

Engineers and Ethical Obligations

February 2007

The Institution of Professional Engineers New Zealand Incorporated (IPENZ) is the non-aligned professional body for engineering and technology professionals in New Zealand.

Practice Notes offer guidance to practising engineers by exploring issues of importance to the profession and setting out good-practice methodologies. They are written by practitioners and subject to peer review by IPENZ Members. While every care is taken in their preparation, these documents are not offered as formal advice. Any liability arising from their use rests with the practitioner.

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Introduction

Members of IPENZ are subject to the IPENZ *Code of Ethics* and Chartered Professional Engineers (CPEng) are subject to the CPEng *Rules Code of Ethical Conduct*. The IPENZ *Code of Ethics* has the force of regulations as set out in the Rules of the Institution. CPEng Rules are governed by national legislation and can be enforced through the courts. This *Practice Note* should be read alongside both the IPENZ *Code of Ethics* and the CPEng *Rules Code of Ethical Conduct*. Most complaints received by IPENZ involve a claimed breach of the codes of ethics.

Engineers and Society

Obligations placed on engineers are not principally limitations, but enablers of their practice. Engineers are highly valuable to society. Ethical obligations are necessary in order for engineers to carry out their profession. For example, without the obligation of confidentiality clients could not trust engineers with commercially-sensitive information. Without this information, engineers could not do their job. The moral obligations of our profession can be understood as duties which are necessary given the role of engineers in society.

Engineers and their Clients

Clients typically rely on relative strangers for significant services in circumstances under which they cannot assess the expertise or diligence of the service. This amounts to a significant risk for the client and for that reason IPENZ Members are required to avoid conflicts of interest and display expertise and trustworthiness.

Clients and end-users alike are often in positions of considerable vulnerability in their relationships with professional engineers. This generates a further set of obligations.

Members of the engineering profession are engaged in a practice that has ethics at its core. Ethical practice is not an optional extra.

IPENZ *Code of Ethics* and CPEng *Rules Code of Ethical Conduct*

Codes of ethics raise the standard of ethical consciousness. Further, the adoption and publication of a distinct professional morality, by way of a code of ethics, is a mechanism for publicising the ethical stance of the profession. A code of ethics can also provide independent support when a practitioner is faced with a situation requiring moral courage.

The IPENZ *Code of Ethics* and CPEng *Rules Code of Ethical Conduct* are framed around five values, each backed by guidelines and minimum standards. The five fundamental values are:

1. Protection of life and safeguarding people

Members shall recognise the need to protect life and to safeguard people, and in their engineering activities shall act to address this need.

2. Professionalism, integrity and competence

Members shall undertake their engineering activities with professionalism and integrity and shall work within their levels of competence.

3. Commitment to community well-being

Members shall recognise the responsibility of the profession to actively contribute to the well-being of society and, when involved in any engineering activity, shall endeavour to identify, inform and consult affected parties.

4. Sustainable management and care for the environment

Members shall recognise and respect the need for sustainable management of the planet's resources and endeavour to minimise adverse environmental impacts of their engineering activities for both present and future generations.

5. Sustaining engineering knowledge

Members shall seek to contribute to the development of their own and the engineering profession's knowledge, skill and expertise for the benefit of society.

Engineering Practice and the Codes

The application of ethical principles requires judgement. No code can cover all situations. In difficult cases, the test used by the Complaints Research Officer is to ask what would have been done by the "reasonable engineer", working competently and diligently.

Competence

Competence is the overarching obligation of the professional with respect to the client. This includes:

- Possessing sound knowledge applied with skill, diligence and care.
- Working within your level of competence and specialisation. The engineer who undertakes work for which he or she is not qualified or sufficiently experienced deceives the client and risks harm to others and to their own reputation.
- Accepting personal responsibility for work done. This includes work done by you or those under your supervision and requires taking steps to ensure that anyone working under your authority is both competent to carry out the assigned tasks and accepts a like personal responsibility.
- Ensuring that you do not misrepresent your areas or levels of experience or competence.

Public and workplace safety

The codes emphasise the engineer's role in designing and implementing safe technologies for the public and creating safe workplaces for staff. This includes:

- Public safety – giving priority to the safety and well-being of the community and having regard to this principle in assessing obligations to clients, employers and colleagues. This requires you to advocate to clients and employers, and devote adequate resources to ensure safety in use.

- Risk management – ensuring that reasonable steps are taken to minimise the risk of loss of life, injury or suffering which may result from your engineering activities, either directly or indirectly.
- Workplace and construction site – minimising potential dangers involved in the construction and manufacture of engineered products and processes. It is the engineer's responsibility to draw the attention of those affected to the level and significance of risk associated with the work. For further guidance refer to *IPENZ Practice Note 04 "Safety and Engineers"*.

Community well-being

The engineer should endeavour to be fully informed about relevant public policies, community needs and perceptions which affect their work. This may require an engineer, as a citizen who is also a specialist, to use his or her engineering knowledge and experience to contribute helpfully to public debate and to community activities.

The codes' guidelines also exhort the engineer to treat clients, peers, employers, staff and the public with humanity, respect, and sensitivity. Anticipating possible conflicts and attending to conflict resolution is a professional skill and duty.

Communication

Communication is important to an engineer's overall competence as a professional. Many complaints could have been avoided with careful attention to communication.

Important skills include:

- listening
- giving clear and concise advice
- being assertive with respect to clarification or interpretation of instructions

Good communication procedures include:

- recording all important conversations with clients
- having documentation procedures and internal audit systems for staff
- maintaining up-to-date files
- confirming verbal agreements in writing
- clarifying fees
- following a recognised professional practice (such as the IPENZ model conditions of engagement)

Conflict of interest

Conflicts of interest arise when the interests of a professional conflict with those of a client or when the interests of one client clash with those of another. It is important that an engineer has no motive for compromising the performance of his or her duty to the client.

The codes restrict the conditions under which a professional may act where a conflict exists. They require an engineer to disclose any financial or other interest that may, or may be seen to, impair their professional judgement on any engineering activities they are to carry out for that employer or client.

Good practice in any case of conflict requires an engineer to first identify and then assess any actual or potential conflict.

Suggested guidelines include:

- in a dispute between two clients, where possible decide which party you are acting for and notify the other
- do not act for either if doing so will harm the other
- assess whether it is better to withdraw
- suggest alternative professionals who can supply independent advice

Financial inducements are a source of such conflicts. The codes require that you do not promise to give to or accept from any third party anything of substantial value by way of inducement.

Confidentiality

An engineer's pursuit of their professional role is likely to be frustrated if clients are reluctant to be forthcoming with important, yet sensitive, information. The obligation to maintain confidence creates the conditions for the required level of openness.

An engineer must take care not to disclose confidential information relating to the work or knowledge of their employer or client (or former employer or client) without their agreement. An engineer must also refrain from using that information for another purpose that is to his or her personal benefit. An engineer may, however, disclose confidential information after gaining permission from the client as indicated by the codes. It is recommended that this permission be obtained in writing.

There are two important exceptions. The confidentiality clause does not apply if withholding the confidential information will put the public at risk, or if the information is asked for in a court of law.

Sustainable management and environmental stewardship

Sustainable management is often defined as management of resources, production and emissions to meet the needs of the present without compromising the ability of future generations to meet their own reasonably foreseeable needs. The overriding purpose of the Resource Management Act 1991 is "to promote the sustainable management of natural and physical resources".

Members are required to recognise and respect the need for sustainable management of the planet's resources and endeavour to minimise adverse environmental impacts of their engineering activities. This includes:

- using resources efficiently
- minimising the generation of waste and encouraging environmentally sound re-use, recycling and disposal
- recognising the adverse impacts of your engineering activities on the environment and seeking to avoid or mitigate them

For further guidance refer to *IPENZ Practice Note 05 "Sustainability and Engineers"*.

Obligations to Members and IPENZ

Peer reviewing

Before peer reviewing another Member's work, it is important to inform the Member concerned. This provides the opportunity for your review to include all relevant information, some of which you may not be aware of but may be known to the Member. Investigate the matters concerned thoroughly, and refrain from criticising the work of other professionals without due cause. For further information on conducting a peer review refer to *IPENZ Practice Note 02 "Peer Review"*.

Engineering in society

Members are asked to play their part in upholding the reputation of the Institution and its Members and supporting other Members as they seek to comply with the *Code of Ethics*. This includes:

- sharing public domain engineering knowledge with other engineers
- seeking and encouraging excellence in their own and others' practice
- improving and updating their understanding of engineering and encouraging the exchange of knowledge with their professional colleagues

Ethical Decision-making

The surest path to enduring success in business and in the profession is developing a good reputation. An ethical approach to work is consistent with this as it encompasses competence, integrity and the personal and professional values that support it. These values contribute to an engineer's ongoing standing within the engineering community and with existing and potential clients.

Good decision-making is central to ethical practice. The test of ethical competence is seen as the way in which engineers make decisions and resolve the conflicts those decisions often involve. A good decision is one made by a person of good judgement with access to all relevant information, who pays heed to all relevant rules and values, weighs them appropriately and implements them effectively. Good ethical decisions are characterised by:

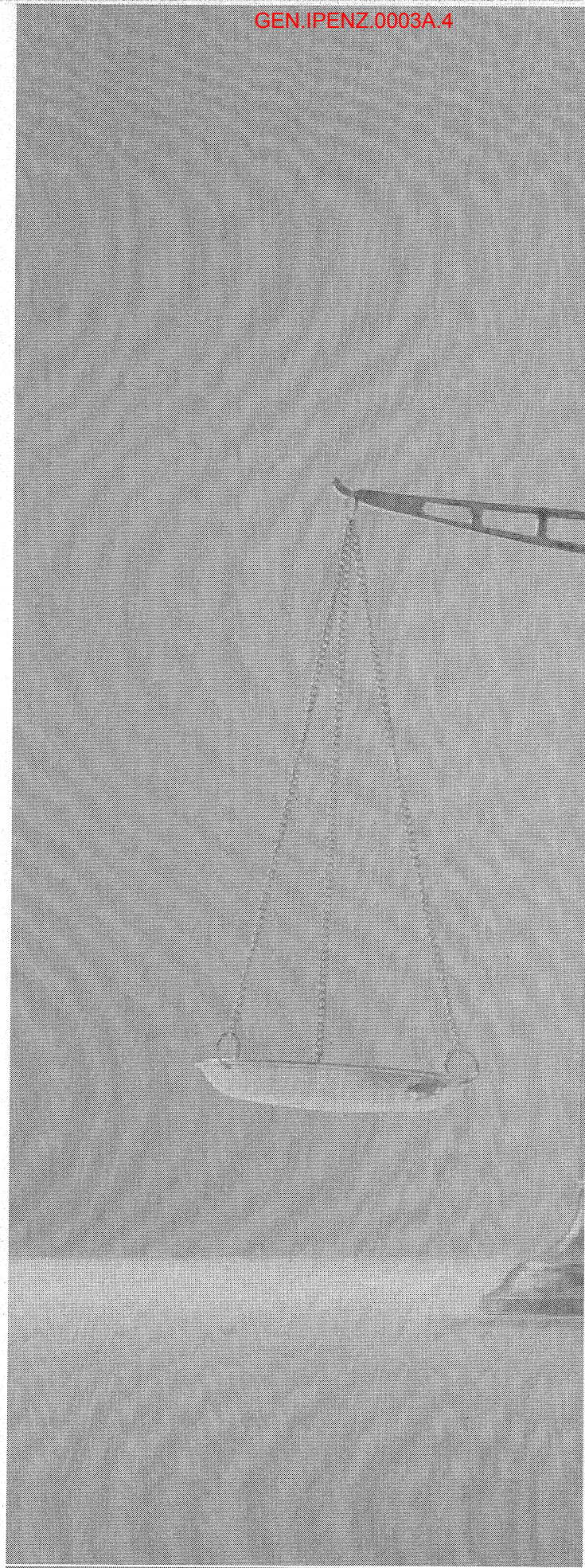
- Richness – how many factors have been considered?
- Openness – how open has the engineer been to these factors?
- Coherence – does this decision make sense within other decisions that have been made by the engineer?

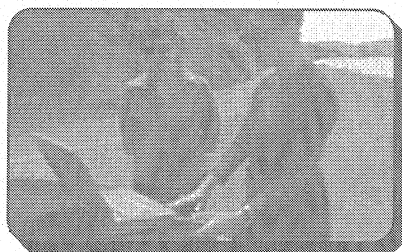
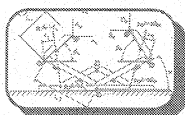
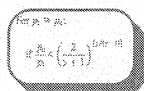
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Peer Review

Reviewing the work
of another Engineer

June 2003

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Types of Review

In the context of reviewing the work of another engineer, there are four basic review categories, each with its own purpose and scope, and entailing particular responsibility for the reviewer. They are:

- Peer Review
- Design Review/Technical Review
- Regulatory Review
- The expert witness

They differ fundamentally and are discussed separately in the following sections, but some definitions are common to all.

Work: a scientific or technical paper or report; an engineering or scientific design; the implementation of an engineering or scientific project; the competency of a technical capability or qualification; an artistic or cultural product; or the management and financing of a project

Designer/Author: the person responsible for the work

Client: the person or body commissioning the review

Peer Reviewer: the person or persons undertaking the review

Contract: The document that defines the scope of the review, the basis of remuneration, and the responsibilities of the client, reviewer and designer

Learned Society: Professional Affiliated Institution, such as IPENZ

Peer: Person of equivalent expertise to the designer/author who has experience relevant to the work in question.

Peer Review

Purpose of Peer Review

The Peer Review is potentially the most complex kind of review both technically and ethically. The purpose of Peer Review can include comment on some or all of the following:

- whether the completed work has met the objectives set out for it
- other options that could have been included in the preliminary design
- whether the evaluation of options is rigorous and fair
- the validity of the assumptions
- the validity of the conclusions
- the process towards completion of the work
- the validity of the recommendations
- the objectives set out for the work
- adherence to relevant regulations and codes of practice
- the fitness for purpose of the work.

Peer Review may also be part of the design function, to consider elements of the design process, such as resources, the value engineering process, concept design, risk reviews and design methodology.

If the peer reviewer can have input into the scope of the work, the design process, project planning and the completed work review, this can lead to a more acceptable outcome for the client.

While the work is in progress, the peer reviewer can have review inputs at specified points, to aid the design process and avoid problems such as poor evaluation of options and incorrect

assumptions. The peer reviewer can act as an adviser to the designer, depending on how the process is managed; the liability implications of this arrangement are discussed later.

Who can be a peer reviewer

A peer reviewer must be recognised by fellow members of the appropriate learned society as at least equal in experience and technical capability to the designer/author. Often the peer reviewer will have more experience of similar works than the designer/author.

The peer reviewer must be independent from the author's or designer's own organisation and have no financial or other interest in the outcome of the review. This requirement can be overridden if complete separation can be demonstrated between the peer reviewer's group and that undertaking the work, for example by means of a "Chinese wall".

The peer reviewer must disclose any conflicts of interest that could impair the independence of the review.

The ethics of Peer Review

The peer reviewer must abide by the code of ethics of the appropriate learned society. They must avoid usurping the role of the designer or succumbing to professional jealousy.

The peer reviewer must report against only the criteria and restrictions that were put in place for the designer/author of the work.

The peer reviewer must respect the intellectual property made available in the course of the review, which often passes from one firm to another during the review process.

The peer reviewer must avoid using hindsight to make a point against the designer, and comment on the design relative to the state of knowledge at the time of the design.

Scope of Peer Review services

Review of completed work

This is a basic service, in which the peer reviewer has no influence on the development of the work. The report establishes what is good, what is deficient and what other outcomes could have been developed.

Project Peer Review

This more complex task involves the peer reviewer in the development of the work. The peer reviewer is present at the setting of objectives, and reports throughout the development of the work, working closely with the designer/author of the work. Project Peer Review is provided for in the ASCE Standard Form Agreement for Independent Project Peer Review.

Competence Peer Review

Peer Reviews may also evaluate a professional's experience and capability in relation to their competence to undertake tasks as a member of a learned society. In this case, the peer reviewer can discuss the relevant experience with the individual concerned. Ideally, the qualifications and experience of the peer reviewer will be greater than those of the subject.

Who appoints a peer reviewer

In most instances, the client who commissioned the work or design will appoint the peer reviewer, since the client has a vested interest in getting the work/design completed satisfactorily.

Often the client will select a peer reviewer from candidates nominated by the designer/author. The peer reviewer is assumed to be able to work with the designer/author in a context of trust and respect for intellectual property.

Contractual arrangements

The peer reviewer should enter into a written contract for services with the client, including the following elements:

- the purpose of the review
- the objectives for the work or design given to the designer
- the scope of the review (limitations on numerical checking etc)
- the supply of all relevant documentation by the designer
- the lines of communication between designer and peer reviewer, and peer reviewer and client
- the reporting schedule for interim reviews
- the limit of the peer reviewer's liability, in contract and in tort, and whether the Consumer Guarantees Act 1993 is covered by the contract
- who apart from the client will use the review and for what purpose.

The peer reviewer reports to the client, and a courtesy copy goes to the designer with the client's consent. In particular, the report should include:

- who is entitled to rely on the report and under what circumstances
- the scope of the report
- the purpose of the report
- disclaimers
- qualifying statements as to work not undertaken, matters requiring further investigation, reliance on information provided by others, and assumptions made.

There is a close relationship between peer reviewer and designer, to ensure that all objectives and assumptions are included in the review. This closeness can be construed as an added responsibility under tort for the peer reviewer regarding the design outcome, and needs to be cleared with insurers.

Design Review / Technical Review

Many forms of Design Review are undertaken by design organisations as part of their quality assurance programmes. They are mostly undertaken in-house, and can be similar in scope to a Peer Review. Reviews at defined stages of the work – for instance 10%, 50% and 90% of completion – are common for QA purposes.

The purpose of a Design Review is to check assumptions, design method, arithmetical accuracy and the conclusions drawn by the designer. The review will include compliance with regulations, laws, design codes and internal design methods. A Design Review is sometimes required to utilise a different design approach from that of the designer so as to test the acceptability of the design.

The independence of the peer reviewer is not an issue, and the peer reviewer can be a senior from the same organisation as the designer, or from another firm. If the design is from a licensed supplier of proprietary know-how, the peer reviewer will need to be conversant with this knowledge.

The peer reviewer commonly undertakes a thorough assessment of the work including numerical checking. Such a verification check forms part of the quality assurance programme of the design organisation.

There is a direct working relationship between the peer reviewer and the designer, and all assumptions, calculations and procedures are open for review. Intellectual property is not an issue. The review is reported back to the relevant project manager or design head, and reports are not meant to be made available outside of the designer organisation. It is recommended that the review be undertaken by another designer rather than the project manager, because the project manager has the role of reconciling differences should they arise.

Regulatory Review

The purpose of a Regulatory Review is to assess whether the design complies with pertinent regulations, consent requirements and laws. The review does not assess the design objectives, process, options, assumptions or method, but only the submitted design, testing the outcome against regulatory parameters.

There is no direct relationship between the peer reviewer and the designer, although the designer may be asked questions about inconsistencies in the work. Access to the designer by the peer reviewer is important. An ethical consideration arises for the peer reviewer when there are concerns with the design. The peer reviewer should contact the designer to indicate any differences between the peer reviewer's documentation and the designer's design before the peer reviewer issues a report. This allows the designer to comment and state a position before the report is submitted.

The peer reviewer's role is to identify areas of the design that need to be addressed and to invite the designer to resolve them to the peer reviewer's satisfaction. The peer reviewer does not become involved in resolving the issues.

The peer reviewer may be from a regulatory office, or may be an independent designer engaged by that office to carry out the review, and report to the Regulatory office.

The expert witness role

The role of an expert witness can be arduous and testing, and it involves many ethical issues that need to be carefully traversed. The expert witness is a servant of the court, not one of the parties, and therefore their advice must be unbiased, particularly with respect to the party who is paying for the witness's preparation and attendance.

The expert witness may be selected because of previous experience in the role of designer, or in evaluating works.

In the capacity of an expert witness, a peer reviewer is asked by legal counsel or the commissioner of an inquiry to advise the court on specified aspects of a work undertaken by another designer. The scope of the questioning to the expert witness can be as wide as the court deems relevant. The expert witness is not obliged to inform the designer of their engagement for this role, but it is courteous to do so. There is no direct relationship between the expert witness and the designer. The expert witness should comment only on the information received on the designer's work.

The expert witness should declare the ethical limitations on his/her comments frankly when asked if there are any conflicts of interest.

It is imperative that the expert witness should not exceed his/her experience in answering questions and keeps to the matter of the question. The court is more respectful of those who acknowledge their limitations.

The expert witness should act independently and not as an advocate for the party that has commissioned them. They must also be circumspect about using the benefit of hindsight.

The expert witness must avoid being judgmental and giving an opinion as to negligence. It is up to the court to determine negligence, since this is a legal matter.

Assisting in Disaster or Failure Reviews is similar to the role of an expert witness, as the purpose is to identify the contributing factors. The outcome of the review may be the establishment of a need for changes in design codes or regulations, even though all relevant design practices were followed in the work. If so, the peer reviewer is encouraged to contact the designer directly to discuss the design philosophy.

The role should not be construed as an opportunity for the peer reviewer to market his/her design skills at the expense of the designer, and comments must be made against accepted standards at the time of the design.

For further comment and advice on the role of an expert witness and court procedure, ACENZ Members are recommended to refer to the ACENZ Practice Notes B51 Evidence and Court Procedure April 2002, and B52 Expert Witness April 2002.

Contractual Arrangements

The contractual documents relating to reviews can generally be prepared from the Short Form IPENZ/ACENZ documents for simple Peer Reviews and the other reviews.

For Project Peer Reviews, the ASCE Standard Form of Agreement between Owner, Designer, and Peer Reviewers for Professional Services for Independent Project Peer Review, amended for New Zealand use is a suitable document.

Liability

In all the kinds of review discussed, responsibility for the work resides with the designer/author. If comments by the peer reviewer are adopted by the designer, the responsibility stays with the designer. However, the peer reviewer has been linked to the design responsibility under tort in some cases, and this

needs careful qualification when entering into the contract for services.

The authority requesting a Regulatory Review takes responsibility for the Compliance Certificate if one is issued. In the matter of Producer Statements, IPENZ has issued Practice Note 01, which discusses liability and conflicts of interest. ACENZ Members can refer to the ACENZ Practice Note B64 A Guide to Producer Statements May 1997.

The contract between peer reviewer and client needs to record whether the peer reviewer is:

- disclaiming all liability in contract and tort
- limiting liability in contract and tort to a certain sum of money
- contracting out of the Consumers Guarantees Act 1993.

Summary and Recommendations

Reviewing the work of another engineer entails different responsibilities depending on the type of review. Peer Reviews are ethically the most onerous, demanding independence, respect for intellectual property and reporting against strict guidelines. For Peer Reviews to be the most effective, the peer reviewer should be engaged at the outset so that the design process can be assessed throughout the progress of the work. The peer reviewer is best selected by the client from a list supplied by the designer. Compatibility between peer reviewer and designer is imperative.

In Peer Reviews and Design Reviews the peer reviewer and the designer should have direct one-to-one communication.

Design Reviews and Technical Reviews are frequently undertaken in-house and should include arithmetical checking.

Regulatory Reviews are focussed solely on the outcome of the work, but have liabilities associated with certificates of compliance.

An expert witness has a duty of care to stay within his/her experience when reviewing another engineer's work. Detailed advice on the responsibilities of an expert witness and on court procedure is to be found in the ACENZ Practice Notes for ACENZ Members.

Conditions of Contract for Review Services can generally be prepared from the IPENZ/ACENZ Short Form documents. More complex projects can use the ASCE Project Peer Review contract.

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