14 Risk and Insurance

14.1 Insurance in construction

One of the first, clear definitions of insurance principles was formulated by the *English Insurance Act* (1601). According to its drafters, insurance was intended to meet the following primary functions:

- to distribute individual loss across many;
- to encourage individuals to take a risk by promising them compensation in case of loss; and
- to motivate young people to become entrepreneurial.

The large number of restoration programs that followed the devastation of the world wars (going hand in hand with the rapid development of manufacturing processes) resulted in a consolidation of the risk management principles of responsibility, liability and indemnity. Consequently, it was at this point in history that insurance became recognized as an important need in the construction industry.

Construction insurance covers all indemnity agreements within the limits of individual construction activities where insurance is selected as a risk (liability) assignment instrument. The following are the main types of insurances relevant to construction projects:

- political risk insurance;
- exchange risk insurance;
- bank guarantee insurance (guarantee for bid, performance, advance payment);
- lost profit insurance;
- construction all risk insurance;
- erection all risk insurance;
- professional liability insurance;
- employer's liability insurance;
- public liability insurance.

International Construction Contract Law, Second Edition. Lukas Klee.

Within construction projects, risks are usually allocated by the two most important contracts—the contract between the employer and the service provider (contract administrator, designer, and so on), and the contract between the employer and the contractor.

Insurance costs have escalated so much in recent years that they have become one of the most important cost items of a construction project. Construction project participants must, therefore, understand risk management issues, in particular, risk allocation and insurance. Insurance is widely recommended to protect the contracting parties against the financial implications of unexpected losses, damage, or liability. The primary participant (i.e., the employer) usually requires of the secondary party (parties) (i.e., the contractor, designer, consulting engineer as a contract administrator, and so on) to be insured against risks in connection with their role and activities. Therefore, a primary party is not then necessarily a direct party to the insurance contract.

The level of the insured amount shall be determined on an estimate of the potential damage the other participants can cause to this party by their activity or inactivity. Potential damage also depends on the nature and duration of the contract, the place where realization takes place and on other circumstances (risks).

14.2 Commercial risk, risk of damage, and exceptional risk

When analyzing individual construction project risks and their likely nature, we can distinguish between two main categories. The first contains the hazards and risks leading to injuries, death and physical damage, such as defective materials, floods, and work-related accidents. The second comprises hazards and risks giving rise to financial losses and delay, such as late site handover, delayed instructions, and variations.

The above categories further differ because the former (i.e., physical risks) are insurable risks and the latter (i.e., non-physical risks) are not insurable. These categories are handled in different ways even within the standard forms of contract that normally regulate the issues of insurance. The first category is typically dealt with by a separate, specific chapter in the contract. The second category is usually "spread across" the entire contract with basic risks typically specified in one section.

The question still remains: who is to bear the risk, which is not expressly allocated to one of the parties? The answer is that the party bearing such risk depends on the particular wording of the contract and/or on the governing law.

FIDIC forms in the 1999 First Edition did not solve this problem. FIDIC DBO, published in 2008, contains a significant update of mentioned risk and insurance provisions. The clauses have been restructured in a more logical sequence matching the natural flow from risk allocation to responsibility to liability to insurance. Furthermore, the risks carried by both the employer and the contractor have been identified and allocated and different types of risks have been identified as the

commercial risk (risk that results in financial loss and/or time loss for either party where insurance is not generally or commercially available) and risk of damage (risk that results in physical loss or damage to the works or other property belonging to either party, other than a commercial risk).

"Exceptional risks" were established to replace the *force majeure* that is preserved under the term "exceptional event" (FIDIC, 2011a).

Other risks such as *The Employer's Risks during the Design-Build Period* are found at Sub-Clause 17.1 and read as follows:

> Subject to the provisions of Sub-Clause 17.8 [Limitation of Liability], the risks allocated to the employer and for which the employer is liable during the design-build period are divided into:
>
> (a) The employer's commercial risks, which are:
> (i) the financial loss, delay, or damage allocated to the employer under the contract or for which the employer is liable by law, unless otherwise modified under the contract;
> (ii) the right of the employer to construct the works or any part thereof on, over, under, in, or through the site;
> (iii) the use or occupation of the site by the works or any part thereof, or for the purpose of design, construction, or completion of the Works other than the abusive or wrongful use by the contractor; and the use or occupation by the employer of any part of the permanent works, except as may be specified in the contract; and
> (b) The employer's risks of damage, which are:
> (i) damage due to any interference, whether temporary or permanent, with any right of way, light, air, water, or other easement (other than that resulting from the contractor's method of construction), which is the unavoidable result of the construction of the works in accordance with the contract;
> (ii) fault, error, defect, or omission in any element of the design of the works by the employer or which may be contained in the employer's requirements, other than design carried out by the contractor pursuant to his obligations under the contract;
> (iii) any operation of the forces of nature (other than those allocated to the contractor in the contract data) against which an experienced contractor could not reasonably have been expected to have taken adequate preventative precautions; and
> (c) The exceptional risks under Clause 18 [Exceptional Risks].

The biggest difference is in the new wording of Sub-Clause 17.2, where "The Contractor's Risks during the Design-Build Period" are stated as follows:

> Subject to the provisions of Sub-Clause 17.8 [Limitation of Liability], the risks allocated to the contractor and for which the contractor is liable during the design-build period are all the risks other than those listed under Sub-Clause 17.1 [The Employer's Risks during the Design-Build Period], including the care of both the works and the goods.

Exceptional risks are defined in Sub-Clause 18.1, which reads:

> An exceptional risk is a risk arising from an Exceptional Event, which includes, but is not limited to:
>
> (a) war, hostilities (whether war be declared or not), invasion, act of foreign enemies;
> (b) rebellion, terrorism, revolution, insurrection, military, or usurped power, or civil war, within the country;
> (c) riot, commotion, or disorder within the country by persons other than the contractor's personnel and other employees of the contractor and subcontractors;
> (d) strike or lockout not solely involving the contractor's personnel and other employees of the contractor and subcontractors;
> (e) munitions of war, explosive materials, ionizing radiation or contamination by radioactivity, within the country, except as may be attributable to the contractor's use of such munitions, explosives, radiation, or radio-activity; and
> (f) natural catastrophes such as earthquake, hurricane, typhoon, or volcanic activity that are unforeseeable or against which an experienced contractor could not reasonably have been expected to have taken adequate preventative precautions.

The list is not exhaustive and the contractor may claim that an event gave rise to an exceptional risk allocated to the employer under Sub-Clause 18.1 if the contractor considers that an event has occurred, which falls within following definition (Sub-Clause 1.1.37):

> "Exceptional Event" means an event or circumstance which is (a) beyond a party's control; (b) which the party could not reasonably have provided against before entering into the contract; (c) which having arisen, such party could not reasonably have avoided or overcome; and (d) which is not substantially attributable to the other party.

The reasons that these exceptional risks are allocated to the employer include the fact that they are the initiator, ultimate user, and beneficiary of the project. Furthermore, it would be extremely difficult for the contractor to price such a risk if they were required to bear it. Moreover, the likelihood of such risks arising is small and it is better for the employer to absorb the costs of such risks if and when they occur, rather than ask the contractor to include it in the contract price and be responsible for them (FIDIC, 2011a). It must be stressed that the above mentioned wording was changed in the 2017 FIDIC second edition. Clauses 17 to 19 were subject to complete revision regarding "Care of the Works and Indemnities," "Exceptional Events", and "Insurance." These parts were returning back to the basic principles regarding these areas, as they were included in the 1977 FIDIC Red Book.

The following risks can be categorized as belonging to the first category. That is, hazards and risks that lead to injury, death, and/or physical damage:

- insurable risks that are required to be insured on the basis of a contractual agreement;
- insurable risks that are not required to be insured on the basis of a contractual agreement; and
- non-insurable risks.

The insurable risks that are required to be insured on the basis of a contractual agreement are most frequently covered by the contractor's comprehensive insurance policy, construction all-risk insurance, public liability insurance, professional liability insurance, or contractor's and employer's liability insurance (for employee workplace-related accidents).

Insurable risks that are not required to be insured on the basis of a contractual agreement are most frequently the subject of a contractor's, consulting engineer's, and designer's professional liability insurance and employer's liability insurance.

Non-insurable risks are the contractor's or employer's responsibility, depending on their allocation.

Weather risk in offshore wind construction contracts by Alex Blomfield (UK)

Adverse weather constitutes one of the main risks in any construction project. This risk comes to the fore even more in offshore wind projects, particularly as such projects are built increasingly further from shore and in increasingly deeper waters. Severe weather conditions, including high waves, strong and turbulent sea currents and tides, and strong variable winds have the potential to significantly disrupt the construction and installation of offshore wind components, particularly given the limited weather window often available to deploy massive components to site, and install, test, and commission them. Managing such weather conditions and dealing with the difficulties they cause for transportation, installation, testing, commissioning, and the logistics of offshore wind project construction in general constitute one of the greatest challenges involved in delivering offshore wind projects on time and on budget.

The difficulty of managing adverse weather risk in offshore wind construction is exacerbated by the industry preference to deliver projects using a multi-contract rather than an EPC-wrap approach. The multiple contracts in place with the various stakeholders, such as vessel operators and suppliers and installers of foundations, wind turbines, cables, and other electrical parts and substations, often make it the case that one party's delay will cause serious delay to other parties. For example, if a vessel has been reserved for a particular time slot, and bad weather prevents work from being carried out during that period, it may be some time before another slot for that vessel can be reserved. Furthermore, variations in the weather tolerances of different vessels and the windows of good weather required for different scopes of work can create major challenges for the scheduling of installation that requires multiple vessels.

Weather risks need to be quantified at the time when the contract is negotiated and the risk allocated to the appropriate project participants at the various stages of the project. This requires careful due diligence, planning, and legal drafting tailored to the particular weather risks and remuneration mechanism of each contract. Contractors who have not adequately protected themselves contractually may suffer the consequences of adverse weather through a reduction in their profit margin or, worse still, through the payment of liquidated damages and/or

increased labor and other costs arising from the disruption to the works. Project finance lenders will also require a higher level of contingency funding and sponsor support in projects where their technical advisors assess a higher adverse weather risk.

No single standard form construction contract exists for the offshore wind sector. To date, BIMCO, LOGIC and FIDIC construction contract forms have proved popular in the European offshore wind market.

Under the BIMCO Supplytime 2005 form, payment for vessel hire continues irrespective of delays or stoppages caused by adverse weather conditions. However, if weather conditions are unexpected and exceptionally bad, then a party may be able to claim relief under the *force majeure* provisions. Under the Supplytime form, neither party is liable for any loss, damage or delay if the party invoking *force majeure* is hindered from performing any of its obligations under the charter. However, the party relying on an event of *force majeure* is expected to make all reasonable efforts to minimize or avoid the effect of a *force majeure* event. Furthermore, a *force majeure* event may result in termination, if it prevents the performance of the charter for an extended period.

The FIDIC conditions of contract (the Red and Yellow Books) deal with adverse weather risk differently and allow the contractors an extension of time for completion of construction if they suffer a delay caused by "exceptionally adverse climatic conditions." However, the contractor has no entitlement to compensation for such conditions, and may even suffer the cost of any acceleration methods designed to mitigate the effects of such delay.

The FIDIC conditions do not define what weather events fall within "exceptionally adverse climatic conditions" nor is there a universally accepted definition of this term. When negotiating a contract based on the FIDIC conditions parties are therefore advised to define what constitutes adverse weather conditions as well as the location where the applicable weather measurements are to be taken.

One approach could be to compare actual weather conditions experienced during construction with historical weather data for the site in question. Whether or not this is feasible depends on the availability of historical data. Given that the first offshore wind project in Europe dates back to the early 1990s, the data available to permit a meaningful comparison of current and historical weather information are limited and may not be conclusive. For instance, metmasts, which are used to collect wind data, have only been installed in recent years, thereby limiting the empirical value of such data.

The FIDIC conditions also contain *force majeure* provisions, the definition of which includes natural catastrophes such as earthquakes, hurricanes, typhoons and volcanic activity. Although *force majeure* events do not affect the obligation to make payments to the contractor, the challenge lies in establishing that the adverse weather conditions being experienced are sufficiently serious to constitute natural catastrophes.

The LOGIC general conditions of contract 2003 also deal with adverse weather as part of the *force majeure* clause. However, in these conditions, *force majeure* only extends to physical disasters and excludes all other weather conditions regardless of severity. In contrast to the FIDIC conditions, the LOGIC form does not have a general extension of time clause. Instead, the contractor will be held responsible for the timely completion of all work done and will have to notify the company of any proposed or actual stoppages of work and any other matter likely to affect its completion. The LOGIC contract does favor the contractor in so far as it gives the contractor the unilateral right to suspend works "in

the event that suspension is necessary for the proper execution or safety of the work, or persons."

Unless work is suspended due to contractor default, the LOGIC contract stipulates that the contract shall be adjusted in accordance with the relevant provisions relating to remuneration. Parties will need to take this into consideration and allow for appropriate rates in the event of suspension due to weather-related conditions.

None of the three standard form construction contracts discussed above provides a satisfactory solution as to how to deal with the risk of delay and disruption caused by adverse weather. This means that parties who use these forms as the basis for their agreements will need to negotiate specific provisions to deal with adverse weather risk and with the impact that adverse weather may have on time and cost incurred during a project. These provisions will need to be tailored to the specific project and the parties may need to be quite creative to mitigate the potential impact of adverse weather to the project as a whole.

Before entering into negotiations, due diligence should be carried out as to the weather conditions at the relevant site so that the parties can negotiate an approach tailored to those conditions. This would facilitate a better understanding of the potential impact of adverse weather risk at the outset of the project and reduce the risk of significant schedule and/or cost adjustments during the execution of the contract.

An allowance for adverse weather conditions can be built into a construction schedule. However, calculating a realistic allowance can be extremely challenging. Weather data may provide predictions of likely conditions over the course of a fixed period of time. However, each operation may require specific windows of "good" weather, such as, for example, a specified number of hours to relocate from one location to another, or to install one or more blades on a turbine. At times or locations where weather is particularly changeable, such weather windows may take substantially longer to appear than can be deduced from the mean weather readings.

The potential margins of error in building contingency into a project schedule are huge. Where there are multiple vessels working on an integrated schedule, errors in these calculations are likely to prove costly. Where a contractor contracts on the basis of a lump-sum, fixed schedule contract, it would be prudent to include significant contingency in terms of time and cost to reflect this risk. However, this means that if the weather is favorable, the contractor may receive a considerable windfall and the employer may face substantial wasted costs in terms of the rest of the spread. Employers, therefore, may attempt to carve out adverse weather in general, or some excess of adverse weather, from the lump-sum contract price and include it as a reimbursable element. This enables the project schedule to be calculated against the most realistic projected weather patterns, thereby minimizing the risk of wasted spread costs where the weather follows the projections. However, this will not cut out all of the fat, the employer will still need to ensure the availability of the spread in case the projections are wrong.

Another consideration is how adverse weather delay should be reflected in the remuneration of a contractor, in particular, in cases where the contractor does not assume the weather risk. This issue is straightforward in the case of day-rate contracts, such as the Supplytime, where each day of adverse weather is compensated at the day rate (or perhaps a reduced rate), as a further day of hire. For lump sum contract where instalments of a lump sum are paid against specified milestones, the picture is more complicated. In such cases, the contractor may risk liquidity issues where completion of the relevant milestones is delayed due to adverse weather. It is possible to solve this issue by including an "adverse weather day" payment milestone. Another

way might be to maintain a minimum monthly payment under the contract in addition to the milestone payments. In the former case, if the period of adverse weather exceeds the stipulated allowance, the contractor will be reimbursed on the basis of the additional "adverse weather day" milestone.

Contractors will need to be careful to observe any notice or other formal requirements relating to claiming an extension of time due to adverse weather. Daily weather logs should be kept as well as records of the work, which has been affected by weather, the nature and cost of the delay and the steps taken to minimize such delay. These records should be as detailed as possible so as to ensure there is sufficient evidence of the severity of the weather conditions.

Developing a market standard approach to the issue of adverse weather risk in the construction of offshore wind projects should be a priority for the offshore wind sector. However, it is likely that some degree of tailoring would remain necessary to reflect the peculiarities of the individual projects. Nevertheless, all parties would benefit from the reduced negotiation time and increased certainty that this would bring, not least given the complexity of multi-contracting structures for offshore wind projects. However, no amount of clever contractual drafting will eliminate the dramatic impact that adverse weather can have on the timely and on-budget completion of offshore wind projects.

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14.3 Risk management in the standard forms of contract

Associations of professional organizations have created standardized sample forms of contract in order to ensure well-balanced and fair contractual relationships. This form of unification reflects the preferred tendering method based on comparisons of individual contractors' bids to employer unified requirements. A side effect of this is that the provisions of such sample forms of construction contracts concerning risk and insurance are becoming increasingly complex.

The British tradition has had the biggest influence on such sample conditions of international construction contracts. Based on Anglo-Saxon principles, the purpose of the contract is not only to define the scope of work, price and time for completion, but also to allocate the risks the project is exposed to and to establish the way the risks will be treated and managed. The need to insure various aspects of a construction project is tied to the above trend and to the use of the standard forms of contract.

Within most sample conditions of contract, certain risks are usually allocated to one of the parties and the remaining risks belong to the other party. The risks are normally allocated to the party most capable of managing them efficiently. Some of the risks are non-insurable and must be allocated to one of the parties, based on a prevailing benefit from participation in the project.

With the risks identified, they should then be allocated to the individual construction project participants. This allocation should be based on sound evaluation

of the participants' interactions and the risks themselves. The most fitting method may be allocation based on the mentioned ability to manage and control an adverse situation and its consequences. However, this may not always work in practice. For example, one of the parties may be optimally equipped to carry out a particular task but may not be prepared to accept a particular risk.

Should there be no risk allocation (or if the allocation is incorrect) and adverse events arise causing loss and damage, disputes are sure to occur. The risks should, therefore, be conveniently allocated to the party, which has the expertise to control them or to reduce the probability of their occurrence or to mitigate adverse implications of such an event.

If a risk is allocated to one of the parties, this party shall bear the adverse consequences of the respective realized risk. Such party, however, may assign these risks to the other party by means of an *indemnity provision*. This other party must then fully trust the indemnified party or stipulate the conditions and requirements the indemnified party must observe.

Take, for example, *construction all-risk insurance* where the insured party (contractor): (1) assigns the adverse liability implications to the insurer (insurance company), which then (2) stipulates the conditions and requirements for the contractor, concerning diligent work practices and mitigation of the potential occurrences and consequences of an adverse event (risk management requirements).

Poor risk management will result in bad risk allocation, damage, losses, and disputes. Whenever a proper risk allocation is sought, the allocation must be reasonable, fair (balanced), and efficient. In practice, there is rarely any consensus on what is "reasonable and fair." Further criteria should therefore be specified to ensure optimum risk allocation so that best value for invested money can be found.

The following questions need to be raised (Bunni, 2011):

- Which of the parties can best control the events leading to a risk occurrence?
- Which of the parties can best control a risk once it appears?
- What if the employer wants to get engaged in risk control?
- Which of the parties is prepared to bear a risk beyond their control?
- Is the payment for risk transfer reasonable and acceptable?
- Is the party bearing the risk able to bear the consequences of risk realization?
- Can a particular risk transfer from the employer (to another party) lead to a potential transfer of another risk back to the employer (from another party)?

Answers to the above questions will help formulate unambiguous and realistic conditions. These requirements will also assist the contractor to transparently evaluate the bid.

To determine which party ought to bear a particular risk, these further summarized sets of criteria are available (Bunni, 2011):

- Is the party able to control the risk?
- Is a party able to transfer the risk and have the related transfer costs refunded by the other party? (Such an approach is economical and most advantageous to keep the given risk under control).
- Which party has the highest economical benefit from particular risk acceptance?

- Is risk allocation to a particular party beneficial for the construction industry's long-term prosperity?

As such, there are in fact three risk allocation scenarios:

- All the risks to be borne by one of the parties.
- Risk allocation is well balanced.
- Risk allocation is based on specific criteria to be efficient.

The specific criteria of efficient risk allocation are as follows:

- the ability to control a realized risk (to avoid its realization, reduce the probability of its occurrence, and to mitigate its consequences);
- the ability to perform a particular activity the risk relates to;
- inability to accept a risk.

14.4 Hazards and risks in construction projects

A construction project is exposed to a large number of hazards and respective risks (Bunni, 2011), related to:

- The time necessary for planning, site inspection, design, and construction. Completion of projects often extends across a long time horizon and some phenomena and related hazards can occur repeatedly or on a regular basis within a single project. There are also climatic conditions to contend with such as severe winters, monsoons, and so on.
- The number of people who participate in the project, that is, those who initiate, prepare, finance, design, provide the supplies of materials and plants, construct, supervise, administer, operate, secure, and repair can be enormous. These people usually come from various social classes and from many different countries and cultures in cases of international projects.
- Numerous engineering works are executed in isolated locations with complicated surfaces, often extending across large areas and being exposed to natural hazards with an unforeseeable intensity and frequency.
- New materials and products—not yet proved over time—might be used. Advanced technologies also tend to appear which are necessary for some projects.
- An extensive interaction involving large numbers of companies and individuals with different goals and commitments.

Due to the above, risk management (including insurance risk management) is of great importance in construction projects. The importance of risk management increases two-fold when dealing with large construction projects. Individual risks multiply with the growing size of a project and, frequently, new significant risks appear.

Risks include but are not limited to (Bunni, 2011):

- Lack of experience by construction project participants as a result of a limited number of large projects realized. Moreover, it is complicated to gain and transfer experience and information because the parties may be against

its publication. For example, litigation often takes the form of confidential arbitration as do alternative dispute resolution methods. Insurance and reinsurance companies are not actively communicating or willing to communicate information and experience.

- More institutions will often take part in financing due to the need for extensive funding. It is sometimes impossible to employ private resources as they may be unavailable or insufficient and public resources must therefore be used. Incorporation of public financing will, however, bring additional new risks.
- The impact of even one unsuccessful, large construction project on the contractor's financial position may be devastating. There may also be adverse consequences for other participants and the project as a whole.
- Time for completion of a large project may take several years. Thus, risk occurrence is more likely. Shortening of this time will then bring other, new risks. Once complete, the entire project may become redundant and inefficient due to the availability of new technologies and user requirements.
- A number of specialists are often involved in a large construction project. Their efforts are difficult to unify but they must cooperate on matters such as planning, preparations, engineering, execution, financing, operation, maintenance, securing insurance, and so on.
- Managers must be willing to give their time, sacrifice privacy/personal life, and dedicate a significant part of their career to a single, particular project.
- Projects frequently take place in complicated geological and climatic conditions and can extend across vast areas of land.
- Complicated delivery methods are used to execute projects involving a number of contractors, subcontractors, service and material providers, their subcontractors, and so on.
- New technologies appear. These may have to be implemented in practice by thousands of people with inadequate experience in these new technologies.

Individual hazards then give rise to risks that can be divided into the following categories of hazards and risks (see Bunni (2011) as an excellent source of details in this regard).

14.4.1 Project preparation risks

- Employer's selection of the contract administrator and consultants.
- Employer's requirements for the contract administrator and consultants.
- Selection of the site.
- Adequacy of site surveys and inspections (including underground sections).
- Adequacy of financial funds and accuracy of necessary cost estimations.

14.4.2 Design risks

- Improperly selected design documentation in respect of its intended users and society.
- Negligence.
- Technical standards.
- Lack of knowledge, lack of supervision, and hasty work.
- Lack of communication.

- Inability to foresee problems.
- Use of unproven technologies.
- Improper use of, and reliance on, software, automatic processes, and mechanical and electronic equipment.
- Lack of safety measures.
- Selection of contractor and subcontractor.

14.4.3 Site risks

- Excessive rain.
- Floods and inundations.
- Winds and storms.
- Hurricanes and tornados.
- Subsidence, landslides, rockslides, and avalanches.
- Extreme temperatures.
- Cyclones.
- Earthquakes.
- Political, economic, legislative, tax, transport, and other risks in connection with the country where project execution takes place.
- *Force majeure*.
- Adverse sub-surface and geological conditions.
- Anthropogenic underground obstacles (power and service utility lines).
- Lack of project acceptance by local population and neighbors.

14.4.4 Execution risks of a technical nature

- Extended duration of the project.
- Technical complexity and innovation in design requiring new methods of construction and/or erection.
- Removal of temporary structures.
- Defective temporary structures and their poor design.
- Dangerous substances and materials.
- Defective design.
- Defective workmanship and materials.
- Lack of supervision.
- Failures and collapse of mechanical and electrical systems.
- Inadequate site management.
- Ground movement.
- Explosions and fire.
- Vibrations and oscillations.
- Corrosion.
- Collapse.
- Collapse of a temporary structure.

14.4.5 Execution risks of an anthropogenic nature

- Human failure.
- Negligence.

- Fraud and other criminal acts.
- Programming of work.
- Lack of communication.
- Failure to ensure compatibility with insurance conditions.
- Riot and commotion.
- Strikes.
- Incompetence.
- Malicious acts.
- Inefficiency and delays.
- Insufficient site supervision.
- Variations in technical specifications.
- Dispute resolution risks.

14.4.6 Post-construction risks

- Security/safety.
- Serviceability.
- Material fatigue.
- Fire and arson.
- *Force majeure*.
- Natural hazards including inefficient remedies.
- Human errors and anthropogenic risks (including vandalism).
- Risk in connection with making the work fit for intended purpose.
- Project operation risks.
- Wear and tear risks.

The difficulties connected to construction risk quantification by Dejan Makovšek (France)

Every day we make decisions based on imperfect information. We make bets. Our bets are based on past experiences and our behavioral traits. For example, we choose our daily train to work not based on the time table only but based on our experience how late that train on average is. We build our train delay contingency on past experience. If we travel somewhere else, where we have no way of knowing how late the train can be our contingency will be higher. The more information we have, the more accurate our "risk pricing."

An abundant volume of empirical literature on risk pricing exists in finance, where it is possible to study vast sets of data on the performance of past investment decisions. The more information investors have the more accurate their risk pricing, resulting in a lower cost of financing they provide assuming there is competition.

The principles of risk pricing are generic, that is, relevant for every domain, where decisions need to be made based on imperfect information and that includes construction. A particularly challenging field is the construction risk involved in the delivery of major schemes—for example roads, bridges, tunnels, dams, and so on.

For the construction company the relevant measure of risk exposure is a risk contingency, an amount added to a central estimate of cost to cover future cost overruns that are

realized. A range of techniques for quantifying construction risk have been propounded in academic construction literature, including deterministic methods, probabilistic methods, and fuzzy-logic (Baccarini, 2006). There is, however, inherent complexity and a lack of historical information that restrain construction companies from applying these methods to major infrastructure construction projects. Accordingly, construction risk (and the resulting contingency amount) is normally estimated subjectively through risk workshops: that is, experts scrutinize the design and assign probabilities and impacts of various events (Infrastructure Risk Group, 2013). Though such exercises are invaluable in terms of due diligence, there is no empirical research available on their ex post accuracy, making it difficult to form a view on the accuracy of contractors' perceptions of risk.

In the introduction above we illustrated the importance of information about risk to risk pricing. Very few examples exist how additional available information can affect construction risk pricing (e.g., De Silva et al., 2008) in for example traditional highway procurement. Oklahoma's Department of Transportation changed its procurement policy to publicize the state's internal cost estimates during tendering. After this information was released, winning bids were reduced by an average of 11% for more risky and complex projects (e.g., a bridge construction), but were unaffected for low-risk projects (e.g., asphalt pouring). The authors applied a difference-in-difference approach, observing thousands of bids over multiple years. In summary, the particular market was competitive, but the availability of the state's estimates still improved bidders' willingness to reduce their contingencies.

What should matter aside from competition for the contract and information about risk is also the power of the construction contract. Low-powered contracts transfer less risk to the contractors (e.g., DBB/Red Book FIDIC), whereas high-powered contracts transfer most of the construction risk at a fixed end cost and also involve high penalties for delays (e.g., Silver Book FIDIC). The latter are typically used in PPPs, where the lenders in the project company prefer to be as insulated as possible from construction risk. Sparse existing evidence below does indicate contract power matters.

In traditionally procured road projects (=low powered contracts) the state absorbs significant cost overruns. These cost overruns (measured against the detailed design or contract value) reach, on average, 9% at most over large samples in different studies.

If we were to use a higher powered contract it is not the 9% of cost variability above that would be transferred to the construction contractor. Whether the project is delivered using traditional procurement or a PPP, the primary cause of cost overruns is scope creep, at least in the case of transport infrastructure (Makovšek, 2013). Under the terms of either contract, it is the responsibility of the procuring authority to define what it wants to build. Thus, in either case, the cost overrun is not necessarily a risk to the construction company or the project company, as the additional cost can be passed back to the procuring authority. To the extent that much of the 9% mentioned above would reflect the responsibility of the procurement authority in defining the scope, the actual risk to be managed in a PPP would be smaller.

Using a high-powered contract to deliver infrastructure greatly reduces end cost variability. In the single available study of construction contract performance for 75 major PPP projects the median and average cost overruns were zero and 2.3%, respectively (Blanc-Brude & Makovšek, 2013). Construction risk in infrastructure project finance (EDHEC-Risk Institute Working Paper, EDHEC Business School). This result was indifferent to the sector (not only roads were in the sample) and geography (project location).

Table 14.1 Presents a summary of existing studies of construction cost overruns in traditional procurement.

Source	Reference estimate	Project type	Time period	Observ.	Average Cost overrun (%)	Area
Cantarelli et al., 2012b; Flyvbjerg et al., 2003	Decision to build	Roads	1927–2009	278	21.2	NW Europe
		Bridges, tunnels		39	25.3	
Cantarelli et al., 2012a	Decision to build	Roads	1980–2009	37	18.9	Netherlands
		Bridges, tunnels		15	21.7	
Makovšek et al., 2012	Decision to build	Roads	1995–2007	36	19.19	Slovenia
Lundberg et al., 2011	Decision to build	Roads	1997–2009	102	21.2	Sweden
Lee et al., 2008	Decision to build	Roads	1985–2005	138	11.0	South Korea
Ellis et al., 2007	Detailed design	Roads & bridges	1998–2006	1847	−13.40	USA
Odeck, 2004	Detailed design	Roads	1992–1995	620	7.88	Norway
Cantarelli et al., 2012c	Detailed design	Roads	1980–2009	23	−2.9	Netherlands
Ellis et al., 2007	Contract value	Roads & bridges	1998–2006	1908	9.36	USA
Bordat et al., 2004	Contract value	Roads	1996–2001	599	5.6	USA
Hintze and Selstead, 1991	Contract value	Roads	1985–1989	110	9.2	USA

Despite the relatively small amount of risk transferred to PPPs, there is clear evidence that the cost of infrastructure is higher when built via a PPP than when it is built traditionally via the state. Blanc-Brude, Goldsmith, and Välilä (2009) observed ex ante construction cost (contract prices) in 162 traditionally procured and 65 PPP road projects in western Europe: PPPs were found to be 24% more costly on average than the equivalent traditionally procured projects. Daito and Gifford (2014) found an even greater cost premium of 64% for PPP over traditionally procured road projects. Due to the limited PPP experience in the United States and data issue encountered this study is less robust but nevertheless points in the same direction.

Since the Blanc-Brude, Goldsmith, and Välilä (2009) study used ex-ante cost (at contract close) we could correct these by adding average cost overruns for traditional procurement (i.e., 9%) and PPPs (2%), which would make the PPP 17% more expensive than traditional procurement. While such a correction is speculative (as the averages have been derived from different samples) and the exact percentage can be argued about it is nevertheless clear that already the ex-ante difference is of an order of magnitude.

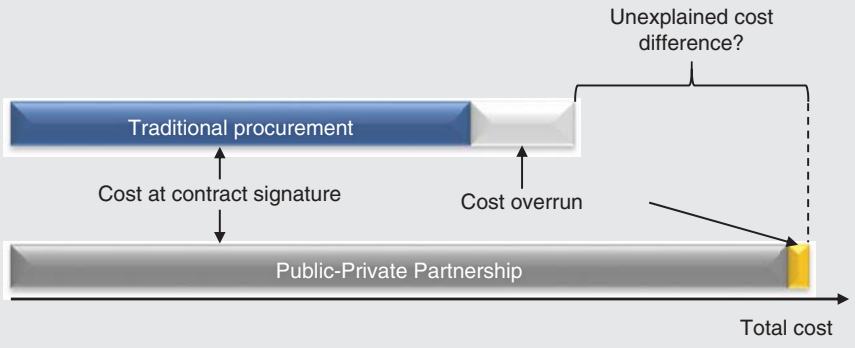

Figure 14.1 conceptually illustrates construction cost at contract signature and cost overrun for traditional procurement compared to PPP.

Taken together, these strands of evidence suggest that the cost to governments of transferring risk to the private party in a PPP is significantly above the efficient price (i.e., the unexplained cost difference in Figure 14.1).

Two further arguments may compound this finding. First, lenders and investors may avoid the riskiest of projects, suggesting the portfolio of projects delivered as PPPs is actually lower risk than the traditionally procured one. Second, traditional procurement mainly relies on lower powered contracts, which provide fewer incentives to efficiently manage risk, whereas the PPP model relies on fixed-price turnkey contracts. Effectively better management of risks is expected, which reduces their impact and/or probability. Interestingly, practitioners report that the use of a lump-sum turn-key construction contract generally involves a premium of 20% against a less-restrictive contract types, such as DBB, regardless of whether it is part of a PPP or not (Yescombe, 2014).

An argument against the conclusion that these outcomes are a source of inefficient risk pricing or extraordinary profits in PPP projects is that higher quality infrastructure is built to optimize the LCC of infrastructure management (Soliño and Gago de Santos, 2010).

This should be true for capital-intensive PPPs in any sector. There is, however, little evidence that this is the case or that in all traditionally procured projects the opposite is true. On a declarative level, there is a widespread embrace of LCC optimization principles in PPPs in the UK, but there are practical obstacles to its execution (Meng and Harshaw 2013).

There is evidence to support this proposition. An available study on social infrastructure by NAO (NAO, 2007)—a construction review of PPP hospitals in the UK—found that these were not built to a higher standard of quality than traditionally procured hospitals. A report by the Bundesrechnungshof (German Court of Audit, 2014) in review of seven German PPP motorways comes to the same conclusion, albeit in the context of investigating innovation. PPP motorways were built to the same standard as traditionally procured ones.

The German example cited two reasons: first, even though contracts were output-based, building to a different standard is difficult due to strict technical rules and regulations. Second, as lenders are risk averse, they may prefer tried and tested methods rather than experimentation.

In summary, there is reason to suspect that high-powered contracts are disproportionately more expensive than low-powered ones. If that is the case there are major questions that need

answering. How much risk should we transfer for what type of product? What can the procuring side do to better inform the bidders so as to improve the competition for the contract outcomes?

The overview above suggests that there is much to learn about how different construction contracts perform and how the broader settings (product complexity, competition and so on) affect their outcome. In fact it is surprising how little we do know given that the practice and common sense recommendations captured in the rest of this book have been evolving for decades.

The immediate reason for this is clearly that the researchers do not have sufficient data to investigate this area in greater detail.

Contract outcomes are in many cases market sensitive and private information. Some would call this a market failure, but it should come as no surprise that contractors do not share such information between themselves or with others.

On the other hand, governments spend billions of different currencies around the world on procuring major assets from construction contractors. Not having a good understanding how the contracts that they use work could mean they spend many more billions than they should. Hence, it is the governments that should have the foremost interest to collect and enable access to data on contract characteristics and historical performance.

The first step toward more data and progress though is to make them aware, where is there room for improvement. This text is a contribution in that direction and is based on the previous work of Makovsek and Moszoro also published in *Transport Reviews*.

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14.5 Insurance requirements in standard forms of contract

14.5.1 Insurance requirements in FIDIC forms

The conditions of contract of the *Fédération Internationale des Ingénieurs Conseils* (FIDIC; International Federation of Consulting Engineers) are the most widely used sample conditions of contract in international construction projects. These sample forms are now perceived as international best practice documents and their popularity is ever growing. This is thanks to international employers and lenders wanting reliable and proven "rules of game" for their construction projects. Three basic forms (1999 version) are now most frequently used for delivery of construction works (including the design and plant). In particular:

- Conditions of Contract for Construction (CONS/1999 Red Book);
- Conditions of Contract for Plant and Design-Build (P&DB/1999 Yellow Book);
- Conditions of Contract for EPC/Turnkey Projects (EPC/1999 Silver Book).

As foreseen by FIDIC, there is risk inherent in every construction project. Therefore, the risk should be insured to the greatest extent possible.

In the case of CONS, they follow similar general insurance conditions as applicable to P&DB and EPC. With P&DB and EPC (and/or CONS), the employer or the governing law will often require that the contractors themselves or their subcontractors have professional liability insurance cover as a precondition to the contractor designing a part of the work. These requirements should be described in the tender documentation for the contract. The scope of the contractor's compulsory insurance will cover the design risks where P&DB and EPC are to be used. As already mentioned, the 1999 wording was changed in the 2017 FIDIC second edition. Clauses 17 to 19 were subject to complete revision. These parts were returning back to the basic principles regarding these areas, as they were included in the 1977 FIDIC Red Book.

14.5.2 Design risk and insurance

Liability and insurance problems that relate to designer responsibilities and defective design appear worldwide. It is widely assumed that if a product or material is selected as built in, then the party responsible for its selection is, to an extent, protected by the manufacturer's warranty or insurance. Concerning design documentation, the designer will not provide such a warranty and the designer's professional liability insurance is not based on the fitness-for-purpose liability principle. Even when not covered by any designer warranty or by indemnification promise given by an insurance company *per se*, the contractors are responsible for such defects where the preparation of the design is one of their contractual obligations.

Designers, in general, lack the resources to be able to underwrite the risks a design error may cause to a large construction project, to other participants and to society at large. Professional liability insurance providers will then refuse to insure the designer's fitness-for-purpose liability, arguing non-insurability on the basis that

they go against insurance principles. The contractors will then, naturally, argue that their liability should only be of the due-skill-and-care type. Actual contractor and designer liabilities will then depend on a particular contract and governing law.

FIDIC DBO Sub-Clause 17.9 reads that:

> The contractor shall also indemnify the employer against all errors in the contractor's design of the works and other professional services which result in the works not being fit for purpose or result in any loss and/or damage for the employer.

14.5.3 General insurance requirements

General requirements for insurance are defined in Clause 18 of the above forms. At Clause 18, "insuring party" means, for each type of insurance, the party responsible for effecting and maintaining the insurance specified in the relevant sub-clause. Sub-Clause 18.1 reads that whenever the contractor is the insuring party, each insurance policy shall be effected with insurers on terms approved by the employer.

Furthermore, whenever the employer is the insuring party, each insurance policy shall be entered into with insurers on terms consistent with the details as stated in the particular conditions.

14.5.4 Insurance for works and contractor's equipment

As required by FIDIC forms, the insuring party shall insure the works, plant, materials, and contractor's documents for not less than the full replacement cost (including costs of demolition), removal of debris, professional fees, and lost profit. The insuring party shall maintain this insurance until the date of the taking over certificate. This insurance is to be effected and maintained by the contractor as an insuring party.

14.5.5 Insurance against injury of persons and damage to property

Concerning the definition of "insurance against injury of persons and damage to property":

> The insuring party shall insure against each party's liability for any loss, damage, death or bodily injury which may occur to any physical property (except things insured under Sub-Clause 18.2 [Insurance for Works and Contractor's Equipment]) or to any person (except persons insured under Sub-Clause 18.4 [Insurance for Contractor's Personnel]), which may arise out of the contractor's performance of the contract and occurring before the issue of the performance certificate.

This insurance can have a minimum guaranteed amount per occurrence with no limit on the number of occurrences.

The insurance shall also be effected and maintained by the contractor as the insuring party. Even here, however, an optional liability limit may sometimes be determined.

14.5.6 Insurance for contractor's personnel

Under Sub-Clause 18.4:

> The contractor shall effect and maintain insurance against liability for claims, damages, losses and expenses (including legal fees and expenses) arising from injury, sickness, disease or death of any person employed by the contractor or any other of the contractor's personnel.

The employer and the engineer shall also be indemnified under the policy of insurance, except that this insurance may exclude losses and claims to the extent that they arise from any act or neglect of the employer or of the employer's personnel.

As such, the FIDIC forms require the contracting parties to have three insurance policies:

- *Property insurance* to cover damage to works and on-site property, being realized in practice as the contractor's construction all risk insurance (CAR).
- *Liability insurance* that protects the employer and the contractor against statutory liability for injury, disease and death of contractor personnel occurring in the scope of their performance in a construction project. This insurance is executed via *employer's liability insurance*.
- *Liability insurance* that protects the employer and the contractor against statutory liability for injuries, disease and death of third parties and against damage to third party property in connection with the contractor's activities in a construction project. This insurance is executed via *public liability insurance*.

Such insurances are negotiated on a project-by-project or yearly basis in cases of projects with long time horizons for completion. Coverage can be broken down into three individual insurance contracts or take the form of one composite contract.

Professional indemnity insurance under the FIDIC yellow book by Richard Krammer (Austria)

Although under the Yellow Book (or P&DB) conditions of contract risks associated with design are predominantly to be borne by the contractor, the requirements regarding insurance are very much like the Red Book. The differences relate to the necessity of insurance cover to explicitly also having to comprise damage caused by the contractor during tests after completion (Clause 18.2 with reference to Clause 12). The insurance requirements fall in the following categories:

- 18.1 General Requirements for Insurance
- 18.2 Insurance for Work and Contractor's Equipment
- 18.3 Insurance against Injury to Persons and Damage to Property
- 18.4 Insurance for Contractors Personnel

The fact that substantial design risks are transferred between the parties compared to the CONS edition is not immediately reflected in the general contract conditions dealing with insurance. This may surprise since design is generally acknowledged as being a possibly very complex part of every project with far reaching consequences while representing a comparably low share of the total expenditure.

In a regular design-bid-build setup, the owner would contract with separate entities for the design and construction of a project. As such, the contractor could claim or counter a claim by the owner with the argument that the design was insufficient and he still did not violate a duty to warn. Under a design-build system as the Yellow Book, a more comprehensive set of works and services are contracted from a single entity whereby a reduction of risk for the project owner is achieved. Typical examples of categories of claims under this type of contract hence comprise clarification of the brief, responsibility for estimates, knowledge of current standards and codes, specification of materials, duty to warn of further investigations (e.g., regarding ground conditions), and inspection/supervision of the works.

The only reason given in the FIDIC Contracts Guide for a requirement for professional indemnity insurance not already being dealt with under Clause 18 Insurances is that the employer should consider whether he requires this insurance, in consideration of the solvency and apparent ability of the contractor to bear losses and liabilities himself. After all, insurance fulfills several functions, a very important one being relief of own risk capital and procurement of external capital in the case of damage. For an insured, this may mean the difference between economic survival and insolvency. For a principal it means achieving increased stability and security. If the risk is deemed to be low or the financial standing of a company deemed adequate to meet all conceivable future obligations, omitting the insurance may be an option. The question may of course be raised why the current form of contract permits this flexibility for design related insurances while following a stricter regime for the general third party liability insurance (Clause 18.3), damage to the works (Clause 18.4) and even risks, which, generally speaking, can have less detrimental effect on the successful completion of a project, such as the insurance of the contractor's equipment.

However, there is an example for an additional sub-clause titled "Insurance for Design" in the Guidance for the Preparation of Particular Conditions (GPPC). The intention is to give the employer additional protection:

"The Contractor shall effect professional indemnity insurance, which shall cover the risk of professional negligence in the design of the Works. This insurance shall be for a limit of not less than […]. The Contractor shall use his best endeavors to maintain the professional indemnity insurance in full force and effect until […]. The Contractor undertakes to notify the Employer promptly of any difficulty in extending, renewing or reinstating this insurance."

Given current market conditions and the fact that a new edition of FIDIC forms was published with changed insurance clauses it is to be expected that this will have an influence on the topic of professional indemnity insurance.

New conditions of contract for plant and design-build

Current new edition foresee as fundamental change especially in respect of design insurance, effectively underlining the relevance of the topic that, for many practitioners, has been obvious from a claims side for some time.

The most recent 2017 version available is already different in terms of structure when it regulates under Clause 19. Insurances along the following headlines:

19.1 General Requirements
19.2 Insurance to be provided by the Contractor
19.2.1 The Works
19.2.2 Goods
19.2.3 Liability for breach of professional duty
19.2.4 Injury to persons and damage to property
19.2.5 Injury to employees
19.2.6 Other insurances required by Law and local practice

It is notable that actually all insurances are to be concluded by the contractor. This makes redrafting necessary should a principal decide to procure some insurances (such as insurance for the works and an excess third-party liability insurance) himself and leave other requirements or also some freedom to the contractor. Additional control can always be added by loss payee provisions or contractual regulations detailing the process for claims collection in excess of attritional losses.

An eminent change with respect to insurances is to be seen under the heading of "Liability for breach of professional duty" under Sub-Clause 19.2.3. The contractor would now by standard be required to insure for this risk. It is actually not foreseen that this insurance is contingent on an amount to be set forth in the schedule but if there is no amount agreed on in the contract data (a part of the particular conditions) it shall still be procured, albeit with a limit agreed with the employer. Though there is no explicit mention within the paragraph of how to proceed of no agreement with the employer can be reached the change in significance with regard to this topic is quite palpable.

A considerable debate has evolved around the new Sub-Clause 14 dealing with the indemnities and limitations on liability. It maintains that "The Contractor shall also indemnify and hold harmless the Employer against all acts, errors or omissions by the Contractor in carrying out the Contractor's design obligations that result in the Works (or Section or Part or major item of Plant, if any), when completed, not being fit for the purpose(s) for which they are intended under Sub-Clause 4.1 (Contractor's general obligations)." However, the Sub-Clause 1.15 (Limitation of liability) limits liability in terms of loss of use of any Works, loss of profit, loss of any contract of for any indirect or consequential loss or damage to the sum stated in the Contract Data or (if a sum is not so stated) the Accepted Contract Amount.

It may well be that the new requirements—as suitable as they may be with respect to the underlying risk—push the envelope of what is achievable on the commercial insurance market for some buyers or in some regions. Since the FIDIC contract conditions are applied on an international level it is understandable that many local specifics cannot be foreseen. With respect to insurances discussions often revolved around the scope of insurances during the maintenance period (extended maintenance versus guarantee maintenance cover) and availability of sums insured in general third party liability (aggregated sums insured versus unlimited occurrences). The appropriate sum as a limitation of liability becomes a key aspect of a design-build contract under the FIDIC Forms.

The difficulty in drafting a standard which is internationally applicable and practicable is certainly to address the relevant topics such as risk allocation while providing for sufficient freedom, in order to be usable in various jurisdictions.

Users across the globe tried to adapt and merged the intentions of the contract conditions—which highlight the important aspects and provide a suggestion of how to draft them—with the preferences of the actual parties and commercial realities, such as availabilities of insurance covers.

The new 2017 edition in the Sub-Clause 19.2.3 imposes an insurance requirement for the mentioned Sub-Clause 17.4 design liability, which may exceed what is feasible on insurance markets. At the same time, it highlights one of the central aspects of design and build contracts in connection with insurance and as such also serves as a basis for discussion of what the risk is, which party bears it and whether it can effectively be transferred.

It could be maintained that the current wording will push the parties to analyse and negotiate the issue of design liability carefully. Almost coincidentally it seems that the new requirement is quiet on the number of occurrences to be insured which may be seen as beneficial for many global insurance markets, which want to calculate aggregate sums insured.

The quite extensive requirement on the fit for purpose aspect, however, is apt to be grounds for considerable future discussion evolving around the very term, its distinction to a mere guarantee and its insurability as will be laid out in greater detail below.

It is to be expected that the term "fit for purpose" will be scrutinized in much greater detail and on a comparative basis across jurisdictions or at least be critically discussed between the parties which in itself may be seen as progress.

Current requirements

Coming back to the 1999 edition, confusion sometimes arises as to why a professional indemnity insurance would make sense or be required in addition to the insurances already outlined in the standard wording.

The design risk itself can indeed be subject of the cover obtained under the Sub-Clause 18.2. Damage consequential upon faulty design, material or workmanship can be covered under readily available construction all-risk covers. Standard market clauses have been established which adjust the insurance ranging from outright exclusion over covering consequential damage to parts of the works free of any defect to clauses also covering the damaged defective part or item itself.

Relevant endorsements comprise particularly Munich Re Contractor's All Risk and Erection All Risk Endorsements 115 and 200 as well as the regime of London Engineering Group (LEG) under the 1996 and 2006 clauses as well as the design improvement exclusions (DE). There is a line of case law pertinent to this aspect of loss or damage under construction policies following from design errors (e.g., *Promet Engineering (Singapore)PTE Ltd v. Sturge & Others*; *Hutchins v. Royal Exchange*; *Pilkington v. CGU*; *Graham Evans & Co (Qld) Pty Ltd v. Vanguard*; *Walker Civil Engineering v. Sun Alliance*; *Seele Austria Gmbh & KG v. Tokio marine*; *CA Blackwell v. Gerling All gemeine Versicherungs AG*; *Cementation Piling v. Aegon*; *New South Wales v. AXA Insurance Australia Ltd (Australia)*; *Manufacturers' Mutual Insurance Ltd v. Queensland Government Railways (Australia)*; *Railway Co. v. Royal and Sun Alliance Insurance Co. of Canada*).

It should also be noted that the term design has been the subject of debate. Even under Red Book arrangements, execution designs will be the responsibilities of the contractor and project management itself is a form of professional service. As such, the following should not be read with a restriction in mind to the particular type of contract but always rather the risk of the underlying activity and its potential to cause unforeseen deviations from expected or desired results.

The relevant passage in this respect is found under Sub-Clause 18.2 (e) (i) where there is set forth that, unless stated otherwise in the particular conditions, loss of, damage to, and reinstatement of a part of the works, which is in a defective condition due to a defect in its design, materials, or workmanship may be excluded from the insurance cover. It shall, however, include any other parts, which are lost or damaged as a direct result of this defective condition.

The important aspect here is that the insurance cover in question will always only relate to property damage to the works. There is a substantial body of literature and also rulings to the question of when a property damage is established in distinction to a mere defect, which shall not be the subject of the insurance regularly understood under Sub-Clause 18.2. Moreover, the design cover under contractors all risk insurances varies over the life cycle, quite often in a very reduced manner in the phase following practical completion. It is in this phase where the difference between the so called extended maintenance cover (generally excluding damage consequential upon design) and guarantee maintenance cover (including the same) becomes relevant and obvious.

It is the additional costs and expenses a claimant incurs due to a design error as opposed to only the damage to already executed works, which is the main scope of application of a professional indemnity insurance for design.

The second area of discussion, is whether a third-party liability insurance is actually the right product. After all, the Yellow Book is a contract for design and construction. The very fact that both activities are bundled in one legal entity makes it difficult to imagine how there could be a legal liability claim before works have actually been handed over.

After completion of the works the employer will have his rights under the maintenance provision and will not revert to claiming under legal liability regimes without reason. In addition, it is a basic principle in third-party liability insurance in that the insurer tries to avoid stepping in in lieu of the contractor and fulfill the contract in his stead.

So, in this case it may be the same legal entity finding itself having made and error in design and being the contractor and therefore not be insured under regular insurance solutions. Were the design part subcontracted to another company, legal liability between two legal entities could be established and the essentially same risk be insurable on conventional markets. The reluctance of insurance carriers to write this risk emanates from a certain moral hazard on the side of the insured and difficulties in assessing organizational responsibilities and conflicts of interest.

This goes in hand with something not uncommonly observed: checking the existence of insurance on the basis of just a headline or designation instead of its contents. Concluding just any professional indemnity insurance often suffers the severe flaw that common wordings exclude claims if the insured also participates in the execution of the works. Design and construction policies feature additional covers effectively providing insurance coverage just as laid out above, when design and execution are the responsibility of the same legal entity. The policy

wording is different in that it addresses defects caused by a design fault that can arise at any time following the commencement of the construction.

An important aspect is loss, cost, or expenses incurred prior to final contract completion to mitigate a loss or potential loss. Essentially, this extends the cover into the period of execution of the works. Quite often it is already during the execution of the works that the design error is encountered and when insurance coverage is needed, when there could impossibly already be an employer claiming.

Fitness for purpose

Finally, a central point of discussion evolves around reasonable skill and care versus fitness for purpose.

To some extent, the discussion on this topic may also have been shaped by the high relevance of the London insurance market in international construction insurance as well as the influence of UK law and jurisdiction in countries following common law. Under common law, the pre-eminent concept for establishing the grounds for liability for designers is the exercise of reasonable skill and care (exception for instance the Defective Premises Act 1972, which sets the requirement of the works having to be fit for habitation).

It is essential to see that for traditional general contracting (contractor executing a design provided by the principal) does not automatically imply a requirement for the works to be suitable for some purpose. Specifically, for a construction contractor, under the Supply of Goods and Services Act 1982, there exists a requirement to use material fit for the purpose, but no such requirement actually exists for the finished works.

This changes in the case where a contractor designs and executes the works (Smith and Snipes: *Hall Farm Ltd v. River Douglas Catchment Board* [1949] 2 K.B. 500, 513; *Lynch v. Thorne* [1956] 1 W.L.R. 303, CA; *Greaves v. Baynham v. Baynham Meikle* [1975] 1 W.L.R. 1095, 1098, CA; National Coal Board *v.* Neill [1985] Q.B. 300, 317. *Independent Broadcasting Authority v. EMI Electronics Limited and BICC Construction Limited*; *Viking Grain Storage Limited v. T H White Installations Limited*). Here, implied terms or express warranties become pertinent.

The issue of design liability under a FIDIC form of contract may be more relevant than under other standardized forms of contract. The matter was to some extent defused when, for example, under Clause 2.17.1—JCT Design and Build Contract and Option X15 of NEC3—a liability regime is being imposed with reasonable skill and care.

Overall, it is important to assess the contract in its entirety as a more recent case (MT Højgaard A/S *v.* E.ON Climate & Renewables UK) shows, where the contractor had to design, construct, and install the foundations for sixty offshore wind turbines. The contract foresaw a requirement for exercising due care and diligence so that each item of plant and the works as a whole "shall be fit for its purpose as determined in accordance with the specification using good Industry practice"; and when completed comply with and "be wholly in accordance with this agreement and any performance specifications or requirements of the employer as set out in this agreement."

The employer's requirements set out a minimum design life of 20 years and demanded that "The design of the foundations shall ensure a lifetime of 20 years in every aspect without planned replacement."

The foundations were found to be defective and it turned out that the universally accepted industry standard applicable to the design of such foundations was incorrect. A dispute arose

around whether the contractor would, within its fitness for purpose obligation, be able to effectively discharge of its duties by adhering to the prevailing standard or not.

Under reference of two Canadian cases (*The Steel Company of Canada Ltd v. Willand Management Ltd* [1966] SCR 746 and *Greater Vancouver Water District v. North American Pipe and Steel Ltd* [2012] BCCA 337) it was found that "the existence of an express warranty of fitness for purpose by the contractor can trump the obligation to comply with the specification even though that specification may contain an error." As a consequence, it was established that the contractor had assumed full design responsibility and warranted a service life of 20 years, irrespective of its obligation to design in accordance with the standard.

In the United States, there appears to be a nationwide trend of states moving away from broad indemnity provisions from designers and architects. As a result of a 2010 California Court of Appeal ruling, a design professional who contracts to defend and indemnify its client for negligence is responsible for that defense, regardless of whether he or she is found liable for the underlying claims involving private contracts. Furthermore, a decision by the California Supreme Court in the *Crawford v. Weather Shield Manufacturing* has created problems for subcontractors, suppliers, consultants, or anyone else who assumes the obligation to defend an upstream party. A recent California Appellate Court decision in the *UDC v. CH2M Hill* case reinforced this decision, which leads to a situation in which a party has to indemnify another irrespective of any negligence.

Under the amended California Civil Code Section 2782.8, the professional's indemnity obligations will be enforceable only "to the extent that the claims against the indemnitee arise out of, pertain to, or relate to the negligence, recklessness or willful misconduct of the design professional." Moreover, the design professional's defense obligation may not exceed "the design professional's proportionate percentage of fault." An interesting aspect with this legislation is that it will not apply in cases where there is a project policy insuring all project participants on a primary basis, if the design professional is a party to a written design-build agreement or the contract is with a state agency. Design professionals will no longer have unlimited liability with respect to indemnity and the duty and cost to defend. Design professionals will not have to indemnify their clients for claims that are not tied to their negligence, recklessness, or misconduct. Although not immediately connected to the topic of fitness for purpose is shows that also here and also under the amended legislation, design-build contracts lead to particular challenges.

Despite this influence from common law it is of course imperative to also look at how the outlined requirements would be perceived in other jurisdictions. A general fitness for purpose requirement is by no means unknown and could, among others, be ascribed to Bulgaria, France, Greece, Luxembourg, and the Netherlands where an actual requirement of habitability, usability, or fitness may be applicable in addition to warranty periods stretching over several years.

Mandatory insurance covers within the European Union may be seen in Denmark, Finland, France, Italy, Spain, and Sweden while it is worth noting that corresponding insurance cover comprise structural defects and sometimes also major other defects such as water ingress. Mandatory latent defect covers may be further divided into property damage covers and liability covers with Denmark, Italy, and Sweden showing mandatory insurances responding in the

event of existing defects regardless liability of any party to construction operation. On the other hand, in Finland and Spain the mandatory cover is a liability cover, that is, it covers liability of the insured parties for construction defects. In France, there are actually two mandatory covers existing in parallel: property damage insurance covering latent construction defects regardless of liability (dommage ouvrage insurance) and decennial liability insurance. An overview that may be recommended in this context is the "Liability and insurance regimes in the construction sector" procured by the Elios project. The project has been realized by CEA (Centre d'Etudes d'Assurances) and CSTB (Centre Scientifique Technique de Bâtiment) at the request of the European Commission and studied the building insurance systems of the 27 EU member states. Its works can be found under www.elios-ec.eu.

Quite recently, the international commercial insurance market has picked up this topic and now more proactively offers stand-alone insurance products for latent defects in many territories worldwide. They are based on the concept of a property damage cover and as such are more readily usable across jurisdictions while insurance solutions tailored to a certain liability regime will be merely impossible to transfer abroad since the legal framework in the corresponding country will be missing.

Countries such as Germany know the term of "Beschaffenheitsvereinbarung," which translates as agreement on the legal and factual nature of an object and follows, contrary to the regime outlined for common law countries, which focuses on an activity driven aspect skill and care, on an actual success or result (Erfolgshaftung). The pertinent legal regulation found in § 633 Par 2 Sentence 1 of the BGB sets forth that the work rendered has to suffice the actually agreed requirements or, in absence of such, that it has to be usable according to general standards, which can be customarily be expected with regard to the nature of the work or service. It depends on the respective circumstances to differentiate between an actual guarantee and an agreement on the legal and factual nature. What they have in common is that they trigger a liability of the supplier to rectify the defect, which is not reflected under insurance covers. Only in case of negligence a claim in tort will be feasible and also be dealt with under a professional indemnity insurance.

Professional indemnity policies generally cover liability according to the requirement of reasonable skill and care, which is a negligence standard. Fitness for purpose is a more entailing concept by which the contractor essentially agrees to deliver so that the product will be suitable for the requirements communicated and will perform to the level required by the client. Fitness for purpose warranties may either be found expressly or implied, which sometimes makes it difficult to assess at first glance whether a fitness for purpose warranty exists.

From a risk and insurance perspective there are several possibilities to approach this.

The first is contractual risk management and the effort to reduce this exposure from the outset by trying to avoid express and implied warranties as far as legally permissible. The common law position regarding fitness for purpose can, and often is, modified by the terms of a contract. It could expressly be agreed that the contractor will only be expected to exercise the level of skill and care that would reasonably be expected from a separately engaged designer. Since this may not hold before court other, more intricate forms were conceived, all aiming at making it clear that the will of the parties is to establish a skill and care regime and to clarify to what extent the principal specifically relied on the contractor.

The second is the quite onerous fitness for purpose exclusion that will exclude liabilities incurred under fitness for purpose conditions that may lead to the undesirable situation of insurance cover also not being given if the insured has actually been negligent. A more reasonable approach may be seen in the exclusion of liabilities in excess of reasonable skill and care, which will still cover negligence, even though if it was incurred in connection with a fitness for purpose warranty.

The next wider coverage comprises the implied fitness for purpose coverage, which essentially relieves the insured of the uncertainty of implied warranties found later in a contract by court. If there is no express standard of care defined a fitness for purpose obligation could easily be construed. A case cited quite often is that of *Viking Grain Storage v. TH White Installations*. White had to design and construct a grain silo from materials that were of good quality and reasonably fit for purpose, that the completed works should be reasonably fit for their intended purpose. The defendant accepted that there was an obligation to use good-quality materials but disputed the requirement of fitness for purpose. The court held that this fitness for purpose obligation could be implied to apply with respect to the design of the works as well. The corresponding insurance coverage here would be available if a court decided that there is an implied fitness for purpose obligation in a contract, which was otherwise entered into in good faith.

The limited express fitness for purpose coverage goes still some further and will cover express fitness for purpose agreements. In exchange for that it will bring additional requirements such as a clear definition of the intended purpose of the works, since quite often it is tacitly assumed or implied purposes that as a gray zone pose substantial problems. In addition, a state of the art defense clause restricts the cover quite substantially. Essentially it states that a cover is limited to that which would have existed if the insurance contract had entitled it to defend the claim on the basis that the design was "in accordance with practice conventionally accepted as appropriate at the time having regard to the size, scope and complexity of the project." While understandable that the insurance cover would be even more far-reaching without this regulation, it should be understood that the rationale for this is to prevent having contractors speculate on untried materials or techniques at their insurer's risk.

Depending on the experience, track record of the insured as well as commercial factors there also is an extended fitness for purpose coverage available on insurance markets though availability is somewhat restricted due to the sensitive nature to larger portfolios or PPP projects.

Professional indemnity insurance may be concluded based on different triggers, meaning the definition of the insured event and its allocation within the insurance period. The concept most commonly used is the claims made policy, which sets the actual reception of a claim as relevant event. Another form is the occurrence or infringement policy, which focuses on the actual activity (the execution of the design) as relevant for the policy being applicable. Also mixtures of the two are widely used practice, where the design activities under a claims made policy may not lie longer in the past than a defined period. All this is important when understanding that design errors can take a long time to become fully obvious. Having the timing parameters set too tight may lead to a situation where there technically is a professional indemnity insurance in place, but insurance coverage is very limited or even negligible because of the time constraints.

As laid out above the design risk has relevance in connection with Sub-Clause 18.2 Insurance of the Work as well as in addition from a liability perspective. As such, those insurances should be dovetailed to the specific projects. Caution has to be exercised when works are to be built

for some defined purpose. Finally, under the envisaged new Yellow Book Contract conditions a clarification on limitation of liability should be openly discussed.

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Insurance in hydropower projects by Alex Blomfield (UK)

International hydropower construction contracts usually require one or both of the parties to take out at least the following three types of insurance:

1. property insurance, covering transport, and equipment while on site;
2. liability insurance, covering damage to third party's property, or death or injury caused by the insuring party; and
3. workmen's compensation and/or employer's liability insurance, at a level customary or statutorily required for the country of the project or in accordance with the employer's minimum requirements.

The conditions of contract (Clause 18 in a FIDIC contract) will specify general requirements for such insurances, and an insurance annex will specify more detail with respect to such requirements, including minimum ratings (e.g., Standard & Poors "A-") and insured parties, coverage/conditions, period, sum insured, and deductibles for each category of insurance. The insured parties will include the contractor, the employer, the engineer (if applicable) and subcontractors at any tier and, in a project-financed deal, the lenders. The cover shall apply separately to each insured as though a separate policy had been issued which, in relation to liability policies, shall include the ability to make cross-suites with no exclusions. The employer, together with its insurance adviser/broker, will initially decide the coverage and conditions, period of insurance, sum insured and deductibles for each insurance and assist in placing in the insurances. However, the lenders' insurance adviser will review all insurance requirements, in particular, the insurance requirements for the employer. As part of the dialogue on appropriate levels of insurance, the employer may also need to correct a common misconception in the construction industry that simply referring to a required quantum of insurance in a contract does not cap liability at that level.

Contractors may need to take out project-specific insurances to meet the project-finance requirements such as insured parties, cross-liability and waiver of subrogation, which can delay the occurrence of the commencement date on a construction contract if that contractor had previously assumed it could rely on its group company insurance policies, which often do not meet such requirements. A lack of familiarity with local fronting requirements, considered together with minimum rating requirements for the insurers, may also cause a delay to the occurrence of the commencement date as the employer may need to enter into a waiver with the contractor and a separate waiver with its lenders to deviate from such minimum rating requirements. An employer can mitigate against this potential delay by properly conducting due diligence on the local insurance market and requesting draft insurance certificates from the contractor at the tender stage. This allows the employer to enter into a dialogue with the contractor's insurance adviser to ensure that it has compliant insurances before the delivery of insurance policies required as a condition precedent to commencement date.

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14.6 Practical aspects of insurance in construction projects

Insurance of large construction projects is an integral part of the project itself or of its execution. The employer and the contractor are capable and willing to bear the financial risks in connection with unexpected damage during construction, but only to a certain extent. The admissible sum (called the excess) tends to be set just at this "limit" and the parties then may assign their risks for extra payment if such risks exceed this "limit."

Troubles and "incompatibility" tend to appear in practice because two quite different industries and practices meet here. The first is the purely technical field of construction projects, and the other is the field of law (finance and civil law), represented by insurance. This can give rise to a communication barrier where the insurance experts do not fully understand the technical aspects of the works and its execution, and where the construction specialists, on the other hand, tend to underestimate the insurance aspects (or allow for such aspects, burdened by technical and managerial duties).

14.6.1 Recommendations for negotiating insurance

An insurance contract is, in principle, based on the Anglo-Saxon doctrine of *utmost good faith*. It is a principle of utmost good faith that an insured will provide the insurer with complete and true information of the risk and the insurer will then sell

the promise of the circumstances under which they shall indemnify. As such, the contractual relationship is based on mutual trust between the contracting parties.

Two basic conditions must be stressed and detailed:

- the duty to inform the insurer of what is relevant in terms of the insurance; and
- the duty to adhere to the conditions under which the contract has been entered into.

The employer's intention must be defined at the beginning. For example, defining their purpose, location, design, financial amounts, time for completion, and other parameters shapes the initial skeleton of the insurance policy. The insurance issue must be considered at the design preparation phase at the very latest.

An insurance specialist, whether an in-house employee (of the employer) or, more frequently, an insurance broker ("broker"), plays an indispensable role here. Experience shows that it is always better when a well-experienced and assertive broker takes over this role in cases of large construction projects. The broker ought to be a dignified, competent, and respectful partner to the insurers at the local or, better yet, international insurance and reinsurance market level. The requirements (on the basis of which an optimum insurance contract can be compiled) have to be put together for this specialist. Of course, these requirements will include all the relevant, underlying documents to be provided, as they relate to the intended works. Moreover, they must include partial documentation such as that in support of geological surveying and the report prepared by a hydrologist, for example. Finding an external broker may be done through a tender process.

The first output of the broker's efforts will be a risk report he/she submits to the insurers along with a request for preparation of the respective insurance bids. The employer (and also the contractor if known at this stage) must, prior to submission of the report to the insurers, make themselves familiar with this report and find out if their requirements are met and if the information contained in it is correct and current.

With bids from potential insurers obtained, the broker must prepare a written, detailed analysis of the bids submitted by the insurers. This analysis will contain detailed comparisons regarding the level of premiums, insurance cover ranges and various limitations imposed by the insurer on the constructed work. Limitations and additional conditions that are not normally included in the insurance conditions are included in various special clauses.

For example, the standard practice of the Munich Reinsurance Company is to include tens of such additional clauses in its construction all risk insurance policies. These clauses deal with, for example, limitations and exclusions in tunneling and underground works, reservoirs, dams, and damage to existing underground pipelines and cable lines. Routine checking and revision of the insured sum and its correctness are essential.

Due to various limitations and conditions, analysis of insurance bids should be made subject to the objections and suggestions given by the employer and respective contractors. This should include an estimation of any risks and costs of the measures to be taken at the insurer's request. All these underlying documents must identify the person who has prepared them and to whom they have been handed over.

The broker must have professional liability insurance in the event of a mistake or negligent conduct on their part. This obligation is usually assigned to the broker by operation of law.

14.6.2 Compatibility of the construction contract with the insurance contract

At the conclusion of the tender, the broker must ensure compatibility of the insurance contract with the work being constructed. A contingency plan (with insurance as its integral part) should be prepared for large construction projects. This plan must address the protocols to be followed in case of potential damage.

All managers must be made fully aware of the actual cover of the insurance contract. This includes top management of the employer and contractors right down to the level of site managers.

A list of the insurance contract parameters extracted from the insurance contract should also be prepared. This will allow the parties to quickly and accurately identify any works/activities, which may breach, deviate from, or be incompatible with what is actually insured. This is of critical importance because, in any construction project, there will almost certainly be deviations in terms of the time horizon of the work, changes in technology employed, and so on. All of this can be incorporated into a single manual tailored for a respective insured project. All levels of management (including site managers) should be made familiar with this manual.

A particular procedure has to be defined, should a deviation appear. It is mainly up to the broker to evaluate the deviation and determine (and then notify) whether it is enough to inform the insurer about new circumstances or to resolve the matter via an addendum to the insurance contract. The principle of utmost good faith applies when informing the insurer about new, relevant facts. Usually these facts relate to information upon which the insurance has been effected.

As a matter of good practice, site documents such as daily logs, time programs, progress reports and taking over protocols have to be properly kept.

The broker should, ideally, be present at the on-site progress meetings and regularly review relevant documents, for example, reviewing and checking design documentation of the project to ensure that it respects the requirements of the insurance contract. This may include issues dealing with the installation and operable condition of pumps used to drain water from a foundation pit in the capacity as prescribed, or the adequacy and operability of anti-flood barriers required by the insurer.

The procedure to be performed in response to potential damage subject to insurance must be clearly spelt out and communicated as well. The broker is best able to determine which situations and/or damage should be reported to the insurer. However, the contractor must set up the system of communication so that the broker is made aware of such situations on a timely basis and has the opportunity to respond accordingly. A raised claim may also include expenses incurred in avoiding damage.

Construction all risk insurance ranks among the most complicated kind and the role of an insurance specialist is critical here. Cooperation does not end at the signing of the insurance policy—the specialist should provide their client with relevant after-sales support throughout the execution of the works and over duration of the insurance contract.

Incompatibility of the construction contract with the insurance contract by Karel Fabich (the Czech Republic)

Unfortunately, not even simple things are actually simple in practice. I am now involved in liquidating two cases of damages in a construction project before it is handed over to the employer, that is, while the contractor is still responsible for them. Being a medium to large enterprise, the contractor has an insurance contract in place for the works under construction. The works are automatically included in the comprehensive insurance contract when they meet certain conditions. A premium is then paid to complete a straightforward insurance process.

Working according to schedule, the contractor is building conscientiously on a river bank and the river bed. In my opinion, the contractor cannot be making much of a profit in these times of strong competition and price-cutting. The contractor does seem to care much about the compatibility of its insurance contract with the works under construction. It is written in the insurance contract that any construction works taking place close to rivers (as predefined) have to be made known to the insurer in advance. But the insured contractor fails to announce anything and the insurance broker is oblivious to the situation. It is the height of the construction season and there are other things to worry about after all.

A rain shower and what a pity! Flooding damages reach between 3%–5% of the total contract value. I assume the contractor to be without profit and remuneration—or even suffering a loss if the insurer refuses to pay on the basis of breach of contract conditions. Two simple emails might have been enough to save the day—one to the broker and the other to the insurer.

Karel Fabich
Insurance liquidator
Czech Republic

14.7 International insurance law and insurance standards in the construction industry

Currently, there is no insurance standard in the construction industry applicable worldwide. International insurance is fragmented but some uniformity is reflected in the terms and conditions used by the biggest and most renowned insurance companies and/or their associations. The following paragraphs will turn attention to two groups of general insurance terms used by German insurance companies. The first set of terms are the provisions of the General Terms for Construction Insurance of the Association of the German Insurance Industry. In particular, the *General Terms for Construction Insurance Agreed with Employer* and the relevant interpretation clauses (TK ABN 2011) (ABN) and the *General Terms for Construction Insurance Agreed with Contractor*, including the relevant interpretation clauses (TK ABU 2011) (ABU) will be analyzed.

Second, the chapter will deal with the standard forms, terms, and clauses prepared by the International Association of Engineering Insurers (IAEI). The IAEI currently has a membership of 20 countries. The IAEI has created two sets of insurance terms, both used in construction; see: http://imia.com/munichre_examples.php#220. The terms include *Construction All Risk Standard Insurance*

(CAR) and the *Erection All Risk Standard Insurance* (EAR). To avoid confusion, the abbreviations of CAR and EAR mean conditions prepared by IAEI unless otherwise stated.

14.7.1 Standard insurance terms of ABN 2011 and ABU 2011

The most recent editions of the ABN and ABU conditions are dated January 1, 2011. Both ABN and ABU are consistently interlinked with the *Verdingungsordnung für Bauleistungen* (VOB) construction contract procurement regulations. Construction risks insurance mainly includes the insurance of construction works and building materials. The purpose of ABU insurance is to protect the contractor from the necessity to rebuild works at their own expense, should they suffer destruction or damage in the course of construction. Under ABN terms, insurance will provide the employer with protection against the necessity to pay the costs of the rebuild of a building that has been destroyed or damaged by an incident. The first notable difference between ABU and ABN terms is the party insured against risk (ABU—contractor, ABN—employer). There is also another major difference in the scope of insurance. In compliance with § 1 of ABU, all building materials, construction elements and construction works intended to fulfil the purpose of a construction project as defined in the insurance contract (including the temporary works and materials) must be insured. As such, the ABU conditions apply to both construction (reconstruction) of the buildings and construction of civil engineering works (roads, railways, bridges, tunnels, and so on). Paragraph 1 of the ABN conditions only applies to insurance of a newly erected or reconstructed building. Nevertheless, the scope of the subject of insurance can be modified (extended) via insurance clauses by agreement (for example, Clauses TK 5862, 6364, and 6365). If these clauses are agreed upon, the differences between ABN and ABU will actually vanish in respect of defining the scope of the subject of insurance.

The ABU and ABN terms can be subdivided into two parts. The first regulates the issues typical of construction risk insurances only (Section A), and the second defines the general insurance terms (Section B). A brief explanation will be given of both Section A conditions.

14.7.2 Conditions of ABU—Section A

Following the exhaustive list of insured and uninsured items at § 1, Section A of the ABU terms further consists of insured and uninsured risks and damage (§ 2), insurable interests (§ 3), insurance location, (§ 4), insured value, sub-insurance (§ 5), insured and uninsured costs (§ 6), scope of insurance indemnities (§ 7), payment of insurance indemnities and interest on insurance indemnities (§ 8), and expert proceedings (§ 9).

As per § 1 of ABU, the term "work" means "any building work at any phase of construction. All the preparatory and temporary works are insured." ABU falls under the category of all risk insurance, covering nearly all risks except those listed in § 2, sub-sections 2–4. The provisions of § 2 of ABU defines damage, subsuming damage or destruction of an insured item under them. This definition, however, does not cover damage caused by a defective method of construction or error in design. Other basic preconditions upon which indemnity can be paid out is unforeseeability of

damage occurrence. Damage is unforeseeable if the insured or their representatives (who are professionally skilled in the particular construction process) could not have foreseen it or when caused by gross negligence.

The work can be extra-insured against fire and floods. This leads to the necessity to specify respective terms in the insurance contract. For example, the absence of a definition of "uncommon and extraordinary levels of water" in § 2, sub-section 2 (b) of ABU is widely criticized by the German literature on the topic. Damage to glass, metal, or plastic materials while they are processed during construction are fully excluded from insurance cover. This does not mean that the exemption applies to damage caused to parts of the building already completed or under the construction. Damage caused by abnormal levels of water in watercourses, strikes, and political turmoil are also exempted from insurance cover.

14.7.3 Conditions of ABN—Section A

The main difference between the ABN and ABU conditions is that the employer is the insuring party in the case of ABN. Civil engineering works are widely exempted from insurance cover under ABN. Another difference between ABN and ABU is in the definition of "insurable interest." In principle, ABU terms relate to contractor insurable interest. According to § 3 Section 1, the ABN terms—even though applying primarily to an insurable interest of the employer as the insured—cover the insurable interests of all contractors with an insurable interest in execution of the employer's works (including their subcontractors). They are also secondarily covered in accordance with § 3, Section 2 of ABN. As such, additional contractors become co-insured with the employer.

14.7.4 Munich CAR and EAR insurance terms standards

The ABN and ABU insurance terms are rather regional in their nature because they are primarily used to insure construction risks in Germany. The standards of CAR and EAR are also used in international construction projects. The concepts of CAR and EAR come from the Anglo-American insurance model. Prepared by IAEI, CAR, and EAR constitute a combination of a contract sample form with insurance terms.

The CARs and EARs consist of a preamble, general conditions, tangible damage cover conditions (Section 1), conditions upon which indemnity can be provided for injury and damage caused to a third party (Section 2) and the conditions upon which indemnity can be provided for lost profit (Section 3). The forms where particular policy-related data can be filled in are attached to the CAR and EAR terms. Like the ABN and ABU: (1) the CAR and EAR standard insurance terms can be modified by means of clauses which allow policy tailoring for a particular insured; and (2) the CAR and EAR terms contain a variety of identical provisions.

14.7.5 CAR terms

The CAR insurance terms are designed for policies entered into between construction contractors and insurers in large (often international) construction projects.

The preamble of CAR insurance terms outlines general exemptions from insurance cover (such as war and civil unrest, nuclear events, deliberate acts of the insured, and their representatives and suspension of works). The preamble also defines the start and end points of insurance cover. In general, insurance cover starts with the commencement of construction works or with placing the insured things on the construction site and ends by acceptance of the works or their commissioning.

The general terms outline the insured's notification duties, specification of the official inspection by the insurer and the insured's obligation to promptly repair damaged things should an insurance event appear. An arbitration clause appears at Paragraph 7 of the general terms to facilitate quicker settlement of disputes.

Tangible damage is included in comprehensive insurance cover, except for cases specified in Section 1. These exemptions are more extensive than those set out in the EAR terms. Compared to EAR terms, items such as costs for repairing defective materials, wear and tear, corrosion, repair of on-site damage arising from black-outs (including to machinery and plants) and damage to vehicles and watercraft are exempted from insurance cover under CAR terms.

The condition upon which insurance cover can be provided for injury, death or damage caused to a third party is that the event has occurred directly in connection with construction or during the installation of insured things. Here CARs offer identical provisions to EARs.

Concerning the conditions upon which the insurance cover provides for lost profit, CARs are identical to EARs. In the third Section, there is a list of definitions (such as turnover, yearly gross profit) for the purposes of insurance indemnity. This section also contains a series of exemptions and provisions (such as periods of time and their calculation).

14.7.6 EAR terms

The EAR terms have been put together for erection all risk insurance. Deviations are reflected in their CAR counterparts. In addition to the discussion above, the definition of when insurance cover actually ends is critical. Insurance cover will end either after taking-over or after the field tests or load tests are commenced, depending on which comes first. In general, insurance cover will not end later than four weeks after commencement of the first test. Every other agreement must be made, according to EARs, in writing—despite being an excessive provision as the insurance terms can be modified by the parties without the necessity to have such an option expressly stated in them. The end of the insurance cover will be determined as separate for every particular facility or part of the work as gradually commissioned.

Construction/erection all risk insurance in the offshore wind industry by Gregory Efthimiu (Germany)

Introduction

In large construction projects, it is common that project assets are insured against physical damage to protect the interest of the employer during the construction phase. This applies

especially in offshore construction projects like the erection of a windfarm, where the project assets are highly expensive long-lead items and are exposed to higher risk compared to an onshore construction site. The common vehicle to do so is the construction or erection all risk insurance (EAR/CAR insurance).

In general, it needs to be clarified that a CAR insurance is an asset insurance covering the physical assets of the project. When a complete offshore windfarm is built likely all components (e.g., foundations, transition pieces, wind turbine generator including tower, blades, and cables) are insured. The usual constellation is that the employer provides the CAR insurance.

When talking about the coverage reference is often made to the term of "all contract works." It is important to understand that this is a description of the asset to be installed under the project and not the activities performed under the contract by the contractor, since activities cannot be insured under an asset insurance. In other cases when the CAR policy refers to "covered activities," this must be understood as a limitation, meaning that the assets are only insured when performing certain covered activities. However, at the end the actual scope of coverage of the insurance is always subject to the specific wording of the insurance policy.

The first mentioned distinction is mainly relevant in cases where a substation (transformer station) or a converter station is already installed and the contractor performs works close by. Such preexisting assets are likely not or only limited insured under the CAR insurance.

Another major part of a standard offshore construction insurance is a third party liability (TPL) insurance, which covers damage to third-party assets when performing construction activities. It must be emphasised that damages caused by a vessel are in the majority of the cases excluded from the coverage of the TPL insurance. Therefore, employers do often require contractors to obtain a so-called "hull and machinery insurance," as well as a "protect and indemnity (P&I) specialist operations insurance," which cover damages occurred to and by the installation vessels.

Exclusions

As in every insurance, the exclusions are the interesting part. When talking about CAR policies a focus should in any case be on defect related damages. As already mentioned above, the insurance only covers physical damage of the project asset. Therefore, a defect itself is not insured under such insurance, which is traceable, since the defect-free delivery of the works is a major obligation under the main contract of the respective contractor.

However, how is dealt with a physical damage to the asset caused by a defect in design, workmanship, or material?

The London Engineering Group, a consultative body for insurers in the engineering business, developed standard clauses to define the limits of the insurance cover for damages arising from a defect in the works. Although, there is no obligation to use such clauses for an insurance company, the so-called "LEG clauses" are often implemented in CAR insurance policies, to determine whether damages arising from defects are covered or not.

Overview—LEG 1 to 3

It has to be noted beforehand that the below stated clauses are left without any commas by the London Engineering Group, which partially increases the incomprehensibility and ambiguity of the wording.

1. LEG 1/96

The LEG 1/96 clause is short and easy to understand, but it is also the most limiting one of the three LEG clauses, since damages arising from defects of workmanship or material, design or specification are simply not covered.

LEG 1/96	Model **"outright"** Defects Exclusion "The Insurer(s) shall not be liable for Loss or damage due to defects of material workmanship design plan or specification."

2. LEG 2/96

The LEG 2/96 clause covers the cost for remedying the damage arising from a defect, minus the cost, which would have been accrued if the defect would have been remedied immediately before the damage occurred.

The idea is to give an incentive to the contractor not to install defective works, therewith gain coverage, and claim money under the CAR insurance, if the defect results into a physical damage.

LEG 2/96	Model **"Consequences"** Defects Wording "The Insurer(s) shall not be liable for All costs rendered necessary by defects of material workmanship design plan specification and should damage occur to any portion of the Insured Property containing any of the said defects the cost of replacement or rectification which is hereby excluded is that cost which would have been incurred if replacement or rectification of the Insured Property had been put in hand immediately prior to the said damage. For the purpose of this policy and not merely this exclusion it is understood and agreed that any portion of the Insured Property shall not be regarded as damaged solely by virtue of the existence of any defect of material workmanship design plan or specification."

3. LEG 3/06

The LEG 3/06 clause excludes any cost incurred to improve the original contract works, with an explicit exclusion of defective but not damaged property.

LEG 3/06	Model **"Improvement"** Defects Wording "The Insurer(s) shall not be liable for All costs rendered necessary by defects of material workmanship design plan or specification and should damage (which for the purposes of this exclusion shall include any patent detrimental change in the physical condition of the Insured Property) occur to any portion of the Insured Property containing any of the said defects the cost of replacement or rectification which is hereby excluded is that cost incurred to improve the original material workmanship design plan or specification. For the purpose of the policy and not merely this exclusion it is understood and agreed that any portion of the Insured Property shall not be regarded as damaged solely by virtue of the existence of any defect of material workmanship design plan or specification".

Practical application

Example case

A is an offshore cable installation company and installs a high voltage cable from a supplier.

Due to defective workmanship during cable manufacturing, the cable insulation is too thin and therefore not in accordance with the contractual specifications, which constitutes a defect of the asset and is hence not covered under the CAR insurance.

The defect is not discovered and the cable is installed. When the cable is energized, the defective insulation within the cable causes a short circuit, which damages the (1) cable and a (2) transformer to which the cable is connected.

The question if the damage to cable and/or the transformer is covered depends on which LEG clause is used in the insurance policy.

LEG 1

The damage to cable and transformer was caused by a defect in workmanship during manufacturing. Therefore, both damages are not covered.

LEG 2

LEG 2/96 states that damages due to defect in the works are covered, however minus the cost for remedying the defect one moment before the damage occurs.

The cost of replacing the damaged cable can be split roughly into (1) cost for the new cable (2) cost for removal/ installation of the cable. Since the cable was already installed offshore the moment before the damage occurred, the cost to remedy only the defect at that point of time are similar to the cost to remedy the damage. Therefore, the cable is covered under the CAR insurance, since it is a physical damage to the insured property, but the majority of the cost will be excluded due to the LEG 2 clause wording.

Example calculation

Cost for rectification after the damage occurred:	
1. New cable	100
2. Installation of new cable	100
3. Transformer repair	100
(−) Cost for (hypothetical) rectification before the damage occurred:	
1. New cable	−100
2. Installation of new cable	−100
= Covered amount	**100**

Regarding the damaged transformer, it is clear that when the defect in the cable would have been remedied before the damage occurred, there would be no need to replace said transformer. Therefore, the costs for replacing the transformer are not deducted from the rectification cost and hence covered by LEG 2 wording.

LEG 3

Following the logic from LEG 1 to LEG 2, LEG 3 must provide the widest coverage for damage to the work caused by defect and indeed the LEG 3 only excludes cost for improvement of the work. In this case, this would exclude the additional cost for installing an advanced cable or using alternative materials with a higher level of quality for installation. Such scenario is not very likely since the employer will not vary the product specifications during installation phase.

A scenario like this could be relevant if acceleration measures must be performed due to a delay caused by the damaged work, which of course would result in higher costs for advanced installation technology and/ or workmanship.

Summary

As one can see, the coverage provided by a CAR insurance in the offshore construction industry can vary and requires special attention when it comes to the explicit wording of the policy. The CAR insurance is a tool to allocate risk and protect against defective products or defective workmanship—and therewith from enormously high costs—during the offshore installation process. All this depends on the respective wording of the defect coverage clause included in the CAR insurance policy. In most of the cases, the employer has the last word regarding the contents and therewith the coverage-scope of the insurance clauses, but with correct awareness, it is possible and advisable to consider such topics during the contract negotiations phase.

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