

What Corporate Counsel Need to Know About Engaging Forensic Engineers

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Abstract

Forensic engineering is the application of the art and science of engineering in the jurisprudence system, requiring the services of appropriately qualified and experienced professional engineers. Forensic engineering may include investigation of the physical causes of accidents and other sources of claims and litigation, preparation of engineering reports, testimony at hearings and trials in administrative or judicial proceedings, and the rendition of advisory opinions to assist the resolution of disputes affecting life or property. Forensic engineers may also be required to give evidence to a tribunal as to the cause and reasonable options for replacement or repair.

This paper outlines the services that forensic engineers can provide, and emphasises the importance of their early and appropriate selection and engagement by the relevant legal team. A distinction is made between the roles of “clean” and “dirty” experts, and the need to clearly define the desired role to be undertaken by the expert. The responsibilities of corporate counsel in ensuring that appropriate information and support is provided to forensic engineers are highlighted. Examples are given from some case studies.

The issues of the time and cost of forensic engineering services are discussed in the context of how these can be appropriately managed by corporate counsel. The tools available to forensic engineers to manage and report on their activities are noted, with particular reference to “CTRs” – schedules of the cost, time and resources required for the defined scope of the identifiable components of the required tasks.

Introduction

Commercial enterprises may need the assistance of forensic engineers for a variety of purposes. This paper is intended to provide guidance for corporate counsel who have to engage the services of a forensic engineer. Faced with such a need for the first time, corporate counsel may be bewildered by the range of expertise available, and may not be clear on the most appropriate procedures for finding and engaging the most appropriate forensic engineer for the task in hand.

The paper suggests a procedure for finding, engaging and managing a forensic engineer who is appropriately qualified, and who will deliver value for money with appropriate predictability and accountability.

What is forensic engineering?

As used in this paper, the term *forensic engineering* is “the application of the art and science of engineering in the jurisprudence system, requiring the services of appropriately qualified [and experienced] professional engineers. Forensic engineering may include investigation of the physical causes of accidents and other sources of claims and litigation, preparation of engineering reports, testimony at hearings and trials in administrative or judicial proceedings, and the rendition of advisory opinions to assist the resolution of disputes affecting life or property.”¹ Forensic engineers may also be required to give evidence to a tribunal as to the cause and reasonable options for replacement or repair.

Thus, forensic engineering may be confined to giving technical advice to counsel for “internal” purposes of the organisation, such as a technical review of the adequacy of a facility as part of pre-purchase due diligence, or it may be required for “external” purposes, such as expert evidence in a trial or arbitration that will determine the legal liability for defects or failures.

As noted below, it is important for corporate counsel to clearly understand the role they wish the forensic engineer to undertake, as this will have a considerable influence on the way the engineer is briefed and how s/he reports.

“Clean” and “Dirty” experts

Corporate counsel should understand before briefing a forensic engineer whether s/he is required to act as an independent expert (often referred to as a “clean expert”) or an expert consultant (often referred to as a “dirty expert”). The terms “clean expert” and “dirty expert” relate to whether or not the expert is seen as a member of the legal “team”. Which type of expert role is required of the forensic engineer will determine how the forensic engineer is instructed, what documents s/he is provided with, what investigations s/he may conduct and what type of report the forensic engineer is instructed to prepare. It is therefore critically important that corporate counsel define in the brief to the forensic engineer whether s/he is engaged as an expert required to maintain independence from the legal team, or as an expert consultant to assist the legal team.

The appropriateness of engaging a forensic engineer as a “clean” expert or a “dirty” expert can only be assessed in the light of the relevant facts at the time. If the forensic engineer is specifically engaged to provide expert evidence in litigation or arbitration, it is clear that the forensic engineer must not be provided with any documents, e.g. on the client’s case theory, that could jeopardise his/her independence.

Conversely, if it is not known whether or not litigation or arbitration might ensue, it may be appropriate to engage an expert consultant who can assist the legal team in whatever manner is appropriate and to the fullest extent possible, recognising that an independent expert may have to be engaged at a later time. This may often be the case at the early stages of an investigation that corporate counsel is required to undertake, before the legal dimensions of the issue are known, or whether litigation may ensue. In such cases, corporate counsel would be well advised to obtain the services of a “dirty expert” who can participate in determining the legal course to follow subsequently. Such an expert may ultimately be a valuable resource in selecting and briefing a “clean” expert when required.

There is a possible third type of role that an expert may be required to fulfil: an independent party who determines disputes between parties acting as an expert but not as an Arbitrator. Such a role as an “Expert Determiner” would not normally be regarded as within the remit of a “forensic engineer”, and is not considered in this paper.

¹ Peter Campbell (ed), *Learning from Construction Failures: Applied Forensic Engineering* (2001)

Selecting the most appropriate forensic engineer

Defining the scope

The first step in the engagement of a forensic engineer is for corporate counsel to clearly define the task that the engineer is required for, i.e. the scope of the forensic engineer's services. It is frequently the case that the full extent of the forensic engineer's role is not clear at the outset. However, the initial task should be defined with some precision, e.g.:

- investigate a failed facility and provide a report to corporate counsel on the technical causes of failure, to enable counsel to report to management on the legal consequences for the organisation; or
- review pleadings and evidence in litigation or arbitration, and prepare an expert witness statement for use in the proceedings.

Defining the scope with precision is fundamental to selecting the most appropriate forensic engineer, because it is the scope that determines the threshold issue of the skills required. Of course, the scope may evolve over time: corporate counsel may not understand the full ramifications of the issue at the outset, or have insufficient knowledge of the technical requirements, or the forensic engineer's investigations may need to go in a different direction to that initially anticipated.

Part of the scope of the forensic engineer may be to define the full scope of services required, after an initial investigation of the facts and the issues. Nevertheless, the initial scope should be defined as clearly as possible, particularly what are the "deliverables": those outputs of the forensic engineer's intellectual property provided to the client, e.g. a report on the causes of failure, or a presentation to senior management as to the recommended further investigations necessary.

Engineers and forensic engineers

Selecting the most appropriate forensic engineer is no different in principle to the process of selecting the most appropriate engineer for any design or construction task. Many organisations regularly engage consulting engineers for a variety of design and construction tasks, and have well established procedures for procuring the most appropriate engineer for the task in hand. The difference is that the "client" for the forensic engineer will be a lawyer, who may not be familiar with the engineer's discipline, but needs the engineer's technical expertise to assist in the resolution of (usually) a legal issue.

There are many branches of engineering, and many subspecialties within each of those branches. Whilst there is no universally accepted classification of the main branches of engineering, the main branches of civilian engineering (as opposed to military engineering) would probably be generally agreed to be: civil engineering, mechanical engineering, electrical engineering and chemical engineering. There are also many other specialised disciplines which are recognised as unique areas of engineering expertise, e.g.: petroleum engineer, mining engineer, materials engineer, aeronautical engineer.

Civil engineering includes structural engineering, geo-technical engineering, environmental engineering, traffic engineering, hydraulic engineering, hydrologic engineering, as well as "classical" civil engineering comprising engineering of roads, dams, tunnels, canals, harbour works and other infrastructure. Mechanical engineering involves mechanical equipment of all kinds, and includes various subspecialties such as air conditioning. Electrical engineering includes power engineering, electronics and instrumentation. Chemical engineering includes process engineering and metallurgy.

Specialisation within every branch of engineering has reached the point where the traditional "branches" are no longer very useful descriptors of the skills that any

individual engineer has. If a corporate counsel requires a forensic engineer to investigate the failure of a piece of machinery, he may require the services of a structural engineer (a species of civil engineer) and/or a mechanical engineer, depending on the ultimate cause of the failure. Whatever the basic discipline of such a forensic engineer s/he will need to have sufficient expertise to recognise the possible causes of failure, and knowledge of the appropriate analytical tools to use in theoretical investigations to confirm a failure hypothesis. S/he will also need to know the limits of her/his expertise, to be able to advise when another expert is required.

Engineering of a project of any size requires the input of a team of engineers. Any modern project will inevitably require the skills of different "types" of engineers as outlined above. For example, even in a traditional "civil engineering" project such as a bridge, other discipline engineers will be involved: electrical engineers for the lighting and any electrical services, traffic engineers for planning traffic management during construction and in final service, electronics and software engineers for any electronic tolling system, materials engineers to specify the materials required to fulfil the specified durability requirements, mechanical engineers to design maintenance platforms required to inspect and maintain the bridge during its life, etc.

Quality management of engineering

In addition to the different engineering discipline teams involved in any engineering project of any size, each individual engineering discipline will involve a team of engineers to provide independent checking and quality assurance of the final product. In many developed countries it is now virtually mandatory for the engineering of any significant facility to be carried out by an organisation that has an accredited quality management system ("QMS"), usually certified to an international standard such as ISO 9000. Such a QMS requires documentation of the processes that the organisation will follow in producing its "deliverables", and the certification is based on audits that provide objective evidence that these procedures are being followed.

An integral part of any QMS in engineering practice is the element of checking, particularly where there are complex engineering calculations and/or modelling using advanced analytical software. Such work, requires the input of a team, indeed the checking requirement cannot be achieved without more than one individual. Often an engineering firm has specialists in analysis, who work alongside subject matter experts, whereby their combined efforts are integral to delivery of the design. Similarly, when undertaking forensic engineering investigations, particularly those involving complex engineering calculations and analyses, for corporate counsel to have any degree of confidence in the findings, there should be a requirement to demonstrate that the work has been done by an appropriately qualified and experienced team, in accordance with an accredited QMS, involving formal checking of the work.

The engagement of a single named "expert" as a forensic engineer, no matter how eminent or experienced, does not of itself guarantee that a correctly derived finding will be delivered. Indeed, without checking it may be just as prone to individual error as the engineering that is the subject of the investigation. This does not suggest that the forensic engineering team should not be lead by a "lead expert" who may also present, represent and defend the work in court if required. However, in the modern world of engineering practice, it is considered to be "bad practice" to engage engineers who deliver work of a critical nature if they do not operate a recognised QMS. This applies equally to the work of forensic engineers (which may be relied upon in court), which should also be subject to formal checking along each stage of its production. Why should an individual expert be considered to be above good engineering practice and not as prone to human error as other engineers?

Matching scope with required expertise

It should be clear from this that the most appropriate forensic engineer for a particular brief will have specialised expertise and experience in the specific scope of work for which they are to be engaged. Whilst no two engineering problems are identical, previous proven experience in the same type of work is usually of great importance. Further, if the forensic engineering may lead to a requirement to give written and oral testimony, previous experience in preparing expert evidence is of great benefit.

For those experts who have a particular subject matter expertise, the giving of an expert opinion based on evidence put before them (e.g. specimens, data records etc) can often be provided without the need to undertake complex calculations and/or analyses. Often practicing academics, researchers or senior level consultants in a narrow field of expertise are well placed to provide an expert opinion as a sole practitioner. However, where the opinion relies upon detailed and complex engineering calculations and/or analyses, academics and sole practitioners typically do not have the technical resources and quality management systems and procedures to deliver work that would meet "expected good practice". Legal counsel are often not aware of the significant differences in engineering practice, and the associated resources, procedures and systems required to provide quality assured engineering design calculations and analyses. In the authors' view, where complex engineering calculations and analyses are central to the expert opinion being provided, the engagement of sole practitioner experts is not good engineering practice and invites the possibility of flawed opinions. This is because the opinions of a sole practitioner have not been subject to necessary checking nor rigorous team questioning in their formulation (particularly in terms of modelling assumptions adopted).

The sources of information available to a corporate counsel seeking a forensic engineer with experience and expertise in a particular narrowly defined area are many and varied. If the counsel's organisation has its own engineering expertise, this is usually a good place to start. Professional organisations such as the Association of Consulting Engineers (UK) or the local member organisation of Fédération Internationale des Ingénieurs-Conseils (FIDIC) should be able to provide the names of consulting engineers with suitable expertise. Legal colleagues, including corporate counsel, solicitors and barristers may have had recent experience with forensic engineers. There are also commercial organisations that maintain databases of experts on the Internet that may include appropriate forensic engineers.²

However, the source of expertise for any such databases of experts should be understood and used appropriately. Some of these databases comprise mainly or solely academics or researchers who offer themselves as sole experts for forensic engineering and litigation. Many of the bodies which provide the databases of experts tend to be "clubs" in nature, and are thus run as closed shops with restricted access. The qualifications of the gatekeepers and the criteria they use to assess who should or should not be on their registers is often opaque and does not guarantee genuine current expertise. Selecting an expert by carrying out an Internet search is fraught with risk: overblown claims of expertise cannot be critically assessed from the information presented even when read by those with expertise in the area.

Whilst the individuals on academic databases are usually well credentialed, with large lists of seemingly relevant publications related to the particular subject matter expertise,

² e.g. <http://www.expertsearch.co.uk/> contains 131 entries under "forensic engineers"; <http://www.experts.com/> contains 39 entries under "forensic engineers" (36 in USA); <http://www.expertguide.com.au/default.aspx> contains 356 entries under "engineering" (Australia); <http://www.unisearch.com.au/index.html>

they often lack genuine experience in the practical implementation of the technology in the "real world". Without in any way criticising the intellectual output of modern engineering academics, it should be noted that current career pathways promote those who remain within the university system. The emphasis is on the output of a large quantity of papers each year, without necessarily encouraging, rewarding or recognising the benefit that engineers gain from participation in industry and/or having spent a significant part of their career in industry (as was certainly the case in the past). Academics, though expert in aspects of technology, do not always bring a worldly perspective as to how a practicing engineer would or should in the "real world" use the expertise the academic may have or have access to from their research. As such it is rare for an academic to be in a credible position to give an informed opinion as to what a "peer practitioner" would or should have done in a practical situation, what assumptions should have been employed and analytical tools used, etc, as they often have little or no recent current industry practice on they could base such an opinion.

From our experience, we tend to find that there are few engineers with genuine skills and expertise in forensic investigations, and those that do have such expertise tend to work in the "space" of remedial engineering, upgrade and life extension, working on legacy systems or structures, or in the application or adaptation of new technology into industry. Those involved in conventional detailed design or construction tend to be driven by codes of practice and the economics of projects that demand using proven off-the-shelf solutions or approaches, which are well established in practice and do not rely upon niche expertise for application. As such, these engineers, though competent and well experienced practitioners, do not necessarily make experts, and do not normally employ a forensic engineering approach in their day-to-day practice.

Where does one find experts?

A genuine expert with current expertise will, as a general rule still be in practice. If retired, they will rarely be "put out to pasture" without ongoing links to a firm still working in the "space". Large project engineering firms tend to have an aversion to their engineers being involved in forensic engineering work in which their personnel may end up as an expert in litigation; this ties up valuable resources in an often demanding and unpredictable mode, and may be viewed as detrimental to the firm's existing business relationships (e.g. making adverse observations on existing or potential clients, or competitors who may do the same to them).

Further, such large project engineering firms tend to be focussed on engineering well covered by codes and/or with low technical risk, and thus not working in the expert "space". As such, we have found that forensic engineering skills and experts suitable for forensic engineering and litigation work are mostly found in small to medium sized consulting engineering firms. Often these firms attract engineers with post-graduate and/or research backgrounds, who have been motivated to grow subject matter expertise throughout their practicing career, which small to medium sized firms will often accommodate and encourage, as it melds well with their client-base and practice. Such firms will often know who in the industry do and do not have genuine expertise, as they come across these players both in business and in their professional reading, conferences etc.

Ideally, the search for forensic engineers with the experience and expertise appropriate to the defined task scope will identify several potentially suitable candidates. The task then becomes the selection of the "best" from the alternatives.

Time, cost or quality of services?

The forensic engineer ultimately engaged will have to reconcile the conflicting demands of satisfying the scope of the brief in terms of time, cost and quality:

- performing the required scope of work within the required timeframe – perhaps under considerable constraints from court set deadlines;
- maintaining the cost of the investigations within a defined budget or not-to-exceed fee;
- providing the services to the required quality.

It is trite to observe that in any forensic engineering brief (or any other intellectual endeavour), it is not possible to have the highest quality delivered in the shortest time at the lowest cost. Inevitably there is a trade off between the demands of completing the scope to the appropriate quality within the required timeframe at an acceptable cost. In selecting the most appropriate forensic engineer, corporate counsel will have to make their own value judgement on where the appropriate balance lies. By way of example, the most experienced and expert forensic engineer (who could be expected to deliver the highest quality) may cost significantly more than the other contenders, or may not be able to provide the deliverables within the required timeframe because of other commitments.

If corporate counsel seek proposals from more than one forensic engineer, it is recommended that these be based on the same scope of work. In addition to seeking information on the time, cost and quality of the services to be offered, corporate counsel may also wish to seek details of regular reporting to enable monitoring on the fees and progress of the work. In this context, the primary determinant of the quality that can be expected will be the identity of the individual(s) who are going to perform the work. Typically, the skills and experience that will be required will only be available in very senior individuals with years of experience. Such individuals inevitably have a high charge rate, particularly in circumstances where they are required to commit significant periods of time for court appearances.

It is suggested that typically, a forensic engineer should be selected on the basis that s/he can provide the required quality, and their conditions of engagement should be tailored to ensure that the services are delivered within the required time and budget.

Briefing a forensic engineer***Who should formally engage the forensic engineer?***

In most situations, it will be desirable for the forensic engineer's services to attract legal professional privilege to the extent possible. In many cases, particularly if litigation is contemplated, it will be very important.

The common law test for legal professional privilege in many jurisdictions is whether a communication is made, or a document is prepared, for the dominant purpose of a lawyer providing legal advice or legal services. Ultimately it is a question of fact as to whether the communications of a forensic engineer were prepared for the dominant purpose of a lawyer providing legal advice or legal services. However, corporate counsel can preserve legal professional privilege to the maximum extent possible by ensuring that the forensic engineer is properly engaged, and the brief is carefully worded to ensure that the dominant purpose is for legal advice.

Corporate counsel should thus be aware of the appropriate entity that should engage the forensic engineer. Clearly the engagement should come from a legal practitioner, and not some other part of an organisation, such as the engineering department. In many situations, there may be a real doubt as to whether the engagement of a forensic engineer

by corporate counsel would in fact preserve legal professional privilege; many courts view corporate counsel's non-legal activities as having the effect of waiving legal privilege. If considered necessary to preserve privilege, corporate counsel may need to have the forensic engineer formally engaged by, and reporting to, an outside law firm, particularly if litigation is contemplated.

Where a forensic engineer is engaged by an outside law firm as a "clean" expert on behalf of the end client, the authors strongly recommend that the formal engagement of the forensic engineer be by that law firm, and not by the end client. The authors have observed an emerging trend where the law firm, whilst instructing the experts, are not engaging the experts, but instead having the experts directly retained by their clients. The reasoning for such an arrangement is apparently to reduce the costs for the client, by avoiding the "mark-up" that the law firm would normally put on the experts' fees. It is clearly not avoiding any fees associated with management of the expert by the law firm; this interface remains, as the client is not involved in instructing the expert. It may be a moot point as to whether or not legal privilege of the expert's work is preserved by such a contractual arrangement.

However, in the authors' view, this is not an appropriate basis for retaining the expert. Indeed it sets-up and promotes a situation where the client may refuse to pay the experts fees if they are more than they had been lead to expect by the law firm. This can occur in situations where, although the law firm is instructing the expert and managing that interface, it has no direct contractual responsibility to pay the fees of the expert, even if such fees were increased based on their instructions. In our view, it is not ethically appropriate, nor constructive to the provision of an untainted expert opinion, if the expert has been required to argue for payment of its fees with the client, where it had no direct contact with that client when responding to the instructions of the law firm. This practice of engaging experts should be avoided.

Proper management of the forensic engineer's brief, along the lines outlined below, should avoid any surprises on the engineer's fees. If the scope is changed or increased, there should be a reporting mechanism that will provide early warning of the time and cost consequences of the changes that will facilitate proper management of those changes by the instructing law firm or corporate counsel.

Technical briefing of a forensic engineer

Corporate counsel should also be conscious for the potential for conflicts of interest to occur where their organisation's own engineers (often those involved in the original design, and sometimes themselves culpable in the failure) are the ones who liaise with the legal counsel in both recommending the experts to be engaged and in preparing the brief for experts. In some cases, particularly where they are genuine experts in their own right, this can be very beneficial in avoiding the engagement of weak or inappropriate experts (even pseudo-experts). Further, such an expert engineer may also provide a well targeted (and well supported by key data etc) starting point for the experts to begin their investigations.

However, in the authors' experience, that situation tends to be the exception to the rule. In most instances, we have found the client's engineers originally involved in the project to have been dispersed to the wind, as project teams come and go, staff move-on; sometimes companies (or at least their engineering/technical teams) are no longer in existence. When some part of the engineering team remains, it is often the case that they are generalists without the requisite skillsets to provide useful and insightful input to forensic investigations or litigation, or they are too narrowly focussed in their subject

matter expertise, and unable to provide useful input beyond the bounds of their day-to-day operational duties.

Where they were involved in the design/manufacturing/constructional failure, they tend to be very defensive in their dealings with experts. They may be in a state of denial, which does not assist in divulging the full extent of the circumstances involved, nor in identifying what expertise is required, or the scope of the forensic investigation required to provide a sound defence.

We consider it is usually better to engage a "dirty expert" up front to review the lay of the land, and to advise on the likely technical lines of attack that may eventuate and the soundest lines of defence that could be relied upon. This may in turn identify the required independent expert(s) and briefs they should embark upon. Further to the above noted points on the use of academics as experts, our experience is that engaging academics as "dirty experts" can be detrimental to the case if they are not skilled in litigation and are without genuine and current industry practice.

The forensic engineer's brief

Regardless of the entity that formally engages the forensic engineer, it is suggested that the brief should contain requirements as follows. For simplicity, it is assumed in what follows that corporate counsel will brief the forensic engineer, even though that may not be the actual situation in some cases.

The importance of clearly defining the scope of the forensic engineer's services at the outset has already been emphasised. In addition to scope definition, the brief should also contain:

- the agreed basis of fees to be charged, including any cap or budget limit;
- the time in which the work has to be completed, or the time by which individual milestone activities are to be achieved;
- the "deliverables" to be provided by the forensic engineer at each stage;
- any required regular reporting on progress and/or fees;
- a requirement that any change in assumptions or scope is to be communicated immediately to corporate counsel;
- clear details of who to, and how, reporting on the substance of the forensic engineer's findings is to be done.

These items are required to provide the tools that corporate counsel need to manage the forensic engineer's brief discussed in the next section. As discussed above, in many cases it is not possible to fully define the brief at the outset. However, a properly prepared brief will recognise that changes may occur, and provide a framework for managing those changes so that there are no surprises.

An important part of the brief will be the information provided, on which the forensic engineer will base his/her advice and opinions, often supplemented by the engineer's own observations. The two prime requirements of this information are that it be comprehensive, and original. As with other aspects of the brief, corporate counsel may need assistance, perhaps from the forensic engineer, in determining what available information is required for comprehensiveness. In the authors' experience, the best solution may be to give the forensic engineer access to the original filed information, and enable him/her to determine what available information is required. This is particularly the case in relation to discovered documents. The schedules of documents required to comply with court rules on discovery would rarely be adequate for the forensic engineer. A better solution is to allow the forensic engineer to make his/her own inspection of the

original documents; based on his/her knowledge of the documentation of similar projects, s/he will generally be able to find the key documents expeditiously – perhaps even the “smoking gun”.

The requirement to provide the forensic engineer with original documents is fundamental to maintaining his/her independence, and ability to give appropriate advice. The author has experience of a brief in which the forensic engineer was engaged to act as an expert witness in court proceedings. Briefing materials included operational records that were fundamental to the analyses to be carried out by the forensic engineer. The material provided at first instance had, however, been “pre-processed” by the client organisation, perhaps in a misguided effort to save the expense of the forensic engineer carrying out the preliminary analysis of the data. The forensic engineer advised that s/he would be unable to sign the required undertaking to the court on independence unless the original data was provided. The original data was provided shortly thereafter!

Managing a forensic engineer’s brief

In managing a forensic engineer’s brief, corporate counsel will have expectations of the forensic engineer that have (hopefully) been defined in the brief. Corporate counsel can reasonably expect the forensic engineer to comply with the brief requirements, and report formally or informally as required, that those requirements are being met.

Given the importance of clear communications, not only in maintaining control, but also in preserving legal professional privilege to the extent possible, it is highly desirable that the formal reporting process defined in the brief be adhered to at all times, both by corporate counsel as well as by the forensic engineer. The forensic engineer may have interfaces with a number of other people in the client organisation, such as lay witnesses who may need to provide factual material on which the forensic engineer bases her/his work. Nevertheless, any reporting on the forensic engineer’s findings should be confined to the approved formal reporting process.

It may be desirable to emphasise to the forensic engineer that, notwithstanding the intention to maintain legal professional privilege, all of their material prepared in connection with the brief may ultimately be subpoenaed in court or arbitration proceedings, and they could be cross-examined on any material changes in wording, analysis or conclusions between draft reports. Any inadequately considered communications or draft reports revealed in discovery could thus detract from the credibility of the forensic engineer’s ultimate findings.

It may be appropriate to point out to a forensic engineer that there is no requirement, ethical or otherwise, which compels retention of copies of his/her working documents and drafts prepared in the process of writing the final report. Ultimately, it is a matter for each individual forensic engineer as to how they manage their own records. Most experienced practitioners have their own internal practice of retaining on file (whether paper or electronic) only the documents of significance to their final analysis, and make no effort to preserve any others.

Corporate counsel will be concerned to ensure that the forensic engineer’s commitments to time and budget are met, and can reasonably expect regular reporting to document actual against anticipated performance. Many consultants have internal management and reporting tools that can provide, on a weekly basis if necessary, reporting of actual progress against the budget and time program. The discipline of the forensic engineer producing, and corporate counsel reviewing, such regular reports should give early warning of scope change or “creep”, the anticipated budget being exceeded, or the projected time for deliverables not being met.

CTRs

One such management tool used by some consulting engineers is the “**CTR**” – a formal tool to plan, manage and report cost, time and resources on a task by task basis. The principle behind CTRs is the ability to subdivide any project into smaller tasks, and if necessary, sub-tasks that can be individually planned and resourced.

For each sub-task CTR, the following can be defined or estimated:

Scope:

- what work is required to complete the sub-task;
- client input required;
- consultant input required;
- consultant deliverable to client;

Time:

- start date;
- end date;

Resources:

- for each category of staff: estimated number of hours;
- other resources: software, consumables, communications, travel and subsistence, subcontracted services and products;

Cost:

- for each category of staff: estimated cost;
- total cost for all staff.

The total time, cost and resources for a specific task is determined by aggregating all of the relevant sub-task CTRs. Similarly, the total time, cost and resources for the entire assignment is determined by aggregating all of the task CTRs. By breaking down an assignment into “bite sized chunks”, a project of any size or complexity can be understood, and realistically planned and managed against tangible criteria: delivering a defined scope of work, based on known inputs and outputs, from anticipated resources and within a specific time frame. Variants of this technique for planning large projects have been used for many years; the increasing demands on performance by consultants has formalised the process such that it is now in common use, particularly in certain industries such as oil and gas.

The value of CTRs, properly used in managing performance, is that in defining what is to be done, it highlights departures from the original assumptions. These departures may be at the input level, e.g. the client may not have provided the required data by the defined start date of a sub-task, or the output level, e.g. the consultant may not have provided the agreed deliverable by the end date stated. It also provides a formal mechanism for dealing with a change in scope: e.g. if a new deliverable is required, a new CTR will need to be prepared, or an existing CTR amended. In either case, there is a basis for assessing the time, cost and resource impact of the scope change.

Whilst the client may gain great benefit from the forensic engineer’s use of CTRs in planning, managing and reporting, corporate counsel should be careful not to intrude into the consultant’s internal management processes. Where CTRs are used, what corporate counsel need and should expect, is high level reporting on progress based on the consultant’s analysis of the CTRs. Corporate counsel do not need, and should not expect, to be provided with the CTRs prepared by the consultant for its own internal purposes.

Conclusions

This paper has made proposals on the selection, appointment and management of forensic engineers. They are intended to assist corporate counsel in finding the most appropriate engineer for the task in hand, ensure that the brief is properly prepared, and that the work is then managed in accordance with the brief.

The work of forensic engineers is frequently of great economic importance to corporate counsel's enterprise. It may relate to determining the organisation's liability for damages, the extent to which damages can be recovered from others, or the organisation's liability to penalties under statute. Accordingly, it is suggested that the primary focus in engaging a forensic engineer should be to find the engineer with the most appropriate experience and expertise directly related to the task for which they are engaged. In the case of forensic engineers who may be required to give expert evidence in court or an arbitration hearing, previous court experience, and a demonstrated ability to communicate complex technical issues clearly are important attributes.

The starting point for the brief is a clear definition of the scope of the work required of the forensic engineer. In preparing the forensic engineer's brief, corporate counsel needs to be mindful whether s/he is to be engaged as a "clean" or a "dirty" expert. If the expert is required to be an independent expert, the material provided to him/her should be appropriately limited. Although it may not be possible to retain legal professional privilege over the forensic engineer's communications, the possibility of this will be maximised by formal engagement of the forensic engineer by a legal practitioner, and a careful wording of the brief so that the dominant purpose is to assist with the provision of legal advice. The brief should also recognise the possibility or likelihood that the scope may change after preliminary investigations have been carried out, and require regular reporting of progress.

Corporate counsel can endeavour to avoid surprises by requiring the forensic engineer to comply with the regular reporting requirements in the brief, both in relation to progress of the work, and the financial performance in relation to any budget. Many engineers will have internal management tools for such purposes, based on the use of CTRs or something similar. Such regular reporting should flag potential issues in relation to the timing of the deliverables, performance against the budget, or whether the scope needs to be revised for changes that have occurred because of changed instructions, or changed circumstances.

Dr Donald Charrett BE(Hons), LLB(Hons), MConstLaw, PhD, FIEAust, MIAMA

Dr Charrett was appointed a Non Executive Director of AMOG in 2010, and assumed the role of Chairman in late 2011.

He currently practises as a barrister at the Victorian Bar, specializing in building and engineering disputes, and is an accredited Arbitrator and Mediator. His career in construction law has included litigation, mediation, expert assisted determination, facilitation of an experts' conference, arbitration of construction disputes and membership of dispute boards. He is an accredited FIDIC trainer, a Founding Member of the Society of Construction Law in Australia, and is the first chairman of Melbourne TEC Chambers, a "virtual" chambers of barristers at the Victorian Bar. He also chaired the Committee that organized the Fourth International Construction Law Conference, held in Melbourne in May 2012.

Prior to becoming a lawyer, Dr Charrett worked as an engineer for over 30 years, commencing with three years on the staff of Monash University. His engineering career

as a consulting engineer included 12 years as a director of a medium sized Australian consulting engineering firm carrying out design for projects in the offshore, mining and infrastructure sectors. His engineering experience included computer applications, structural design, managing engineering projects and acting as an expert witness, and management roles in contract negotiation and administration, insurance, international joint ventures and corporate restructuring.

Dr Charrett has published widely on legal and engineering subjects, and presented papers at engineering and legal conferences and seminars in Australia and internationally. His legal publications include articles in Australian and international journals on FIDIC contracts, the avoidance of disputes, scope and risk in contracts, contractual lessons from past projects, design and construct contracts, quantum merit, solidary liability, professional indemnity insurance, reinsurance and managing design risk. He is a joint author, with Philip Loots, of “Practical Guide to Engineering and Construction Contracts”, published by CCH in 2009.

Dr. Andrew Potts BE(Hons), MEngSc, PhD, FIEAust, CPEng, FRINA CEng, MSNAME, MAICD

Dr Andrew E Potts is the founder and Managing Director of AMOG Consulting. Dr Potts is predominantly engaged by the offshore oil and gas sector on projects relating to hydrodynamic loading and response of fixed and floating offshore structures, submarine pipelines or highly flexible systems such as moorings or flexible risers. This work involves advanced numerical and finite element analyses, complemented by physical model tank testing. It ranges from development of design criteria and concept engineering, through to detailed design of various aspects of facilities, structures, operations and installations.

His skills in project management and technical engineering across many disciplines, often see him engaged to provide specialist advice in business plans, project management, specification development, tender evaluation, contract negotiation and assessment of contract deliverables. This work often extends into the field of failure investigation, forensic engineering and the provision of expert witness services.

Dr Potts has extensive experience in supporting legal cases, both as a “clean” and a “dirty” expert. This experience has included working with counsel to frame statement of claims/defence, as well as extensive time in court providing expert testimony and/or in supporting counsel in the critiquing of technical and expert evidence.

AMOG is a leading global provider of specialist analytical and design solutions to the energy, resources, defence, rail and maritime construction industries. AMOG has offices around Australia and in Houston, USA and provides solutions to clients around the world.

AMOG has a 21-year record of delivering our industry-leading scientific and engineering know-how to projects of any scale. AMOG’s cutting edge solutions are typically associated with critical design or operational issues enabling its clients to operate more effectively, safely and profitably.

A significant portion of AMOG's work each year is forensic engineering and support to legal cases. AMOG’s contribution to such legal cases includes high-end analysis and simulation in support of failure investigations, provision of specialist technical advice and the provision of expert witness services.