

# Contractual Sharing of Risks in Underground Construction: ITA Views

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**Abstract**—This paper deals with the special considerations that should be given to underground construction in relation to the sharing of risks between the client, contractor and consultant. The paper highlights the work of the International Tunnelling Association (ITA) in this area and details the 25 propositions that the ITA has recommended be included in contract documentation for underground construction projects. It concludes with a review of present and future topics under consideration by the ITA Working Group on Contractual Sharing of Risks in Underground Construction.

**Résumé**—Cet article traite des considérations particulières qui doivent être prises en compte pour les constructions souterraines en matière de partage des risques entre le maître d'ouvrage, le maître d'œuvre et l'entrepreneur. L'article met en lumière le travail de l'AITES dans ce domaine et recense les 25 propositions que l'AITES a recommandé d'insérer dans les contrats relatifs aux projets de constructions souterraines. Il conclut par une présentation des sujets actuels et futurs étudiés par le groupe de travail de l'AITES "Partage contractuel des risques dans les constructions souterraines."

## 1. Introduction

Knowledgeable people in the tunnelling industry have long recognised that the contracting practices employed for the construction of underground works have a material effect upon the efficiency with which such works are constructed.

Generally, the contract system in the field of civil engineering has evolved over time for the realization of important capital works for the benefit of mankind. To achieve these works, we must:

1. Define the objective of the project;
2. Plan and design the project;
3. Implement and construct the project.

The ultimate realization of such projects requires complete cooperation, assistance and understanding between the three main partners of the contract: the client, the contractor, and the consulting engineer. The ideal contract is one which defines the re-

sponsibilities, duties, and obligations of each of these partners clearly; and is set up in such a manner that the project is brought to reality objectively and economically. This is what is internationally known as the sharing of risk among the three partners.

Special consideration must be given to tunnelling and underground works contracts. In these works, the contractor is generally faced with more uncertain site conditions, resulting in significant risks. These risks include:

- Potential damage to the properties of third parties;
- Risk to the contractor's work force and equipment;
- Risk to partially complete works of the employer.

Tunnelling and other underground works differ in other respects from general construction contracting. The contractor can only work economically if he is allowed to work continuously day and night, as in an industrial process. Temporary works and equipment account for a much higher proportion of the total cost than is generally the case with aboveground construction contracts.

The characteristics of tunnelling are its linear form and the continuous revelation of site conditions not entirely known at the start of construction. Unexpected events, including those resulting from unforeseen site condi-

tions and the construction medium, have a greater impact on the progression of work, where interruptions in the continuous construction process can present serious physical and financial risks to both the contractor and the employer.

## 2. Role of the International Tunnelling Association (ITA)

The International Tunnelling Association (ITA) is a worldwide body, active since 1974; as of the last annual meeting, held in Stuttgart, Germany in May 1995, 42 member nations are represented in the ITA. Within the ITA, a number of Working Groups study various tunnelling topics; typically, ten or eleven such groups are active at any given time.

In 1974, the ITA established a Working Group on "Sharing of Risk in Underground Construction." The primary concern of the ITA and its Working Group on contractual sharing of risk has been the development of advice to ITA member nations on ways to distribute more equitably the risk of underground construction among the owner, the contractor and the engineer (consultant). The perceived purpose of such advice, which has been presented in a series of ITA "propositions," is to reduce the overall cost of tunnelling and other underground construction by lessening the contractual fear of

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unknowns; and by apportioning the risks attendant on tunnelling works.

Understanding how a topic becomes a proposition is important to a full appreciation of the Working Group's accomplishments over the past decade. The usual course by which a topic evolves begins with the original suggestion of a need by a Working Group member, the "Animateur" (Chairperson) or the "Tutor" (the member of the Executive Committee of ITA for sponsoring and guiding the group).

If the Working Group members decide that the topic is sufficiently worthy of study, a volunteer is sought to draft an initial "position paper." The Group has agreed on a format using the position paper set out in an advisory manner, without any official ITA recommendations. Conclusions and recommendations may be included, but these are (progressively) of the author, the member nation, and the Working Group.

This draft document is circulated among member nations active in the group for review and comment. The group members then begin their "negotiations" of the policies, terms and phrasing of the proposition topic. The group's commentary and responses form the basis of a second draft and the drafting of a specific proposition. The draft proposition is then reviewed and the final wording in the official ITA languages (English and French) hammered out.

Most of the group's efforts are accomplished through correspondence, organized by the Animateur and the Tutor, and at meetings held concurrently with the annual ITA General Assembly. Some topics have evolved as propositions after two years; others have taken up to seven years before final agreement on them has been reached.

Once the proposition has been accepted as satisfactory by the Working Group, it is presented to the ITA General Assembly as a recommendation for adoption. From the point of view of the ITA, these recommendations should be included or followed in contracts. Each proposition must be approved by the ITA General Assembly, which is held every year in a different member nation. Following approval by the General Assembly, the propositions are published in the ITA journal *Tunnelling and Underground Space Technology (formerly Advances in Tunnelling Technology and Subsurface Space)*.

Twenty-five propositions, relating to the most vital topics that are likely to be faced in tunnelling and underground construction, have been debated among the member nations active in the Working Group to the point of formal adoption of the advice by the ITA.

Between 1974 and 1991, the Working Group produced 25 propositions

on contractual sharing of risk. In 1991, the ITA Executive Committee granted approval for the group to continue with a new mandate under the name "Contractual Practices in Underground Construction."

It must be recognised that various ITA member nations and their national associations for tunnelling and underground construction have translated them into their national languages (e.g., Norwegian, Italian, German, Swedish) or have developed their own versions of these topics. The work of some such organizations may have pre-dated the work of the ITA, thus helping the accomplishment of the Working Group's programme. Other organizations have utilised the resulting ITA endorsed propositions to produce their own set of national policies.

Assessments of the value of the ITA work have continually reinforced the importance of the programme.

### **3. Guidelines Recommended by the ITA for Particular Application to Tunnelling and Underground Works**

For details, readers are referred to the propositions themselves. A summary of the proposition topics, including the period of development, date of adoption by the ITA, and date of publication in *T&UST*, are listed in Table 1.

#### **3.1 Categories of Propositions**

The propositions put forward by the ITA for the Contractual Sharing of Risks fall into five main categories:

1. Legal.
2. Financial.
3. Technical.
4. Measurement.
5. Contract Administration.

#### **3.2 Propositions Relating to Legal Matters**

##### **3.2.1 Proposition 1**

Proposition 1, "Changed Conditions Clauses", recommends that a Changed Conditions clause be incorporated in all tunnelling contracts.

##### **3.2.2 Proposition 2**

Proposition 2, "Full Disclosure of Available Subsurface Information", recommends that all available subsurface information, including both factual and interpretive data, be disclosed to tenderers for tunnelling contracts.

##### **3.2.3 Proposition 3**

Proposition 3, "Elimination of Disclaimers", recommends that adequate resources be employed on ground investigations at the pre-tender stage to eliminate disclaimer clauses from tunnelling contracts.

#### **3.2.4 Proposition 6**

Proposition 6, "Disputes," recommends that:

- The early resolution of disputes be given high priority and that such disputes do not influence the progress of the works;
- All facts be recorded daily and countersigned;
- Conciliation procedures or arbitration should be considered before resorting to litigation in the courts.

#### **3.2.5 Proposition 21**

Proposition 21, "Subcontracting of Work," recommends that:

- Contracts should identify the parts of the work not to be sub-contracted;
- Tenderers should be required to fully describe the sections of the work to be sub-contracted;
- Selection of sub-contractors should be the Contractor's responsibility, but should adhere to certain stipulations made by the Client;
- Nomination of Sub-contractors or Suppliers by the Client should be avoided wherever possible, except in extenuating circumstances; and then only under the same terms and conditions as the main contract.

#### **3.2.6 Proposition 25**

Proposition 25, "Termination or Suspension of Work," recommends:

- That the Contract documents should fully describe the rights of the parties in the case of termination;
- That the Contractor should be encouraged to shut down the operations in a way that minimises the cost of such stoppage;
- That the stop-work order should be precise as to the work to be stopped, the actions to be taken by the Contractor, and the basis of payment;
- The method to be adopted if the stop-work order is not cancelled.

#### **3.3 Propositions Relating to Financial Matters**

##### **3.3.1 Proposition 5**

Proposition 5, "Contract Variation in Price", recommends that variation in price clauses, preferably of the index reimbursement type, be included in all tunnelling contracts.

##### **3.3.2 Proposition 10**

Proposition 10, "Mobilization Payments," recommends that all tunnelling contracts should include suitable mobilization items; and, where appro-

Table 1. Summary of ITA propositions adopted to date (Working Group on Contractual Sharing of Risks).

Prop. No.	Title	Period of Development	Year and Place of Adoption by ITA
1	Changed Conditions Clauses	1976–1979	1979 — Atlanta, Ga., U.S.A.
2	Full Disclosure of Available Subsurface Information	1976–1979	1979 — Atlanta, Ga., U.S.A.
3	Elimination of Disclaimers	1976–1979	1979 — Atlanta, Ga., U.S.A.
4	Prequalification of Contractors	1977–1979	1979 — Atlanta, Ga., U.S.A.
5	Contract Variation in Price	1978–1980	1980 — Brussels, Belgium
6	Disputes	1978–1980	1980 — Brussels, Belgium
7	Ground Support	1978–1981	1981 — Nice, France
8	Ground Characterization	1979–1982	1982 — Brighton, U.K.
9	Tendering and Awards of Contract	1979–1982	1982 — Brighton, U.K.
10	Mobilization Payments	1979–1981	1981 — Nice, France
11	Measurement Problems in Rock	1980–1987	1987 — Melbourne, Australia
12	Performance Bonds	1980–1983	1983 — Warsaw, Poland
13	Coordinated Insurance Programme	1980–1983	1983 — Warsaw, Poland
14	The Engineer's Role during Construction	1980–1987	1987 — Melbourne, Australia
15	Rights-of-Way and Permits	1984–1986	1986 — Florence, Italy
16	Provision of Plant, Equipment, Services, and Materials by the Owner	1984–1986	1986 — Florence, Italy
17	Alternative Tenders	1984–1986	1986 — Florence, Italy
18	Protection of Project Surrounds	1984–1987	1987 — Melbourne, Australia
19	Measurement Problems Related to Water	1984–1987	1987 — Melbourne, Australia
20	Contractor-Supplied Financing	1987–1989	1989 — Toronto, Canada
21	Subcontracting of Works	1987–1989	1989 — Toronto, Canada
22	Construction Site Safety	1987–1990	1990 — Chengdu, China
23	Project Overview by Third Parties	1987–1990	1990 — Chengdu, China
24	Post-Award Alternatives	1989–1992	1992 — Acapulco, Mexico
25	Termination or Suspension of Work	1990–1992	1992 — Acapulco, Mexico

priate, advance payments at the beginning of the works and/or on supplies.

### 3.3.3 Proposition 12

Proposition 12, "Performance Bonds," recommends that:

- All types of bonds (bid bonds and performance bonds) should aim at a balance between the rights and the obligations of the parties and at a reasonable coverage of the risks; have values limited to moderate and equitable levels; and, ideally, be standardized internationally;
- The size of the performance bond should be reduced by seeking tenders from Contractors who have satisfied a prequalification procedure and the value of the bond should decrease as work progresses;
- On-first-demand or unconditional guarantees shall never be requested.

### 3.3.4 Proposition 13

Proposition 13, "Coordinated Insurance Programme," recommends that, subject to evaluation prior to prepara-

tion of tender documents, the owner shall obtain a Coordinated Insurance Programme appropriate to the project. This programme shall be issued with the tender documents, form part of the contract, and continue for a reasonable period after the completion of the works.

### 3.3.5 Proposition 20

Proposition 20, "Contractor-Supplied Financing," recommends that calls for tender should specify the limits of financing; the minimum acceptable proportion of financing; the form of assurance of financing to be submitted; the period prior to start of repayment; the repayment period; the guarantees intended by the owner that the repayment schedule will be met; and the method by which tenders will be evaluated.

This proposition further recommends that additional time should be allowed in the tendering procedure when financing is included; and that, should delays in the work or in the payment of financing occur due to causes not within the control of the owner, the interest due on the funds advanced by the contractor should not be thereby increased.

## 3.4 Propositions Relating to Technical Matters

### 3.4.1 Proposition 7

Proposition 7, "Ground Support," recommends that all tunnelling tender and contract documents should define:

- The assumed character of the ground throughout the construction site;
- The parameters required for the design of ground support and, more particularly, whether the ground support has been included in the design of the permanent structure;
- The bills of quantities for ground support, covering a reasonable range of site conditions;
- Methods to take account of changes in the quantity or type of ground support, as dictated by actual site conditions when they differ from those assumed.

### 3.4.2 Proposition 8

Proposition 8, "Ground Characterization," recommends that all tunnelling contracts should incorporate:

- Definitions of the character of the ground over the extent of the works;

- The owner's estimate of the extent and occurrence of each discrete set of site characteristics;
- Procedural provisions for agreeing on changes as a result of encountering actual site conditions differing from those understood to exist at the time of contracting.

### 3.4.3 Proposition 14

Proposition 14, "The Engineer's Role During Construction," recommends that all tunnelling contracts should identify what entity will represent the owner as Engineer; and should clearly define the duties, responsibilities, authority and limitations of the Engineer.

### 3.4.4 Proposition 15

Proposition 15, "Rights-of-way and Permits," recommends that:

- All tunnelling contracts shall clearly define the owner's and contractor's responsibilities to acquire rights-of-way for the tunnel and the agreements and permits necessary to build and operate it;
- The owner's responsibilities should include the securing of all permanent rights-of-way, agreements and permits; and only in cases where these are required by the particular method of construction should the contractor be responsible for securing such rights.

### 3.4.5 Proposition 16

Proposition 16, "Provision of Plant, Equipment, Services and Materials by the owner," recommends:

- That the contractor should normally be required to provide all plant, equipment and materials necessary for the completion of the work;
- The minimum requirements that should be clearly defined in the contract documents when the owner decides to provide any of these items.

### 3.4.6 Proposition 18

Proposition 18, "Protection of Project Surrounds," recommends that:

- The owner should conduct advance investigations to obtain a full knowledge of the risks that will be encountered, the nature of the subsoil, the water conditions, and the surrounding buildings and structures;
- During the design phase, the maximum amount of information should be obtained and appropriate designs developed;

- The owner should establish and operate monitoring systems and procedures throughout the project;
- The contractor shall be responsible for avoiding adverse impact on project surrounds caused by construction methods or operations.

## 3.5 Propositions Relating to Measurement Matters

### 3.5.1 Proposition 11

Proposition 11, "Measurement Problems in Rock," recommends that:

- Specifications and Bills of Quantities should be based on distinct sets of geological conditions that are expected to prevail on site;
- Measurement should be based on an appropriate geologic classification system, preferably limited to five classes;
- Bills of Quantities should allow the implications of any changes to be easily established, incorporating both the excavation and filling of overbreak in each rock class and precautionary provisional items where appropriate;
- Any use of "payment lines" and "clearance lines" should be clearly defined geometrically in the contract documents.

### 3.5.2 Proposition 19

Proposition 19, "Measurement Problems Related to Water," recommends that:

- During ground investigation, the pressure, temperature, chemical composition and level fluctuations of ground water should be determined and strata permeabilities measured;
- The ground investigation report should identify any problems anticipated from lowering of water tables;
- Tender documents should clearly indicate the owner's intended methods of dealing with water problems and should incorporate appropriate items in the Bills of Quantities;
- Tenderers' alternative proposals should include similar detail; and, where dealing with water is included in unit prices for other works, this should be clearly stated;
- Practical procedures for notification, inspection, verification, measurement and control of water occurrence should be established and specified in the contract documents.

## 3.6 Propositions Relating to Contract Administration

### 3.6.1 Proposition 4

Proposition 4, "Prequalification of Contractors," recommends that bids should be sought only from contractors who have satisfied a rigorous technical and financial prequalification procedure.

### 3.6.2 Proposition 9

Proposition 9, "Tendering and Awards of Contract," recommends that:

- All tenders containing unpriced conditions or qualifications should be disallowed;
- Alternative tenders, preferably accompanied by a conforming offer, shall be encouraged, fully considered and their confidentiality respected;
- Sufficient time for tendering should be allowed, and pre-tender meetings between all tenderers and the owner's representatives are recommended;
- All tenders should be evaluated on bases that include methods and specific means, as well as price;
- Pre-contract meetings with short-listed tenderers should be held to confirm both parties' understandings of what is required and offered;
- Tenderers who have no chance to be awarded the contract should be so informed as soon as possible.

### 3.6.3 Proposition 17

Proposition 17, "Alternative Tenders," recommends that alternative tenders should include a conforming offer, be presented on contract documents comparable to those prepared by the owner for the basic offer, define any alteration to risks, and incorporate an extended tender validity period sufficient to allow the owner to evaluate the alternative proposal.

### 3.6.4 Proposition 22

Proposition 22, "Construction Site Safety," recommends that the contract shall make the contractor responsible for construction site safety, and shall include a section defining the duties and responsibilities of the contractor and the powers of the Engineer and other parties to enforce safety matters.

### 3.6.5 Proposition 23

Proposition 23, "Project Overview by Third Parties," recommends that the owner shall determine the likely extent of third-party overview require-

ments and state them in the tender and contract documents, together with the procedural steps relating to the impact, in terms of both time and cost, of these overviews.

### 3.6.6 Proposition 24

Proposition 24, "Post Award Alternatives," recommends that:

- The tender documents for tunnels and other underground facilities should invite and encourage value engineering change proposals, the cost benefit for which should be apportioned equitably, taking into account any change of risks;
- The owner shall fully evaluate such proposals and provide detailed reasons for any that are rejected.

## 4. Contacts with FIDIC for the Inclusion of ITA Propositions

Since about 1979, discussion and correspondence have taken place between officials of the ITA and the Fédération Internationale des Ingénieurs Conseils (FIDIC), working toward the inclusion in FIDIC's *Red Book* of particular conditions that pertain to tunnelling and underground construction. The objective is to improve the equity of contract terms developed by owners and engineers in relation to those accepted and implemented by contractors and construction managers.

Most of these propositions relate directly to the same matters covered by FIDIC's Conditions of Contract for works of Civil Engineering Construction; others cover matters that are not taken up by FIDIC. The ITA believes that these propositions provide important modifications to, or extensions of, FIDIC Parts I and II. The ITA's objective is for FIDIC to recognise the pecu-

liarities of underground works—just as it has, for example, for dredging and reclamation work.

To this end, the ITA Working Group for Sharing of Risks has re-cast its propositions in the style and format of FIDIC's *Red Book* and placed the advice and guidelines under appropriate FIDIC Clauses and Sub-Clauses. We hope that the expected publication, in 1995, of FIDIC's revision to its *Red Book* will respond to the ITA initiative.

We believe in the ITA that for tunnelling and underground construction works, many basic FIDIC stipulations must be modified by special provisions, which properly reflect the risks and their allocation.

## 5. Future Topics

From the early days of ITA's formation, it realised that contractual matters constitute an important subject in tunnelling and underground works. The topics currently under consideration by the ITA Working Group "Contractual Practices in Underground Construction" are summarized below.

- *Types of Contracts*, which deals with the various types of contracts; advantages, disadvantages, conditions, and how to proceed with each type.
- *Contractor Selection Methods*, an topic expanded from that already discussed under the title "Evaluation of Tenders."
- *Evaluation of Claims*, which separates the routine process of claims evaluation from the formal declaration of a dispute, and at the same time makes the discourse more universal and more tolerant to alternative methods of claim handling.
- *Settlement of Disputes*, which deals with alternative methods of dispute resolution, including

what has become known as the Disputes Review Board (DRB).

- *Construction Management*. This is a very broad engineering management topic. The Group will deal with it from the point of view of tunnels and underground construction.
- *Avoidance of Claims*, which is a different topic from the evaluation of claims. It is as important to avoid and minimise contractor's claims as it is to evaluate and settle them promptly.

### 5.1 Other Topics

Other topics that are scheduled for future study and discussions include:

- Liquidated Damages.
- Performance Guarantees and Security.
- Quality Assurance and Guarantees.
- Procurement Procedures for Tunnel Boring Machines (TBMs).

Finally, the ITA Working Group on Contractual Practices in Underground Construction does not restrict itself to the 25 propositions previously mentioned, but is proceeding to expand its activities, scope and mandate. By virtue of this approach, it is fair to claim that the ITA is playing a leading role in the field of tunnelling and underground construction. □

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