

## **FIRE, RISK AND PROJECT GOVERNANCE**

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### **ABSTRACT**

The fact that deaths in a tunnel are possible can be confronting and politically difficult, therefore project decisions on risk can be difficult, even if the risks are very small. No one wants to be seen as 'compromising' safety, and so often there is a tendency to avoid responsibility for the final risk level.

The success of projects is related to the skill and dedication of people in design, construction and management and to the productive engagement with interested parties. But above all else, it is related to the framework set up for those people to work within. The project governance framework can either facilitate or thwart successful decisions on design and operation.

Governance reasons for success and failure are examined and a common approach is sought to project governance elements which will facilitate successful fire life safety design in any jurisdiction. Amongst other enabling characteristics, the key requirement is awareness of the role of risk decision maker and appropriate assignment of that role within the contractual framework.

*Keywords: project governance, risk, decision making, risk acceptance.*

### **1. INTRODUCTION**

It may seem trite to note that a successful project requires a range of parties with different skills, in roles that complement each other and are within the capability of the people involved. There are of course many ways in which the management of roles can cause detriment to a project. Compared to other project disciplines, underground fire safety seems to have a high incidence of project issues which have root causes that are organisational rather than technical.

The interest in this paper is in the definition of roles on fire safety, how they have sometimes gone wrong, and how they might best be set up in order that the right outcomes are achieved and management of the various parties through the project is straightforward. That is; it is more about the high level governance of the roles than about the day to day management.

The issues can be quite different in different jurisdictions, although it is surprising how exactly the same issues arise in very different cultural and contractual contexts. It is hoped that an examination of the issues may assist in setting some projects on a more productive path.

### **2. PAST DIFFICULTIES**

#### **2.1. Separation of cost and risk**

The most common difficulty is a real or perceived separation of the responsibilities for cost and risk. The cost responsibility for most major tunnel projects lies initially with an arm of government, either directly or through a project body. Once a contract is let, the contractor may be mostly or partly responsible for costs associated with subsequent design changes. The design work undertaken by both owner and contractor aims in some way to meet a desired standard or performance with reasonable cost. Through the contract, or by duty to the community, there is a cost-benefit, or cost-risk, balance to be found.

The role of the fire brigades may be loosely defined in the construction contract, but the fire brigade is mostly not a party to any contract. Fire service legislation is generally very clear on responsibility and authority when there is a fire, and often includes a regulatory role on building approval, but when it comes to major civil infrastructure, it is generally not clear that responsibility extends to determining an appropriate expenditure on risk reduction. Some legislation (e.g. in Queensland) provides for building approval on government projects to be handled internally by the proponent department of government. Of course, in practice, they will involve the fire brigades as advisors.

If there is no one else nominated to adjudicate on provisions made or omitted, and the contract as usual requires some approvals from the fire brigade, they are essentially put in the position of accepting risk. This can place the fire officers in a difficult position. If there is no defined risk acceptance route, and safety has priority, anything perceived as improving safety is likely to become required, no matter how marginally safety improves or at what cost.

A commercial corollary to this is that, if a fire brigade requests an additional feature to gain approval, it is not an instruction from the owner and so may not be contractually reimbursable. The power of the fire brigade to add cost to a contract, which has already been specified after consultation with the brigade, is interesting contractually. This is addressable by assigning the cost and risk decisions to a common party.

## **2.2. Authority of owner's staff**

A common issue is that the owner's staff who are dealing with the project issues daily are not necessarily empowered to accept design when it includes acknowledging remnant risk. Those who are empowered (typically CEO or minister) may not understand the significance immediately if project personnel are 'working through the issues with the fire brigade' and are reluctant to admit to or point out a project roadblock. It can be very difficult for a manager to consider that application of their management skill may not be the best way of overcoming an organisational issue. In this way, a project may go for some time (years) without a nominated "Acceptor of Risk". Any lack of remnant risk acceptance within the project allows that role to consolidate onto the fire brigades, as the only approval authority in the room.

## **2.3. Areas of technical understanding**

Fire brigades everywhere have experienced officers to plan operational responses and review firefighting provisions in the light of those plans. The experienced firefighters have a clear understanding of the value of each provision and the consequences of its presence or absence. The level of understanding of risk and other engineering analyses is far more variable. A fire officer planning a fire response does not need to consider probabilities as the particular fire is assumed. That is; it is taken for that purpose as having a probability of 1.0.

In any particular jurisdiction, it may be many years between tunnel projects. For this reason, it is likely that staff from all parties will be relatively new to the issues.

If a fire service feels responsible for risk decisions, but has limited ability to engage in the technical arguments, the 'caution margins' increase and an emphasis on chasing risk even lower can be accentuated.

The lack of appreciation of risk and decision making can be project-wide. When this occurs, we can see safety 'proven' by deterministic analyses with somewhat arbitrary inputs and no resulting handle on risk or whether it meets any of the 'ARPs' (ALARP, SOFARP, ANARP, etc). The author discussed this aspect in 2012 [1].

## **2.4. Adherence to process**

Around 2001, particularly in Victoria, there was a perceived problem with the standard of some fire engineering reports for buildings. The Australian Building Codes Board published a document which later became the “International Fire Engineering Guidelines” (IFEG). While the intention may have been to engender a more rigorous approach from the less scientifically inclined practitioners, it also became applied as a rigid approach by some of the less scientifically able practitioners. The parts of the IFEG which grant the engineer freedom to rearrange the process to suit the project are ignored by the rigid process adherents.

One manifestation of this issue is that the linear ‘process’ starts from scratch at each project stage. Specifications and provisions agreed between government and fire brigade at preliminary design stage are all opened up for re-‘fire engineering’ in a fresh ‘process’ at the start of a contract. In effect, the approach annuls the contract, in that the provisions above the collective signatures are no longer sufficient unless once again “agreed by stakeholders” through the ‘process’. In addition to not being inside the contract, the brigades may have new staff between the two project phases.

Rigid process adherents can also generate logical nonsense when the progress or the facts don’t fit the process. To paraphrase: “We can’t review your risk report on how you want to use your smoke ducts because, in the process, we must first agree the Fire Engineering Brief. We don’t agree the Fire Engineering Brief because of how your trial design uses the smoke ducts.

The above examples are Australian. In the US, projects often have a designated ‘code engineer’ whose job it is to identify and ensure compliance with any relevant codes, without necessarily having a grounding in the technical area described by the codes. This is a different layer of process, sometimes more technical than the Australian one, but still with its risk of producing poor results. One example result is dry sprinklers over a fire-sterile rail platform, isolated by valves that the fire brigade say they will never turn on.

Regardless of the jurisdiction, a rigid adherence to process, to the exclusion of common sense, can only serve to confuse the mechanism for acceptance of risk and cost. Besides the threat to sensible design outcomes, it can consume undue amounts of time from project directors on political matters which ultimately have little impact on the constructed outcome.

## **2.5. Unspoken realities**

There is a non-zero risk in anything we do and the risk from fire in a tunnel seems to be amplified in the mind. Because it is difficult to be seen acknowledging that there is such a risk, it makes it doubly difficult to reach a conclusion that provides other than the absolute minimum risk, regardless of how tiny the remnant risk is. On many projects, the roles and responsibilities around achieving that safety also become taboo subjects, with the apparent mismatches in authority, responsibility and, sometimes skill, not discussed. The taboos will be overcome when funding and risk acceptance come together.

## **2.6. Lost opportunities**

A consequence of the fire brigades becoming a de-facto design and risk acceptor, in isolation from costs, can be that conversations become skewed to a less collaborative style. A lack of design progress was once explained sufficiently by noting that everyone had been so busy with the politics, we had forgotten about designing. The fire brigades can be an invaluable design partner in planning the infrastructure and the response in a holistic sense. A successful project structure will capture the unencumbered inputs and advice from the operational fire brigades.

### **3. THE CHALLENGE**

The challenge for projects, jurisdictions, and perhaps for the transport tunnel industry as a whole, is to work out how to govern the fire safety decision making to get to the right answer for the community and in a way that facilitates projects. This particular challenge is separate from questions about how to evaluate risk, or how to design deluge. It is about who has authority to decide such things, who wears the remnant risk, and who bears the cost. The 'R' in all of the 'ARPs' stands for 'reasonably', and so the challenge is also partly about nominating an arbiter of reason.

### **4. ESSENTIAL ELEMENTS OF A GOVERNANCE FRAMEWORK**

#### **4.1. Acceptor of Risk**

The first requirement in setting up project governance of fire safety is to realise that the role of Acceptor of Risk is a critically important one and it matters who it is, for smooth and productive decision making. The realisation having been achieved, the Acceptor of Risk needs to be answerable to the community in some way and to have community interest as a primary driver. That really means that it needs to be an arm of government, or someone implicitly trusted by the government proponent. On safety matters, the fire brigade fits that description and for that reason they often are nominated into or assume the role.

The other quality that is important in the Acceptor of Risk is the ability to make rational cost-risk trade-offs. This is the characteristic most often missed. It is typically not part of the expertise of the fire brigades, who have no project cost connection at all. The requirement for the Acceptor of Risk to also be the approver of costs really restricts the role to the government proponent.

An alternative Acceptor of Risk is the government treasury or finance department. Economists in most government treasuries will be able to find an estimate for the economic value of life, although it will probably be called something more like; the economically justifiable expenditure to avoid a fatality. The reality is that government funds are limited and when making decisions about which remote hospitals to improve, which level crossings to grade-separate, and which intersection black-spots to fix, the cost-benefit ratio of each initiative has a value which is in units of \$/life. The value may be compared to that for other initiatives and to the benchmark value.

The fact that deaths due to fire in a tunnel are a realistic possibility can be confronting. We can avoid that discomfort if we don't look at costs but just install every feature imaginable, such that there is the appearance of risk being absolutely as low as possible (ALAP?) rather than ALARP or SOFARP etc. It is the injection of reasonableness into the risk outcome that requires the funding decision makers to be involved. However, treasury officials usually do not want to get involved in the detailed decisions on a project, preferring to fund to an expected community outcome and budget.

Practically then, this means that the government project proponent, who also has the cost drivers, must stay centrally involved in the risk acceptance, and not pass it on or allow it to be usurped by others. This may seem like a really simple point, not deserving of elaboration in this paper. However, from the projects where this aspect has been seen to go wrong, the point that cost and risk acceptance need to be tied together in the government proponent warrants the exposure given.

## **4.2. Risk benchmark**

This is not really part of the governance framework, but a criterion that can be passed on to the project team by the Acceptor of Risk. The 2012 Graz Tunnel Safety and Ventilation Conference had many papers on the evaluation of risk. It is suggested that, for modern road tunnels, quantitative risk analysis (QRA) will only show you that the risk from fire in the tunnel is vanishingly low. The risk is likely to be three orders of magnitude below the road traffic risk from all causes, or lower. QRA is unlikely to give design guidance in an absolute sense.

The Australian Standard on Tunnel Fire Safety AS4825 suggests a figure of two orders of magnitude below the prevailing road use risk. That benchmark was written with the express knowledge that it would take QRA, and all the arguments around it, out of the design decision process for new tunnels. A discussion on this was given in Graz in 2012 [1]. It is argued that, regardless of absolute risk, 'reasonable' efforts need to be made to prevent unsafe (stopped) traffic, facilitate self-rescue, control smoke, facilitate asset protection by the emergency services, and assist rapid resumption of operations.

In that context, the role of Acceptor of Risk requires the exercise of judgement on reasonableness more than it does the numerical comparison of a risk figure with a pass mark.

## **4.3. Clarity on other roles**

When the responsibility for risk and cost is clarified, it will be clear that other parties do not have that role. There are still many interactions where early, documented definition and agreement can avoid parties working at cross purposes.

For a complex project, there may be road and/or rail operators separate from the project proponent. Rail is interesting because most rail operations maintain a 'safety file' or 'safety case' describing how their operation is run to keep risk appropriately low. Some roads do this also. The relationship between such safety files and the project design needs to be considered and preferably agreed beforehand.

The local government area of the project will most likely have building regulations or by-laws relating to fire safety. This will affect control buildings and other ancillary spaces and may affect the tunnel itself. It is best if the extent to which they apply to the project is clarified for all at the start. To the extent that building by-laws apply, a Building Certifier may be involved and have interaction with the fire brigades, the designers and reviewers. While perhaps already known, those interactions are worth describing briefly.

If there is to be a peer reviewer involved, it is most likely to be to assist the Acceptor of Risk to come to terms with the choices, by offering an additional view.

Of course there will be designers, possibly as consulting engineers, in the mix as well. They are typically contracted either by the owner or by the contractor and so for these purposes they are part of those entities.

## **4.4. Project Agreement**

In Queensland, over the last several tunnel projects, the project governance with respect to fire safety has been recorded in an Intra-Governmental Agreement (IGA). This step has been a contributor to the projects running generally more smoothly over time. While IGAs are agreements between different arms of government, they also assist the contractors and other parties by clarifying for them how to approach matters and by providing a hierarchy and framework around the information they prepare and the responses they get from government.

It is important that a project agreement, or governance framework in some form, be prepared prior to any contract. A contract prepared before the issues above have been acknowledged can lock in some of the difficulties. With the inertia of contracts between large organisations, it is then hard to unwind.

## **5. CONCLUSION**

Fire safety design on many projects is made more difficult than it need be by inappropriate assignment of responsibilities and authorities. Where this happens, with few exceptions, it is not by intent, but due to a lack of awareness of the problems. The solution is a governance structure which includes the government proponent funding the project taking the role of Acceptor of Risk. In some cases, this will be sufficient on its own. For more complex projects, there will likely be a need to extend the framework to describe the expected inputs, responsibilities and authorities of a range of interfacing parties.

In some ways this conclusion is so simple and self-evident that it is bit of an anti-climax. Based on my early experience, I suggest that when deep in a project, the existing organisational structures can powerfully restrict recognition of the obvious. Whatever the reason, projects do go wrong in the ways described. The hope is that this paper will help some to avoid the pitfalls and achieve greater value and creativity in fire safety design.

## **6. REFERENCES**

- [1] Stacey C.H.B. 2012. Refurbishment, risk and responsibility – decisions when upgrading tunnel fire provisions, 6<sup>th</sup> International Conference ‘Tunnel Safety and Ventilation’ 2012, Graz.