works, but which have their origin there). The policies which are renewed annually cover works after their completion which are exposed to certain risks which are not related with the project or with the execution of such construction works. This risks use to be related with natural hazards.

Also in the way of defining the scope of the main guarantee of the policy, there are differences between some types of insurance from other: the CAR, EAR insurance, per example, is an so termed 'all risk' policy, while CECR are policies wich cover 'nominated risks'.

In an 'all risk' policy, all risks which could to produce damages would be covered by the policy, unless the ones which are specifically excluded. In the policies with 'nominated risks', only the risks which are nominated in the policy will be covered.

Specially in the case of civil engineering, the traditional formulas of insurance, which we have seen above, give way to new kinds of 'comprehensive policies', which at the end of the day consist in a set of temporary and annual policies, put together with cohesion and some enlargements in order to avoid coverage gaps.

In this group we find the BOO (Business-Operate-Own) and the BOT (Business-Operate-Transfer) policies. Its peculiarity lies in the nature of the policyholder: these usually are large public works projects

which are given to a company (or group of companies) not only for carry out the project and construction part, but also for the operating phase during a few years after.

Finally, to complete this brief summary, and leaving out the group of special policies (whose peculiarity lies basically in the special character of the insured object), we would find the group of the 'multi-annual policies'. This kind of insurances (Decennial Insurance, Inherent Defects Insurance,…) differs radically from the previous, not only in the pluriannual length of the guarantee, but specially in the concept of the coverage: while for the previous it had to be a sudden physical loss or damage to the property insured which the insured could not reasonably have foreseen, for this last kind of insurances we do not have this kind of requirement, being covered the damages which had been caused by defective items, including the costs of its repair. In other words: the aforementioned multi-annual policies cover 'the cost of doing well the parts of work which were done wrong', while the temporary policies specifically exclude such costs, however covering the cost of repairing the damage caused by the defective parts on the rest of the work.