

Fire Safety in Tall Buildings - *Part 1*

By Martin Edwards

The Use of Modified FIDIC Forms in the UAE

By Catherine Joshi

Expert Evidence in Adjudication

By Gerard McLean



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Fire Safety in Tall Buildings - Part 1

By Martin Edwards

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Tall, Supertall and Megatall

The citizens of Dubai, London and elsewhere cannot fail to notice the worldwide, post-recession, tall building phenomenon. But Dubai and London lag significantly behind China, which produced 58 buildings over 200m in the last year alone. [1]

What is a tall building?

The meaning has changed over time, and differs by location, context, function and proportion. The Council on Tall Buildings and Urban Habitat (CTBUH) (USA) recognises no absolute definition, but if a building contains technologies which may be considered to be the product of "tall" (e.g. vertical transport technologies, structural wind bracing), then the building could be classified as a tall building. [2]

Paragraph 3.3.32.7 of NFPA 101, [3] Life Safety Code, 2009 edition, defined a "High-Rise Building" as: "A building where the floor of an occupiable story (sic) is greater than 75 ft (23 m) above the lowest level of fire department vehicle access." This usually means a 7-storey building or more. Building Regulations in England and Wales give no definition of 'tall', but Approved Document B, [4] Table A2, recommends increasing fire resistance to structural elements for buildings with top floor heights of 5m, 18m and 30m above ground level. 30m height is the maximum reach of most fire brigade aerial ladder platforms. Above 30m, rescue from outside is no longer practical, so the majority of the occupants must make their own way down to safety unaided.

Current building heights in the USA and UK are left miles behind by the new wave of tall buildings. In 2009, knowing that the Burj Khalifa in Dubai would be significantly taller than any structure built previously, the CTBUH defined the categories of "Super-tall" and "Mega-tall" buildings [5] as over 300m and 600m high respectively. [6]

London is a member of the "Supertall" club, but the Shard only just skyscrapes in at 306m to the tip. Its occupied height is a mere 244m, but this is typical of "Super-tall" and "Mega-tall" towers. Since the Chrysler Building in 1930, vanity spires have been employed to trump the height of rival schemes, no less than 245m of unoccupied height in the case of Dubai's Burj Khalifa, and an extraordinary 366m for the Kingdom Tower in Jeddah, which is due to assume the title of the World's Tallest Building in 2018.

World's Tallest Buildings 1930 – present (and future): [7]

Date	Building	City	Country	Storeys	Height (m)		Lifts
				+ Ground	Occupied	Tip	
1930	Chrysler Building	New York	USA	77	252	319	32
1931	Empire State Building	New York	USA	102	373	443	73
1972	1 World Trade Center	New York	USA	110	413	527	99
1974	Willis Tower (Ex Sears Tower)	Chicago	USA	108	413	527	104
1998	Petronas Towers	Kuala Lumpur	Malaysia	88	375	452	2x39
2004	Taipei 101	Taipei	Taiwan	101	438	508	66
2008	World Financial Center	Shanghai	China	101	474	494	91
2010	Burj Khalifa	Dubai	UAE	163	585	830	58
2018	Kingdom Tower	Jeddah	Saudi Arabia	167	634	1000	57

Towards Global Standards?

There is no unified code for fire safety design in tall buildings. Developed nations have devised standards around national construction techniques and previous experience, often driven by fatal fire events. The standards tend to include protected evacuation shafts, fire resistant construction, compartmentation, active detection, alarm, smoke evacuation and suppression systems.

Regulation of tall building construction in emerging economies tends to be based on US standards, modified by local practice. This is understandable: from the hegemony established by 19th century iron-framed skyscrapers in Chicago, through the Woolworth, Chrysler and Empire State Buildings and

the World Trade Center in New York City, the USA dominated tall building construction throughout the 20th century.

The USA also has the greatest experience of fires in tall buildings: "In 2007-2011, an estimated 15,400 reported high-rise structure fires per year resulted in associated losses of 46 civilian deaths, 530 civilian injuries, and \$219 million in direct property damage per year." [8] 7 out of the 20 deadliest fires in high-rise buildings occurred in the USA, including the exceptionally lethal fires at the World Trade Center towers in 2001, which caused 2,791 deaths. [9]

Flame damage beyond the floor of origin is rare in high-rise buildings, and less likely than in lower buildings. When a high-rise fire results in deaths among people who are not on the floor where the fire began, the cause is usually one of the following failures of protection of stairways or lifts. [10]

- Lift travels to fire-floor and opens. (This problem was largely eliminated via lift design and the provision of warnings against elevator use during fires.)
- Door to exit stairs is blocked open allowing smoke or fire to enter.
- Substandard, inadequate or non-compliant enclosure allowing smoke into stairways. (This was the principal cause of the 85 deaths in the 1980 MGM Grand Hotel fire in Las Vegas.)

Fire safety legislation has historically reacted to fatal or catastrophically damaging fires. Following the Great Fire of London, which in 1666 swept west from Pudding Lane to destroy most of the City, the London Rebuilding Act of 1667 decreed "... That all the outsides of buildings be henceforth made of brick or stone.", rather than timber. Party walls and external walls were to be 1-2 bricks thick and streets wide enough to prevent fire spreading across them.

In contrast, the collapse of the World Trade Center towers in 2001, has not led to a major reform of the fire safety design of tall buildings, despite a long and complex investigation. In the absence of clear advice emerging from this investigation, there is "... an ever growing acceptance that these buildings are beyond the realm of applicability of prescriptive guidance." [11]

Among the rapidly growing number of tall and super-tall buildings in China and the Middle East, neither fire safety codes nor fire engineering have prevented major fires. Of these, fire spread via the external envelope has been prominent.

(To be continued)

[1] CTBUH Year in Review: Tall Trends of 2014, and Forecasts for 2015, Council on Tall Buildings and Urban Habitat (Chicago) http://skyscrapercenter.com/research/CTBUH_ResearchReport_2014YearInReview.pdf

[2] CTBUH Criteria for the Defining and Measuring of Tall Buildings <http://www.ctbuh.org/HighRiseInfo/TallestDatabase/Criteria/tabid/446/language/en-GB/Default.aspx>

[3] NFPA = National Fire Protection Association (USA)

[4] (England) http://www.planningportal.gov.uk/uploads/br/BR_PDF_AD_B2_2013.pdf

[5] CTBUH changes height criteria, Burj Dubai height increases, 17 November 2009 http://www.ctbuh.org/NewsMedia/PR_091117_ChangeHeightCriteria/tabid/1273/language/en-US/Default.aspx

[6] There are still only two examples in the elite "Megatall" category (2015)

[7] Principal source: CTBUH (USA) <http://skyscrapercenter.com/buildings>

[8] High-Rise Building Fires, NFPA 2013, p2 <http://www.nfpa.org/research/reports-and-statistics/fires-by-property-type/high-rise-building-fires>

[9] High-Rise Building Fires, NFPA 2013, Appendix C - Deadliest High-Rise Building Fires in History.

[10] UHigh-Rise Building Fires, NFPA 2013, p25

[11] Cowlard, Bittern, Abecassis-Empis, Torero Fire safety design for tall buildings *Procedia Engineering* 62 (2013) p169 <http://www.sciencedirect.com/science/article/pii/S1877705813012356> (Scotland/Australia)

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The Use of Modified FIDIC Forms in the UAE

By Catherine Joshi

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Introduction

The UAE, in particular Dubai and Abu Dhabi, has seen an extraordinary growth in construction over the last two decades. The FIDIC Conditions of Contract are still predominantly used on construction projects in the region however these are regularly modified by Employers to create bespoke conditions. The UAE is a civil law jurisdiction and has a codified law with particular Articles that apply to construction projects. The use of modified forms of contract in conjunction with the application of civil law can easily lead to a "perfect storm" of contradictions and conflicting obligations.

Background

The construction industry is predicted to contribute 11% to the UAE's total GDP in 2015 [1] with extraordinary growth over the last decade. The mix of cultures, which is a feature of the UAE, has both benefited and hindered the construction industry. Adverse factors such as language barriers, safety education and quality awareness have added to the inherent construction risks, making a properly drafted contract for the construction industry even more important.

The UAE legal system is founded on principles of Egyptian civil law incorporating Islamic law in certain areas. Its Civil Code [2] is the primary source of law applicable to construction contracts with a specific section called "*Muqwala*", meaning the making of things or the carrying out of work. Bargaining power has traditionally been weighed in favour of the Employer, and Contractors, particularly those with limited knowledge of the local law, have often accepted contract terms without fully understanding the implications.

Modifications

The Conditions of Contract for Construction based on the FIDIC 4th Edition [3] or the Red Book [4] are still predominantly used. The format of these conditions is in two parts with Part II Particular Conditions intended to contain project specific amendments which take precedence over the Part I General Conditions, intended to be standard for all projects. Employers in the UAE frequently depart from FIDIC's contract strategy and modify Part I for their own use. It should be noted that FIDIC will grant licenses for users to prepare such amended conditions, [5] however licensed bespoke contracts are uncommon in the UAE.

The modifications to clauses range from minor edits to substantial redrafting. FIDIC contracts have been drafted by experts who understand the interdependency of the clauses and redrafting of clauses has the potential to compromise this complex interwoven structure. The principle of fairness in the FIDIC contracts which ensures that the parties share a reasonable allocation of risks and liabilities, with accrual of commensurate benefits, is also often compromised.

The modifications fall into two main categories:

- transferring the risk from the Employer to the Contractor
- allowing the Employer to retain control over the contract administration

An experienced Contractor would price the additional risks it has been asked to assume; therefore the Employer ultimately bears the cost. However the competitive tendering process can often leave a Contractor exposed to excess risks; which also equates to an additional risk to the Employer of:

- non-performance
- claims culture

Traditionally FIDIC has promoted good contract administration and the role of the Engineer is key to this. The intended role of the Engineer as the independent decision maker who administers the contract is impaired by the Employer's requirements to review, approve or even determine issues themselves. The Employer's desire to retain control over the Engineer's decision typically results in delayed decisions and ultimately delayed completion and / or increased costs.

In the 4th Edition, FIDIC requires the Engineer to be impartial [6] and in the Red Book to be competent, [7] professional [8] and fair in making determinations. [9] It has been evident in practice in the UAE that the Engineer is not always able to uphold these requirements due to the Employer's reluctance to give full authority for him/her to perform his duties. Bespoke contracts based on the 4th Edition often amend the term "Engineer" to "Employer's Representative" thus impacting on the Engineer's quasi-arbitral role in addition to the contract administration under that edition.

The Contractor's obligations under the FIDIC forms are based on English common law principles; typically that the works are executed in accordance with the Contract with skill and care. Under Design-Build or Turnkey Projects, the obligation is for the Contractor to complete works that are fit for purpose. Modifications in bespoke contracts often extend this obligation by, for example, adding express requirements to warrant the works. In addition, the Contractor has a joint and strict liability imposed on it by the Civil Code in relation to structural defects over a 10 year period which cannot be contracted out of. [10] The *Muqawala* Articles relating to construction, although subject to interpretation in court or by arbitration tribunals, set out clear contractual provisions. Contractors should consider UAE law when accepting a bespoke form of FIDIC, particularly the limitation of liability, liquidated damages, contractual time barring clauses, suspension and termination provisions.

FIDIC's English common law roots are also evident in some legal concepts and terminology. Concepts such as delay damages and time bars are treated quite differently under civil law jurisdictions, such as the UAE, and this may explain why Employers have attempted to modify certain terms and clauses.

What is certain is that the modifications the Employers typically make to standard FIDIC forms are in their favour and they create an imbalanced risk share which can reduce the likelihood for both parties of a successful project outcome. The modified FIDIC contract does not reflect the prevalent international contracting culture of collaboration for mutual advantage. This is perhaps why FIDIC is still predominantly used in the UAE and forms such as the NEC, which are based on a collaborative approach, are considered unsuitable for the UAE construction industry.

Consequences

The rapid growth of the UAE construction industry has not given the legal environment time to develop alongside the complexity of the industry itself. Common Law jurisdictions such as England have had the benefit of developing legal expertise over a long period in parallel to the development of the construction industry. It is likely that the legal framework relating to construction will develop further in the UAE as expertise is gained and the law is updated to reflect the industry requirements.

However, the expertise of FIDIC and the long experience of practitioners should not be lost. A collaborative effort to produce a "FIDIC Middle East Contract" should be considered comprising an industry standard set of particular conditions which reflect local law, and a risk-share balance acceptable to both Employers and Contractors. In parallel a change in attitude by Employers towards Engineer and Contractors to promote trust and collaboration would ultimately benefit all parties in allowing the focus to be on completing a project on time, to the required quality and within budget.

[1] Deloitte GCC Powers of Construction 2014 Construction sector accessed via Overview

http://www2.deloitte.com/content/dam/Deloitte/xs/Documents/realestate/construction/gccpowersofconstruction/me_construction_gccpoc2014_sectoroverview.pdf on 20 March 2015

[2] Federal Law No 5: 1985 (The Civil Code) Civil Transactions Law No. 5 of 1985

[3] FIDIC Conditions of Contracts for Works of Civil Engineering Construction, 4th Edition, 1987 (4th Edition)

[4] FIDIC Conditions of Contracts for Construction for Building and Engineering Works Designed by the Employer – The Construction Contract, 1st Edition, published in 1999 (the Red Book)

[5] Licence Agreements for modifying FIDIC Publications <http://fidic.org/bookshop/about-bookshop/licence-agreement-fidic-contracts>

[6] Clause 2.6

[7] Clause 3.1 Engineers Duties and Authority

[8] The FIDIC Contracts Guide with Detailed Guidance on Using the First Editions of FIDIC's 1999 Conditions for Construction, Plant & DB and EPC/T, Clause 3.1

[9] Clause 3.5 Determinations

[10] UAE Civil Code Article 880 and 882

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Expert Evidence in Adjudication

By Gerard McLean

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Very many UK construction disputes go to adjudication without any input from expert witnesses, even where the contentious issues are technical in nature. Given the often substantial sums at stake, this is surprising, but several explanations suggest themselves:

- Cost
- Expertise of the adjudicator
- Reliability of the expert's evidence
- Timetable
- Temporary nature of decision
- Standard of factual evidence

Cost

The most obvious objection to the use of experts in adjudication is probably that of cost. In a rapid process intended to maintain cashflow, an expert's fees may be disproportionate to the sum in dispute, and expert evidence may not be critical to persuade an adjudicator of an argument. In a typical adjudication, concerning say a main contractor's failure to pay its subcontractor, there is likely to be no need for experts. However, where the dispute involves a claim against a professional, expert input appears indispensable: the principle that "A court should be slow to find a professionally qualified man [or woman] guilty of a breach of his duty of skill and care without evidence from those within the same profession as to the standard expected" is as applicable in adjudication as in any other tribunal; professional negligence claims remain relatively rare in adjudication however.

Expertise of the adjudicator

Even among disputes on technical issues however, there are cases where the use of experts is unnecessary. The adjudicator is often selected for his/her technical knowledge, obviating the need for

technical experts. If, for example, the adjudicator is a quantity surveyor and the dispute concerns only the valuation of work agreed to have been properly completed, it would be reasonable for the adjudicator to make an assessment (if asked to do so), but more often a dispute crosses disciplines, also involving claims of defects in design or workmanship; in these circumstances an adjudicator from a specific professional background, while probably still at an advantage relative to a judge, is likely to require specialist advice in weighing the evidence presented.

Reliability of the expert's evidence

In litigation or arbitration an expert gives evidence under oath and risks committing perjury, whereas an expert in adjudication cannot. And, an expert providing a report to a court runs the risk of public criticism by the judge. Those unfamiliar with the work of experts might consider that the absence of these risks could encourage an expert to pay less attention to the accuracy and impartiality of a report for adjudication than s/he would for a CPR Part 35 report. However, while both the evidence provided to an adjudicator and the adjudicator's decision are confidential (by agreement or convention if not by law), any adverse comment by an adjudicator on an expert's evidence is unlikely to remain a secret; such comment would damage the expert's standing with the solicitors involved in the case, at least one of whom has previously instructed that expert. An expert eats or starves on the basis of his/her reputation, and no reputable expert would take such a risk.

Timetable

The limited time taken for a typical adjudication may discourage the general use of expert reports, at least on the part of responding parties. This provides no explanation for why referring parties do not appoint experts more often.

Temporary nature of decision

A party to a dispute might consider, or might be advised, that as inaccuracies in an adjudicator's decision can be corrected in subsequent litigation, an expert can be instructed later (if at all) rather than sooner. However, parties often enter liquidation following an adjudication, in which case any loss incurred through being on the wrong end of a decision based on incomplete evidence is likely to be irrecoverable. Besides which, the work done by an expert in an adjudication is likely to be of considerable use in any subsequent case, even if further investigation is found to be necessary.

Standard of factual evidence

Because adjudication is a less exhaustive process than arbitration or litigation, an adjudicator typically has to reach a decision on the basis of less complete factual evidence than an arbitrator or a judge. Where the factual evidence is incomplete, an expert's evidence is more likely to be qualified than would otherwise be the case; in that situation, opinion evidence may appear to offer poor value for money.

Conclusion

Adjudication has been described as the Ryanair of dispute resolution: it gets you to your destination, approximately, although a further leg of the journey may be required; typically, it runs on time and is cheaper than the alternatives; and little is offered in the way of comfort and gentle treatment. Extending this comparison: some users may consider expert evidence to be a "frill" that can be dispensed with in pursuit of lower costs.

Not every cost that can be eliminated is a frill, however: some costs cover basic services that customers, whether airline passengers or parties in adjudication, need. In the case of construction adjudication these basic services should include the provision of the best information available to allow the adjudicator to assess the opposing cases as accurately as the nature of the timetable and the process will allow. In many cases, dispensing with an expert's services is a false economy, leading to the adjudicator's decision being less accurate and, probably for both parties, less satisfactory.

[1] *Sansom v. Metcalfe Hambleton* [1998] 26 EG 154 at 156

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