A Submission to the Canterbury Earthquakes Royal Commission

Training and Education of Engineers and Organisation of the Engineering Profession

by John Scarry, BE(Hons), ME

25 July 2012

A. Personal Details

1. My name is John Michael Scarry. I am a structural engineer of Auckland, and currently work in sole practice.

2. I have a Bachelor of Engineering (First Class Honours) degree from the University of Auckland, specialising in structural engineering, and a Master of Engineering degree from the University of Auckland, specialising in structural analysis, structural dynamics and earthquake engineering.

3. I am the author of 'An Open Letter to IPENZ on the Parlous State of the Structural Engineering Profession and the Construction Industry in New Zealand,' 2002 (Appendix A). This led, along with the revelations by the O'Sullivan brothers regarding leaky buildings and rotten timber, to the redrafting of the Building Act, leading to the Building Act 2004. Unfortunately, this is a fatally flawed document, and all of my warnings regarding it were ignored.

4. Despite my numerous completely accurate and serious warnings being ignored, I was able in 2004/5 to get Dr Charles Clifton (then of HERA) to develop world best practice for the design of eccentric steel cleat connections, a critical subject that was ignored by everyone else. Using this, he was able to prevent the complete collapse of the 12,000 seat Vector Arena in Auckland, and investigate several other major roof failures.

B. Executive Summary

5. This submission is in response to the Discussion Paper; Training and education of engineers and organisation of the engineering profession (GEN.CERC.0003).

6. The structural engineering profession in New Zealand is in a parlous state, and close to irretrievable collapse, due to a crisis in technical competence and professional attitudes. The wider construction industry is in a similar poor state.

7. This crisis was exposed in my 'An Open Letter to IPENZ on the Parlous State of the Structural Engineering Profession and the Construction Industry in New Zealand,' 2002.

8. Since then, the critically needed reforms that I identified have not been implemented. Some minor improvements that barely 'scratch the surface' have been made, but overall, the state of the profession and the industry has continued to decline, and there is almost no time left to turn the situation around.

9. Instead of acting in a manner consistent with their fiduciary duty to protect the public of New Zealand, professional societies did nothing to identify or warn of this crisis, have done nothing effective to address this crisis, and have even actively undermined my attempts at reform. The attitudes and actions of successive Prime Ministers, Ministers, and the Department of Building and Housing (DBH) have been and are no better.

10. The result has been that whereas the worst disguised shockers in my Open Letter were extremely important buildings designed by 'blue chip' engineering firms for 'blue chip' clients yet had grievous seismic defects, since my Open Letter, the worst examples have been a number of near collapsed or collapsed roofs which could not even support their own self weight – three of these roofs could each have come down on several thousand people. But according to 'the authorities' within the industry and the profession, the public need not worry, because "New Zealand leads the world in seismic engineering," and "New Zealand has amongst the highest building standards in the world." Yeah, right.

11. The Chartered Professional Engineers of New Zealand Act 2002 has been a complete failure. Nearly all of the gravity and seismic shockers that have occurred since 2002 have been designed or supervised or approved by Chartered Professional Engineers. Many of these shockers have involved Fellows of IPENZ, or other award winning engineers, or lead assessors for CPEng, and a wide range of 'leading' engineering firms. Far from being 'a quality mark,' or as IPENZ would have it, "a quality mark and a mark of quality," at *best*, the title 'Chartered Professional Engineer' means *nothing*.

12. IPENZ is not fit to be the Registration Authority under the Chartered Professional Engineers of New Zealand Act. It has completely betrayed the trust of Parliament and the people of New Zealand, and is, at best, guilty of what the Americans would term depraved indifference.

13. The education of structural engineers is an absolute national disgrace. The actual training at university is not too bad, but is still deficient, particularly in a practical

sense. However, an engineer's training can really only begin 'on the job.' But the graduates are almost universally not getting the training on the job they need, particularly because there are so few competent engineers left to train the graduates, and because of time and fee constraints.

14. Continuing professional development (CPD) as it exists is largely a revenue generating farce, and is not imparting the essential technical and practical knowledge, and is most specifically not eliminating bad practices and attitudes.

15. The role of professional societies in the engineering sector *was* to idly sit by for decades while the rot set in, all the time claiming that "New Zealand leads the world in seismic engineering." Their actions since have been to ignore or discredit my warnings, to continue to claim that "New Zealand leads the world in seismic engineering," ignoring the sound of collapsing stadia and roofs around them.

16. More than any other profession, structural engineering does not operate in a vacuum. Even without the crisis of skills and attitudes within the profession, the actions and attitudes of clients, planners, architects, quantity surveyors, project managers and contractors severely restrict the ability of structural engineers to design safe and efficient buildings, particularly with regard to seismic resistance.

17. To function properly, the structural engineering profession needs a large number of engineering technicians and draftsmen. Both are in critically short supply, especially the draftsmen, and their training has generally degenerated severely in quality.

18. Especially when tasked with constructing first rate seismic performing buildings, the structural engineering profession needs a first rate construction industry, an industry that is constantly revitalised with properly trained apprentices. The NZ construction industry is in a parlous state, and the devastation caused by the willful destruction of the apprenticeship scheme in the early 1990's has not been made good.

19. Attempts to deal with the crisis of skills within engineering, drafting and construction have centred on 'skilled migration.' Unfortunately, instead of the bulk of the migrants coming from the First World, they have come from the Third World, where construction standards are very poor, and especially not consistent with good seismic resistant design. A small proportion of these migrants are very good, but the majority are not. Not only has this directly adversely affected an already dysfunctional industry, it has masked the critical shortage of competent people, and introduced *more* incompetent people who will rise to positions of management, and adversely affect the people working under them.

20. The neglect at Government level, and the malevolent actions of certain Government agencies are equally destructive, but they must be dealt with under the next discussion document.

C. Introduction

21. Please refer to Appendix B. Mayor Bob Parker has stated numerous times that the rebuilt Christchurch "must be the safest city in the world, from a seismic perspective." This article from The Christchurch Press shows what could rightly be described as 'the first building of the rebuild.' In the relatively minor earthquake of 13 June 2011, it just about fell over completely. It was designed by a Chartered Professional Engineer.

22. Please refer to Appendices C & D. The photographs speak for themselves, even to any layman. The appalling construction shown occurred several years *after* the release of my Open Letter. In these two buildings, despite some design deficiencies, the appalling work was due to the contractor, not the engineer. However, this shocking work is the physical equivalent of the shocking engineering design and attitudes I exposed in my Open Letter, and in the decade since. Shocking design standards and attitudes that exist throughout the profession, even in the 'leading' firms. I even used these photographs to convince the IPENZ Board to set up a Taskforce consisting of the likes of Dr Barry Davidson, Dr Charles Cliton and Professor Richard Fenwick to deal with the crisis within structural engineering, and I succeeded, only to have the Taskforce subverted seven weeks later by a food technologist, and a mechanical engineer whose main claim to fame as IPENZ President was to redesign the IPENZ logo!

23. Please refer to Appendix E. This does not show Canterbury earthquake damage. This shows a commercial building in Auckland, under construction, several years after my Open Letter was released. The masonry blocks to the exterior of the column have split after the props were removed, because I think there was no concrete filling to the core. How it did not collapse I do not know.

24. Please refer to Appendix θ. This is from an article in the Dominion Post in late 2011. The tallest office building in Wellington was designed and built in the early 1990's, and is one of the numerous buildings designed and built since the early 1980's which supposedly show that "New Zealand leads the world in seismic engineering." It has recently been found to have some critical seismic deficiencies, and it may well be that the assessed strength, before *$35 million dollars is spent on strengthening*, is at the lower end of the band of percentage of New Building Standard (NBS) stated. One 'leading seismic engineer,' a Fellow of IPENZ no less, who works in this building described me as a 'scaremonger' a few years ago. I'm sure he would still describe me a scaremonger, because 'closed minds' have got us where we are, and 'closed minds' are intent on keeping us here. You will note that the lead tenant in the building is EQC! If I was writing this as fiction, no one would believe it.

25. The interactions that drive building and construction practices are complex, and cannot easily be rigidly compartmentalised in the manner that these Discussion Documents must attempt. I will try as far as I can to stick within the guidelines of this discussion document, but I must put my submission in context, and it really needs to be read in conjunction with the submission I shall be making on Discussion Paper: Roles and Responsibilities.

26. Given the content of the Executive Summary above, and the fact that I challenge the very foundations of the content of the Discussion Paper, I must first provide the

background history to substantiate my assessment of IPENZ, CPEng, the training of engineers and the professional societies. Any mention of 'the profession' or 'engineering' refers to structural engineering unless noted otherwise. 'The industry' refers to the wider building industry, especially the commercial type sector, unless noted otherwise.

27. In response to what was exposed in my Open Letter, many prominent parties charged with a fiduciary duty to protect the public of New Zealand stated that any serious problems would be dealt with. This has not been done, and if not for me and the campaign I have been compelled to conduct, supported closely by some of the best engineers in this country, all hope of achieving the necessary reforms would have been lost. Hence the continuous use of the words *I* and *me*. I cannot help this. My campaign is not about *me*, it is the about the parlous and worsening state of the structural engineering profession and the construction industry, and the fact that *I*, and my close supporters, are the *only* people trying to get the *comprehensive* necessary reforms enacted.

28. Before I start with what I intend to be a damning indictment of IPENZ and others, I wish to exclude the following people from criticism. They each, in their own way, at least tried to do something about the crisis:
    - Barry Brown, former Chairman of the BIA,
    - Dean McNulty, former member of the IPENZ Board,
    - Murray Milner, former member of the IPENZ Practice Board,
    - Jeff Wastney, the actual IPENZ Registrar for the CPEng. Act,*
    - The CPEng Assessment Board,*
    - Murray Isdale, former IPENZ Practice Manager,
    - John Gardiner, former Deputy President of IPENZ and head of the DBH section dealing with 'Determinations,' and his section.

    (* It is the IPENZ Board, Chief Executive and senior staff and the 'hangers on' that are the problem.)

29. Please note that the first bullet point of Item 5.1 on page 3 of the Discussion Document is wrong. The CPEng Act did not create IPENZ. IPENZ already existed.

D. Background

30. Historically, NZ structural engineering has suffered from two serious problems. The public's ignorance of what engineers are, and the importance of what they do (typical of most English speaking countries), and the fact that whereas virtually any part of NZ could be hit by a devastating earthquake at any time, the period between large earthquakes in built up areas is so long that flawed practices are not exposed and proper seismic resistant practices cannot be developed or enforced.

31. Following decades of continuous post-war growth, a sharp decline in the economy in 1967 severely affected the construction industry. I am told that the resulting demand for redundancy payments for carpenters led to changes in the employment of carpenters which had severe ramifications in the following decades.

32. A cycle of booms and busts continued during the 1970's and early 1980's, with two oil shocks having a major effect, followed by the Think Big projects. Contractors cannot help themselves from wanting booms, but a boom and bust cycle is the worst thing that can affect a construction industry, and no developed country has been so affected as NZ. One minute there is no work for skilled people, so they leave, next minute, anyone with a pulse is working in the industry. It is a recipe for disaster.

33. I shall expand on this in the next discussion document, but given free rein by the 1984-1990 Labour Government, then the following National Government, Treasury set about destroying much of the skill base and hence productive base of the NZ building industry.

34. Despite my very public attempts to hold IPENZ to account, I talk every few months or so to a former President of IPENZ. He usually ends with "Keep up the fight, John. We need you." He has brilliantly stated that in the 1980's, "There were two queen bees in The Beehive – Treasury and the Ministry of Works and Development. One of them was going to be stung to death, and it wasn't going to be Treasury."

35. The MOWD was tasked through legislation with providing independent economic advice to the Government, and with care of the state of the entire public infrastructure of NZ, including local body infrastructure. As a result, it was a rival to the laissez faire loons at Treasury, and their plans. The Ministry of Works and Development was destroyed.

36. From 1984 to 1993, the following deliberate devastation to the NZ building industry was inflicted by Treasury and Government action:
    - The input of the MOWD into maintaining high standards of practice was lost,
    - The role of the MOWD in properly training vast numbers of engineers, technicians and especially draftsmen, a role that underpinned the private sector, was lost,
    - The similar role that Government departments such as NZED, NZ Railways and the like played was lost,
    - Highly competent design departments (which never designed a 'leaky building') at bodies like the Ministry of Education were destroyed,
    - The often highly competent and very efficient Engineering and Architecture departments of territorial authorities were destroyed. This has severely

eroded the ability of the territorial authorities to adequately perform their duties as Building Consent Authorities, and

- In an act of unabashed madness, Bill Birch destroyed the centuries old apprenticeship scheme, that had served this country, and especially the building industry, so well.

To add insult to injury, tax changes in the 1980's meant that a university trained professional employee of an engineering firm could no longer claim against his/her taxes the cost of buying personal copies of codes and textbooks, the very basis of a sound engineering career. [In addition, one critical component of the construction industry was lost due to 'penny pinching' on the part of clients, especially developers. The 'component' was the Clerk of Works, a person who was highly skilled in inspecting construction and administering the contract on site. On any reasonably sized job, a Clerk of Works would be on site full time, representing the interests of the owner, but also the integrity of the building, and all subsequent users of the building.]

37. Other 'reforms' of this nature saw universities becoming partial businesses, which had to tout for fee paying students (who often 'hint' that they have paid their money, and want the degree they have paid for), and the technical institutes, which had long trained apprentices of world class, morphing into pseudo-universities.

38. In the 1970's, NZ universities, particularly Canterbury, started to develop some very good discrete components of seismic reinforced concrete structures, but not the complete system that was needed. Buoyed by the development of base isolation devices, without any experience of real earthquakes on real buildings, the NZ structural profession, universities and construction industry declared itself, *by fiat alone*, to "lead the world in seismic engineering." As a consequence, dissent was very limited, and ignored. Even compelling evidence, much of it produced by Richard Fenwick, with the assistance of Barry Davidson, was largely ignored in practice because it was 'inconvenient.'

39. I did not query the rationale behind the 'NZ consensus' at the time of my Open Letter, contrary to what was stated in some of the *ad hominem* attacks on me. I pointed out that 'the ideal' was not being followed. I see now that 'the ideal' had deep flaws.

40. I started work in early 1983. In hindsight, my university education should have had far more practical content, but, all in all, I got an excellent education from a group of excellent, dedicated lecturers, many of whom had actual real life work experience. These included Bob Callendar, Ian Buckle, Richard Fenwick and Barry Davidson. Any educational failings I have are due to me, not them.

41. My first six month stint of employment was a disaster. I was given bits of work to do that required years of experience, not university 'theory,' by people who did not know how to do the work themselves, or at least could not explain how to do it. And despite being trained for years using computer analysis at university, and despite personal computers at that time being easily affordable, the engineering management refused to buy one, so I had to waste hours doing hand calculations, which often showed that the senior engineer's hand calculations were wrong.

42. I then spent over three years at a large multi-discipline consultancy. This was a time when fee levels were still relatively high, and the standards within this company were high in comparison to others. Despite this, there was no proper training as to how to actually do real structural engineering at a high level. Worse, despite one engineer in particular trying to be helpful, I found most times I could not get a sensible answer to searching questions I asked.

43. One of the reasons I was able to ask these searching questions was because I fully appreciated how little I knew of real world engineering. I did two things in particular that a young engineer could not do nowadays, because the resources are simply not there. The Auckland University Bookshop and Technical Books used to be heavily stocked with general engineering textbooks, from Britain, Australia the US and beyond, which were not part of any course. Plus books from the likes of the Lincoln Arc Welding company, which showed how to design a myriad of real world details few academics would ever deign to consider. I bought these books, and devoured them. These books form an extensive library that very, very few engineers can match. A young engineer cannot do that nowadays, because these books are simply not stocked anymore. Also, whereas the much simpler working stress codes allowed most texts from most countries to be understood, the move to nomenclature driven ultimate limit state codes, with complex nomenclature and load factors and strength reduction factors that are so vastly different between each country makes foreign texts extremely difficult to use. Similarly, I would pour through the structural engineering library that was situated on the same floor as the structural engineers, and borrow the best books to work through. This was real, self-initiated continual professional development long before I had ever heard of the term, and was nothing like the 'pay your money and get your credits' nonsense that predominates today. Unfortunately, now in this same company, a graduate engineer cannot 'thumb through' the engineering library, because it has been removed to a central location, and books and articles are handed out on specific request, not that too many graduate engineers nowadays seem to thumb through libraries anyway.

44. Despite standards being at a reasonably good level in this company in the early 1980's, the rot within the profession had set in. Many 'rip, **** and bust' consulting firms started to be set up. There were four main reasons for this, I believe:
    - Unless a younger engineer had personal money to buy in to a consulting firm, especially a large one, many years of extremely hard and stressful work would be required before an income even approaching other professions could be attained,
    - This led to an incentive for people to leave and start their own companies, or join similar startups,
    - But, because hardly anyone can appreciate the value of sound engineering until after a disaster, and if the reaction to all of the recent shockers, and much of the response to the Canterbury earthquakes is anything to go by, not even then, these startups largely got work because they would cut fees, or do pretty much anything a developer or especially a contractor demanded.
    - Combined with this, as fees plummeted, the increased demands of architects and new seismic design requirements increased the workload that a good engineer *should* have been doing.

    Common sense flew out the window.

45. Economists, even the very few who are actually competent, describe certain industries as 'irrational.' An example of this is the pulp and paper industry, where often the returns from producing the product are less than the cost of money borrowed to make it. Similarly, 'rational economics,' and most people, would assume that when something essential was in short supply, its price would rise, and when it was in abundance, its price would fall. Well, NZ structural engineering was just about to confirm that it is an irrational industry.

46. During the mid-1980's, a debt fuelled commercial property building boom went on in NZ, with the construction of buildings that in many instance could not be tenanted. There was an absolute shortage of engineers in this country. In this environment, when consulting firms cried out for engineers to employ, when they could not find engineers to employ for neither love nor money, engineering firms cut fees, to take on work they were completely stretched to do. The size and influence of the 'rip, **** and bust' firms grew, because not doing the work properly meant it could be done quicker.

47. Then, the 1987 crash, followed by the severe recession deliberately caused by Ruth Richardson, led to more fee cutting, and fees have never recovered.

48. Also, during this period of boom and bust, and the rise of the 'rip, **** and bust' firms, it became standard practice to remove virtually all dimensions off the structural drawings, leaving it up to the contractor to work off the architectural drawings and the size and thickness of structural elements to try to figure out where the structure actually was. This was driven by several factors, none of them worthy, but I shall not go into them here. Suffice to say, this has been a severely retrograde step, and could have easily been avoided by requiring the architects and building services engineers to confirm that they approved of the dimensions shown on the structural engineering drawings.

49. During the 1990's, I was exposed to some very good engineers and architects, and I learnt a lot from them. However, my overall experiences in the firm I worked for, and my exposure to the work of other consultants through doing peer reviews and the like confirmed to me that standards in structural engineering were continuing to decline. The key feature of my time at this firm was the fact that I had to work at least one day of every weekend of the year, and many of the public holidays, on a series of complex jobs that were nearly all bid by others to have fees a small fraction of what was required to do them properly. Initially, I was grudgingly allowed the purchase of a simple 3D analysis package, but I had to beg time on other departments' computers to run it. Then I had to buy my own computer to run this program. Finally, a PC was procured for several engineers to share. During my employment there, I received no training in computer aided drafting, but researched it thoroughly and made numerous suggestions to boost the productivity and effectiveness of drafting in the office. All of my suggestions were ignored.

50. In 1994 or 1995, I made a significant submission to the concrete standards committee that was drafting what became NZS 3101:1995. My submission was certainly given consideration, and some comment were acted upon, but my serious concerns about the support and detailing of precast floors and other precast elements were ignored.

51. In 1997 or thereabouts, an intermediate level engineer intended to leave this firm to move to the lower part of the North Island, a pursue a career as a bridge engineer. He put me down as a reference, and I duly received a phone call from (I forget which) either an employment/recruitment agency or the human resources department of an engineering firm. I was asked approximately 20 questions regarding this engineer, who was going to personally inspect and design bridges. Few if any questions related to this engineer's technical competence or experience in structural engineering. Nearly every question related to *leadership!* This was a portent of a further blight on the profession.

52. In 1997, an engineer who had worked at one of the 'leading firms' for almost 15 years joined the Auckland office as senior structural engineer, and if my memory is correct, as the Auckland office manager. This person was worse than technically incompetent; he was dangerous. He was intent on 'making waves in the market place,' by 'cutting out excessive structure' in designs. My services were dispensed with in a very quick fashion, and I was unexpectedly forced to work on contract at several of the 'leading' structural engineering firms over the next four years.

53. What I experienced there was so shocking I determined someone had to finally take a stand and stop this rot. Hence my Open Letter.

54. I contacted IPENZ in early 2002, saying that I wanted to write a 5 page article in their monthly *e.nz* magazine. Years previously, the monthly magazine of the New Zealand Institution of Engineers had contained real technical engineering content, but *e.nz* became a glossy 'general' magazine written largely by professional journalists.

55. I met with John Gardiner, the then Deputy Chief Executive of IPENZ, in Auckland in early 2002. I explained my concerns, and he said "We have been hearing rumours." We discussed the pros and cons of an article in e.nz, and it was finally agreed that the course of action was for me to write a letter to IPENZ regarding my concerns, with all identities adversely commented on disguised. The one technical detail of concern I raised with him as an example was bad or non-existent diaphragm design.

56. I had intended to take a lengthy trip to Europe at this time, to visit many of the museums and art galleries there. I left for Europe shortly after this meeting, and proceeded to spend a couple of hours a day drafting this 'letter' after visiting a museum or gallery.

57. While I was away, I was informed that the O'Sullivan brothers' revelations regarding leaky buildings and rotten timber had hit the headlines in NZ. I knew nothing of this particular crisis until I heard of this. I returned to NZ after a few months away, and continued to complete the 'letter,' which developed into a large report. This report included additional shockers I had to deal with upon returning to NZ.

58. This First Version of 'An Open Letter to IPENZ Regarding the Parlous State of the Structural Engineering Profession and the Construction Industry in New Zealand' was completed in September 2002. It consists of 73 pages of text and 36 pages of Appendices including drawings. Numerous examples of bad practice were included to support my assessment of a profession and industry wide crisis. All identities were disguised. Individuals were labelled AA, BB and the like, while companies were

labelled FFF, ABC and the like. These labels bore no resemblance to the real names of these parties. Also, several of the buildings had their geometry changed to disguise them, without affecting the structural issues concerned.

59. Contrary to some of the *ad hominem* attacks that I have been subjected to, I did not simply 'save up these shockers' without attempting to do anything about them. I came across some of these in the course of carrying our peer reviews, and I required changes to the design. In other cases, I observed *industry wide* bad practices simply by looking at buildings I happened to pass in the street. In other cases, I discovered design deficiencies in structures that had been built before I ever came across them. In other cases, I raised concerns with engineers about their defective designs, my concerns were accepted, and changes made to the design. In other cases, I raised concerns with engineers about their defective designs, and my concerns were dismissed.

60. The sole purpose for writing this letter was to bring an end to these widespread appalling attitudes and practices. It was intended to force the profession and the industry to face the undeniable, unacceptable parlous state of things, so that widespread effective reforms and improvements could be implemented.

61. I released this First Version to IPENZ and many engineers I knew in September 2002. It was an *open* letter, intended to be distributed and discussed throughout the profession in the first instance. The most disappointing response was from a young engineer who had just been registered under the Engineers Registration Act 1924, the forerunner of the CPEng Act 2002. He said "Why did you bother?" This engineer has since 'risen through the ranks,' and has received at least one award for 'leadership.' It is attitudes like that that have played a major role in creating the crisis in the first place.

62. Initial feedback was that some of the buildings could possibly be identified.

63. Copies of this First Version of the Open Letter were sent to members of the Structural Engineers Society (SESOC) management committee upon request. Shortly thereafter, I attended a full meeting of this committee.

64. I have not attached a copy of this First Version of the Open Letter, and will provide a copy and answer questions regarding certain parts of it only if this is done *in camera*. However, I strongly recommend the Royal Commission do this. You really need to hear what I have to say.

65. I was made aware at this time of the 'Matthews' test on precast floors in ductile reinforced concrete frames that had recently been carried out at the University of Canterbury. This was of particular interest to me because of my submission to the concrete standards committee in the mid-1990's, and matters I raised in the First Version of my Open Letter. I modified the Open Letter to remove those examples that were too easily identifiable, and to include the results of the Matthews test. This Second Version is attached in Appendix A.

66. Because of coverage in the press about the General Agreement on Trade in Services (GATS), which I considered a very serious threat to any attempts at reform in the

profession, I sent copies of the Second Version of the Open Letter to senior members of the Government and Opposition. I never sent the Open Letter to the news media, but a few months later they learnt about it.

67. The Labour Government, confronted with the revelations of the O'Sullivan brothers regarding the leaky building/rotten timber crisis and my Open Letter, initiated a review of the Building Act 1991. IPENZ and the BIA also initiated investigations into my Open Letter.

68. Unfortunately, the redrafting of the Building Act was handed to the Ministry of Economic Development. This Ministry was full of career bureaucrats, most of whom were ex-Treasury, and none of whom knew anything about the building industry. The result was an absolute disaster. The draft Building Bill concentrated on 'houses,' and the authors did not seem to be able to understand that the person who builds a house is rarely the person who designs it. My extensive direct submissions to the MED were completely ignored.

69. I made a major written submission on the draft Bill. It is attached in Appendix F (less its own extensive appendices). It was subsequently completely ignored. [No need to read it – it is simply provided as evidence that I did this.]

70. Despite being largely responsible for the review of the legislation, I was only given 15 minutes to appear before the Government Administration Committee. In no uncertain terms, I stated that unless the measures I recommended were taken, a total collapse of the structural engineering profession and the construction industry would occur in 10 to 15 years' time, because there simply would not be enough competent people to keep the profession and the industry functioning, and train the young people coming through. No written record was taken of my oral submission, and the submission was subsequently completely ignored.

71. I then wrote to every MP, asking for a minimum number of essential amendments to the Bill. Despite a very large number of positive responses, and the fact that those who responded negatively would not respond to my counter argument, no amendment was made, no questions asked in the House. I tried right up to just before the Third Reading, but got nowhere.

72. All of my warnings with regard to the technical deficiencies of the legislation and the resulting department, the obsession with 'housing' at the expense of all other buildings, the lack of industry wide solutions and the necessary training, have come true.

73. Shortly after this defective legislation was passed, HERA was called in to investigate the Waitakere Trusts Stadium, which was failing during erection. It turned out that the connection where the main roof trusses landed on the support columns was overstressed 900% in relation to the design loads.

74. IPENZ's investigation for itself is 'summarised' in the report included in Appendix G. It is a whitewash. I was never asked to identify the disguised examples in my Open Letter, and no subsequent investigations were done as a result. The absence of a flood of 'confessions' and 'dob-ins' was used by IPENZ as 'proof' that my

warnings were grossly exaggerated, a stance that they have continued to take, despite a litany of continuing shockers. Even then, the report said that the was an urgent need for IPENZ to prepare and release practice and practice guidelines. But IPENZ then proceeded to do nothing.

75. The BIA report (Appendix H) was required to concentrate on technical aspects of the Open Letter, but one cannot separate ethics and practice issues from technical aspects in these circumstances. Numerous people from the profession and the industry were interviewed "in an attempt to gauge the industry's considered response."
    - Of the 11 individual 'designers' interviewed, 10 of these or their firms had designed shockers in my Open Letter, or have subsequently designed shockers or condoned shocking practices,
    - One of the three academics interviewed had a severe conflict of interest,
    - I shall not go into details with regards to the TA structural reviewers, but it is no better than the above, and
    - The selection of contractors and precasters was no better than the above.

76. This is the sort of completely unprofessional biased 'review' of my warnings that has occurred time and again to thwart the necessary comprehensive effective reform.

77. I consider the report of very limited value, and will not waste time on it. Suffice to say it plays down practically every concern. Read the last paragraph on page 30 regarding diaphragms, and relate it to the CTV Building. Read Section 6.4.1 regarding cold worked welded wire mesh, and ask the report writer to justify the fact that most of the suspended floor slabs in the CBD, and many house slabs on grade, are *munted* because of the fracture of such mesh. (Munted – *adjective* – destroyed or ruined).

78. This report is just one of many where my technical warnings have been dismissed, only for me to be fully vindicated after much defective construction has occurred in the interim.

79. In early 2003, I was invited by John Gardiner to give a talk to the IPENZ Conference in Hamilton. (IPENZ no longer has an annual conference). After my talk, I was approached by an engineer who is a PhD graduate of Auckland, and supposedly an expert in multi-storey seismic resistant design. We talked for a while on the Matthews test. We also got onto a topic that featured in my Open Letter, and I appeared to be the only engineer in this country concerned about it. This was the cold rebending, and often re-rebending and re-re-rebending of starter bars on site, especially those projecting from precast concrete wall panels. (There was absolutely no need for any of this – far better preforming fully threaded Reid bar and Reid inserts had been available for years). This engineer said that he had seen Grade 500 starters fracturing on rebend, and had changed his designs to only have Grade 300 starters. As I promised, I duly posted him a copy of my Open Letter, and included a note asking that he write me a brief letter, describing the rebend fractures he had seen. I received no reply. He has more recently described me as a 'trouble maker.' If he carries on with this unethical behaviour, and calling me a trouble maker, he's sure to be made a Fellow of IPENZ soon, for his "leadership and expertise in the design of seismic resistant reinforced concrete structures."

80. This insane practice of re-bending projecting starters should never have been contemplated by any rational engineer, yet it was and is industry standard practice in 'the country that leads the world in seismic engineering.' It continues to this day, as I describe later.

81. As I describe in more detail later, IPENZ received two complaints that in writing my Open Letter, I had breached the IPENZ Code of Ethics. These complaints were nonsense, by IPENZ HQ were hell bent on convicting me in their kangaroo court system. (That is an insult to kangaroos. It is really an 'alternative reality' court system, where the guilty are exonerated and the innocent punished or ridiculed, much like IPENZ HQ as a whole). I had to make IPENZ an offer they couldn't refuse – I threatened the full force of the law against them, and they backed down, and the charges were dropped.

82. In 2004, I was invited to give a talk to the Auckland Structural Group after the SESOC AGM. I showed several examples of appalling construction, which were industry wide, and asked anyone in the audience to speak up and justify them. In the audience were engineers whose jobs regularly involve these bad practices, and senior members of the 'commercial concrete faction' who allow these practices to continue, and have prevented me from stopping them. No one spoke up, but they left the room, and carried on, business as usual.

83. One extremely common steel connection detail is the eccentric steel cleat connection. (Refer Appendix I). In order to connect, for example, a hollow section brace to a steel support cleat, the end of the hollow section is slotted, and a steel cleat welded in. This projecting steel cleat is then bolted to the supporting cleat, in what must be an eccentric connection. This type of eccentric connection cleat is in thousands of roof structures and seismic bracing systems in NZ.

84. Virtually every engineer in NZ (except me) ignored the eccentricity when designing this connection, "because the eccentricity is small." That is nonsense. The force in one cleat and the reaction in the other are offset, therefore there must be a bending moment. Usually, the forces involved are large, and despite the small eccentricity, a significant bending results. Thin plates have low bending resistance when bent around their weak axis like this.

85. I have *always* taken account of this eccentricity. My method may not have been perfect, but I always designed the support cleat to resist this total joint moment. In doing this, I have received no end of abuse and ridicule. As a graduate in the 1980's working for a large consultancy, I was not only ridiculed for this, I was once threatened with a written instruction to ignore this eccentricity.

86. Kitipornchai, who is usually very good, developed a design method in Australia to account for this eccentricity, but his method was fundamentally flawed. It assumed that some sort of virtual lateral brace sat in space, laterally supporting the connection, which is nonsense, but this method found its way into Australian design practice.

87. In 2003, I tried to get the Heavy Engineering Research Association (HERA) interested, but received no response. But a year later, I saw on the Microstran

website a warning not to use their design package for this type of connection, because the Kitipornchai method was unsafe. There had been collapses overseas, and investigations had shown that the *real* strength of these connections was only half of what was calculated ignoring the eccentricity. I contacted Charles Clifton at HERA, and he immediately swung into action. I worked with him over a couple of weeks, and Nandor Mago at HERA ran ABAQUS non-linear analyses to support the work. Charles then worked to refine and complete the design methodology. He has subsequently developed world best practice for the design of such connections, especially under seismic loading.

88. This was most opportune, because he was then hit with three major roof failures that were due to eccentric cleat connection failure.

89. The first failure Charles never discussed, because of a strict confidentiality agreement, but an Australian engineer phoned me up subsequently, and in the course of the discussion, identified this as an Australian building designed by a NZ owned firm. And who was that NZ firm? The same one I worked for in the 1980's, where I was ridiculed for taking account of the eccentric effects in this type of connection, and once threatened with a written instruction to ignore it. If they had only listened to me.

90. Next up was the near total collapse of the Vector Arena. This is especially galling to me, as I explain under the section where I demonstrate that IPENZ is not fit to be the Registration Authority under the CPEng Act.

91. The third roof was one in Whangarei, but that is all I know. This latent weakness due to wrong design, but more importantly, bad attitudes, is in thousands upon thousands of steel connections in NZ, including many seismic resistant frames. But what does that really matter, when we have the mantra of "New Zealand leads the world in seismic engineering" to protect us. In fact, the public of NZ are doubly protected through the additional mantra of "John Scarry is a scaremonger."

92. In 2005, I was elected to the Management Committee of the Structural Engineers Society (SESOC), and served for the 2005/6 year. What a waste of time that was, except I was able to get one useful design guide written for an essential area that has always 'fallen through the cracks,' especially in academia. A copy of this Anchor Bolt Guide is in Appendix J. This underwent review for *years* by other, very busy people, and was only released in 2009. The copy on the SESOC website is still a draft version, and marked as such. I had intended it to be the first of many such guides aimed especially at graduates, but SESOC has produced no more.

93. As a result of the passing of the Building Act 2004, several advisory panels were set up to assist the DBH. Whereas one of the O'Sullivan brothers was invited onto the body advising on weathertightness issues, of course I was not invited onto the body advising on structural issues. But, true to form, most of the people invited were the directors of companies or the very individuals who had designed shockers described in my Open Letter, or subsequently exposed shockers. Some of these people tried to get the DBH to act to address serious issues, but got nowhere, and left in frustration. In one case, an engineer whose company was involved in a debacle regarding a building that had to be rebuilt during construction because of serious design

deficiencies actually resigned on the basis he could not in all conscience continue in such circumstances. This ethical action on the part of a prominant engineer is almost unprecedented and is to be commended, except that someone like that is the very person who should be sticking around to fix things. It's not about being perfect – it's about learning from mistakes and avoiding them being repeated, by anyone.

94. Nearly all of the shockers in my Open Letter were designed and/or approved by Registered Engineers, the forerunner of CPEng. Nearly all of the shockers since have been done by Chartered Professional Engineers. In 2005, IPENZ was commenting on the Berryman Bridge collapse, and the virtues of CPEng. This had me seeing red, and I drafted a letter to the IPENZ Practice Board.

95. As a result of this draft, I met the then IPENZ President, Roly Frost in Auckland. I said I would drop the letter, if only IPENZ would at last properly address the crisis within the profession. This led to another meeting, which also involved Colin Nicholas and Charles Clifton. Roly responded by paraphrasing Mother Teresa, with reference to the fact that he only had influence over engineers, not the complete industry, "We can't save the whole industry, but we can save part of it."

96. As a result, I met the full IPENZ Board on 4 October 2005. What I wanted was what was needed. A Taskforce that was to have included, amongst others, the top steel engineer in NZ, Charles Clifton, the top analytical engineer in NZ, Barry Davidson, and the top concrete engineer in NZ, Richard Fenwick. The Taskforce was going to lay down the law with regard to bad attitudes and bad practices, and get out critical design guidance in the first instance.

97. I had expected Roly to have briefed the Board, but I was meeting them cold, and was unprepared, so I had to speak off the cuff. I showed them the photos in Appendices C, D & E, and said that this rubbish from the construction industry was the physical equivalent of the appalling designs being produced by the profession. Some of the Board members were in hysterics at the rubbish they saw. The Deputy President, Peter Jackson, challenged me, claiming that the Matthews test and subsequent reaction was "proof that the system was working."

98. I made my case for the Taskforce, then left. I was later informed that the Board had approved the setting up of the Taskforce.

99. Unfortunately, there was some 'wishy-washy' thinking by the Board involved, some of which violated the initial intention of this Taskforce being an IPENZ exercise to specifically address problems within the structural engineering profession. For this exercise, external parties were redundant and could only be an impediment, and from my experience since 2002, these external parties would fight tooth and nail to maintain the status quo. Unfortunately, IPENZ wanted the DBH and several of the technical societies involved.

100. As a result, I had two meetings in Wellington with senior DBH staff, including briefly, the Chief Executive.

101. Because I had been promised the Taskforce, I applied to IPENZ to become a Fellow, so that I would have the same official standing of so many of the engineers who had

designed or approved the shockers I exposed, and who were so opposed to any effective reforms. It was duly found that far from being fit enough to be considered a Fellow of IPENZ, I was barely fit enough to be a Member. In hindsight, this was paying me the highest compliment possible.

102. We continued to wait for more information on the establishment of the Taskforce.

103. I was asked by IPENZ to be involved in a small group to advise Jeff Wastney, the IPENZ Registrar for CPEng. This group met once, and some additional work was done, but that petered out.

104. We waited and waited for more information and received none. Colin Nicholas and I met with Roly Frost in Auckland in February 2006, and the result was we were again promised that the Taskforce would be set up.

105. Again we waited. The day before the first IPENZ Board meeting with Peter Jackson as the President, the third item on the TV One 6 o'clock news was the emergency closure of the almost complete Vector Arena. The railway line adjacent to the Arena was also closed, for fear the building would collapse onto the track.

106. It turned out that the Taskforce had been subverted by the Deputy President, Peter Jackson, and the Chief Executive, Andrew Cleland, food technologist, seven weeks after I met the Board, but they didn't have the decency to tell us. The first Board meeting of Jackson's Presidency implemented some 'alternative' work scheme nonsense that achieved absolutely nothing, and the Board was apparently blissfully unaware of the near catastrophe in Auckland.

107. I then spent the next three months, almost full time, trying to get IPENZ to set up the Taskforce. They refused. This whole sordid saga of IPENZ perfidy is expanded upon at length in Section G.

108. In November 2006, I wrote to Clayton Cosgrove, the Minister for Building and Housing, and asked for a meeting (Refer Appendix K). This letter clearly explained the magnitude of the problem I wanted to talk about, in an industry that Cosgrove had a fiduciary duty to ensure was safe and sound. A fiduciary duty he was handsomely paid to perform.

109. The meeting occurred on 30 January 2007, in Cosgrove's office. Present was the Minister, a DBH staff member seconded to his office whose name I can't recall for certain, John Kay of the DBH, the IPENZ Chief Executive, Andrew Cleland, food technologist, Colin Nicholas and myself. Colin and I had asked for two hours; we were given about 45 minutes. I ran though the crisis in the profession and the industry, and IPENZ's perfidy.

110. No written transcript was taken, but from memory, Cosgrove's response was almost verbatim:

> *"Let me stop you there, Mr Scarry. I have been briefed on none of this. You have made all of these outrageous allegations. You have been so widespread in your condemnations you have left me nowhere to seek independent advice. I can't talk to your supporters, because they agree with you. What IPENZ does*

is no concern of mine, although I would have to seek advice on that. But feel free to keep talking to the DBH and IPENZ, and make a submission on the draft revisions to the Building Act."

111. Andrew Cleland, food technologist, said at the meeting "IPENZ is just a voluntary society." As an MP, Cosgrove should have been most concerned at any impropriety on the part of IPENZ, which is not only *the* body recognised by the Government as representing the engineering profession, it is *the* body entrusted with the fiduciary duty to be the Registration Authority under the Chartered Professional Engineers of New Zealand Act 2002. As a Minister, any Minister, he should have been most concerned. As the Minister responsible for Building and Construction, he should have been especially concerned. But unless something was different back then, the DBH is the Government department responsible for the administration of the CPEng Act. In that case, it was Cosgrove's sole responsibility. Whichever way one looks at it, he should have been concerned about IPENZ's perfidious actions, but he wasn't.

112. The next day, I resigned from IPENZ in absolute disgust. The only effect of remaining a Member was to leave myself exposed to more trumped up charges in their kangaroo court system. And by paying fees to them, I was materially supporting a grossly irresponsible organisation that was in contempt of its *own* Code of Ethics (whereas I was not), and was in contempt of the public of New Zealand..

113. The day after that, I wrote to the Prime Minister, Helen Clark, regarding the meeting with Clayton Cosgrove. Three months later she signed a departmentally prepared fob-off, but at least she signed it. That is far more than the current Prime Minister has done. (Refer Appendix K).

114. I then tried to go to the news media to expose all of this, the fact that nothing effective was being done, and that no one in a position of authority gave a damn. Shane Jones became the Minister, and I did the decent thing and warned him I was going to the media. (Refer Appendix K, but I can't find Shane Jones reply). His reply was along the lines of Helen Clark's – that the DBH had been set up, standards were being updated, and so forth.

115. Jones need not have worried, because the news media did not want to know, because a stadium or building hadn't actually collapsed yet and killed or nearly killed anyone. Simon Collins of the NZ Herald did a good article in November 2007, but stayed clear of the 'political' scandal. Similarly Kim Hill, when I was interviewed on National Radio's Saturday Morning programme on 26 July 2008.

116. Nick Smith had, for a long time, been National's spokesman on building and construction issues, and he had never bothered to talk to me about the issues I had raised in my Open Letter, which had, after all, been half responsible for the redrafting of the Building Act 1991, although we had clashed at a public meeting of irate 'leaky home' owners once.

117. Tony Gibson, former President of IPENZ who had pushed for the CPEng Act, and some of his colleagues, had been slowly bringing Nick Smith up to speed with issues in the building and construction industry as they saw it. This had taken place over a

long period, so of course, when John Key formed his new Government, he made Maurice Williamson the Minister for Building and Construction.

118. My immediate response was a long and loud "Oh noooooooo!" My assessment, as usual, has been fully vindicated over the past, almost 4 years.

119. The building and construction industry is huge. It is the largest industry in the world. Structural engineering is absolutely essential to every aspect of infrastructure, including even telecommunications networks. So of course Key ranked Williamson *outside* Cabinet, whilst in Cabinet were *two* Ministers for Infrastructure, *two* Ministers for the Rugby World Cup, and the critical portfolios like Women's Affairs and Ethnic Affairs.

120. In 2005, I happened to make the aquaintance of a retired structural engineer called Carl O'Grady. Carl was a pioneer of plastic steel design in this country, and a pioneer and leading engineer in the use of precast concrete in seismic resistant structures. He ran a very successful practice, despite never 'towing the party line,' and has always strenuously objected to many of the assumptions underpinning standard NZ theories and practices that were declared to "lead the world in seismic engineering." These included the ignoring of the influence of the floor slabs on the strength of the 'weak beams' in the 'weak beam – strong column model,' unconservative assumptions about building periods based on similar flawed assumptions, the standard NZ beam-column joint model, and the deliberate ignoring of so many sound Californian practices, three of which are critically important with regard to the CTV Building, but I shall deal with that under the next Discussion Paper. Carl was one of the two co-inventors of the precast shell beam, and is appalled at the way they are being 'mis-designed' and used, something covered at length by me in my Open Letter and since. Carl has for many years been a friend of the leading American engineer Al Yee, the inventor of the NMB Splice for seismic resistant structures. Through Al Yee, Carl has had contact with T. Y. Lin, the Chinese *emigré* American engineer who was a giant in the field of prestressed concrete design, and a man described by one of his clients as "The best Goddamn engineer in the world," and few would have disagreed. T. Y. Lin once enquired of Carl's method for assessing the ultimate strength of the prestressing strands in composite shell beams. T.Y. said "No one would be stupid enough to use anything like the ultimate strength of the strands, would they?" (They are in NZ). Carl said he limited the stresses to 0.6 times ultimate strand stress, and T.Y. Lin considered that sound practice. [In the early 1990's, I read a paper by Al Yee on seismic resistant design which went completely counter to the NZ obsession with 'floppy frames,' and it was a revelation. It made so much sense, and has been fully vindicated by years of successful modern Japanese practice, subsequent Californian practice, and what occurred in the Christchurch CBD. This paper is included in Appendix L, but I shall leave it to the next Discussion Document for further consideration of its contents. It is here to show the class of engineer who respects Carl O'Grady].

121. Carl and I beg to differ on certain aspects of precast floors, and their effects, but overall, we are in strong agreement on engineering issues. He has taught me a great deal in the last 7 years, and I think I have expanded his understanding of engineering issues. At the time of writing, he is preparing his own written submission, and hopefully he will be called to appear before the Royal Commission. What I will say

is he has stated many times that if *one quarter* of the shockers and the appalling training, design and construction practices I describe are true, the authorities must stand up and take notice. Well, *everything* I have written and stated is true, and *no one* in a position of authority will take any necessary action.

122. Carl lives in the Pakuranga electorate, and had previously met and actively supported the MP, Maurice Williamson. He respected Maurice Williamson, and said we should meet him and make our case regarding the crisis. He duly arranged a meeting with Williamson shortly after he was appointed Minister.

123. In November 2008, Williamson received his departmental briefing paper from the DBH as the new Minister entitled 'Briefing for the Minister for Building and Construction,' Nov. 2008 (Appendix M). This will be covered in more detail under the next Discussion Document. However, it briefly describes the 'leaky building/rotten timber' crisis as a relatively small, largely historic problem, and makes no mention of any problems with regards to structural engineering and related construction, despite the near collapse of the Vector Arena which, but for a miracle, could have come down on 12,000 people.

124. We met Williamson, *as the Minister*, in his Pakuranga electorate office for 3 hours and 20 minutes on Saturday 13 December 2008. Present were:
    - Maurice Williamson, *as* the Minister for Building and Construction, and *not* as the MP for Pakuranga,
    - Jami-Lee Ross, the Electorate Chairman, who is now National MP for Botany,
    - Dr Charles Clifton, FIPENZ, NZ's top steel engineer,
    - Colin Nicholas, FIPENZ,
    - Carl O'Grady, CEng (UK), FIStructE
    - John Scarry

    (Dr Barry Davidson would have attended, but for a prior commitment).

125. Williamson told us that he had already met with at least two people campaigning for the leaky building crisis to be dealt with. Whilst not our area of main expertise, we talked for 30 minutes on this, and told him that the full extent of the leaky building crisis would be of the order of 80,000 to 90,000 houses. [This has subsequently been accepted throughout the country as realistic].

126. Discussion then switched to structural engineering, and looked at several jobs in detail. One was the Waitakere Trusts Stadium. The main roof trusses consist of circular hollow sections (CHS). These trusses carry on past the main support columns, such that the full vertical load reactions from the trusses have to be transmitted to the top of the columns through transverse loading on the bottom chord CHS. During erection, the contractor was required to keep an accurate measure of the deflections, and as the roof structure was fitted in place, 50mm of unexpected vertical deflection was occurring in the trusses. HERA was brought in, and half the unexpected deflection was shown to be due to eccentric joints in the trusses that had not been modeled. The other 25mm turned out to be squashing of the CHS bottom chord at the support, between the truss web members and the top of the column. I have seen this detail in records held at the Waitakere City Council offices, and from memory the bottom chord was only about 6mm thick. It was overstressed in

squashing by about 900% relative to the ultimate limit state design loads. The joint had to be significantly strengthened in-situ.

127. Next was the Vector Arena, which I cover in more detail later. Suffice to say that a near catastrophic localised collapse led to an investigation that led to the nearly completely failed eccentric cleat connections in the roof being discovered. By this stage, Williamson was screaming out "But why aren't these people in prison?" "Why aren't these people in prison?"

128. I joined the conversation, and made the case for my Taskforce, operating under the 'umbrella' of the Government. When challenged by Williamson about 'more committees' and 'gold plating,' I said that the Taskforce did not need to 'investigate,' because the members knew what the problems were, and knew how to address them. As far as 'gold plating' went, I said that the only way to cut costs was to have an efficient profession and industry, and the only way to get that was through having a highly skilled industry. We left him some reading material, including my Open Letter. As we left, he said "Don't worry Carl, I'll get to the bottom of it." Then what did he proceed to do? Absolutely *nothing* effective, but I was not to learn of this till months later.

129. While I was working on contract at a large consulting firm, I received an e-mail from John Gray of HOBANZ. John Gray is the airline pilot who won a landmark court case on his own leaky home, and set up the Home Owners and Buyers Association of New Zealand to assist other people affected by this national disaster. I had never met him at that stage, but had spoken to him once or twice on the phone. This e-mail asked for my assistance, in the strictest confidence. In the *one* good act Maurice Williamson did in his job, he asked his department, the DBH, to assess the true magnitude of the 'leaky building' problem. The DBH set up a committee to handle this task, and invited John Gray to be a member. But instead of going out and "pounding the pavements to actually look at what was built," as John Gray insisted, the DBH was intent on calculating the number of 'leakers' as a certain arbitrary percentage of one type of house/town house construction. In desperation, John contacted me for assistance. I had gleaned enough over the previous years, including the findings of a man who had over 20,000 accurate readings of framing moisture and decay for houses built over many decades, to be able to write the e-mail attached in Appendix N. Charles Clifton, who is an expert in moisture effects within the wall cavities of steel stud framed houses, described it as the best summary of the rotten timber crisis he had read so far. John Gray then threatened to quit, Williamson found out and wanted to know why, and the DBH was forced to come up with a realistic assessment, which was passed on to PriceWaterhouseCoopers to prepare their famous report. It fell to an *airline pilot* and a structural engineer who apparently doesn't know what he is talking about to do what a Government department, funded by the taxpayer and other public sources and levies to the tune of something like $80 million a year, could not, or would not?

130. We sent him some follow up e-mails regarding the 13 December 2008 meeting, **but heard nothing back**. My employment on contract at a large consulting engineering firm was abruptly terminated because I told the Chief Executive, in no uncertain terms, that his young engineers desperately needed proper training, not the rubbish that was passing as training. I did not intend to have to campaign for many hours a

week, nearly every week of the year, for year after year after year following the release of my Open Letter, especially given the public failure of massive stadia structures, and this has severely drained my resources. To follow on from my Anchor Bolt Guide, I sought modest funding from several sources for three guides for critically neglected areas that only I was concerned about. These were:

- A guide aimed particularly at graduates regarding how to carry out computer analyses of real structures in a design office environment, and in particular, the absolutely essential requirements of how to fully check all such analyses, (this was particularly relevant to Stadium Southland in 1999, when it was deflecting excessively during erection under its selfweight, partly because half the 'live load' had been left out of the analysis, such that roof had to be cut, jacked and 'strengthened,' only to collapse under a modest snow load in 2010),
- A design guide for structural floor diaphragms, a problem that featured significantly in my Open Letter, and a problem that only I seemed to be seriously concerned about, despite some efforts on Des Bull's part, (this is particularly relevant with regard to the CTV Building, and *many other* munted buildings in Christchurch which were just lucky enough to have their shear cores inside the floor plate), and
- A practical guide on welding aimed particularly at graduates, who generally have a very poor appreciation of this topic, along with a good many more senior engineers, (particularly relevant to the collapse of Stadium Southland under modest snow loading).

131. I met with Maurice Williamson in his Pakuranga electorate office. I showed him the Anchor Bolt Guide, and asked for unspecified modest funding to write the three design guides described above. I said that the likes of the DBH hierarchy, IPENZ or other 'authorities' *must not be involved*, because the guides would be rendered useless, even if they managed to get published. Williamson made **no mention of the content of our meeting on 13 December 2008**, but seeing π in the Anchor Bolt Guide, he commented that $e^{i\pi} = -1$. He also said that being outside Cabinet saved him from all of the other stuff they had to deal with. Several weeks later, he wrote to say he had passed on my suggestion regarding these design guides to *the DBH* for their consideration. Nothing happened, surprise, surprise. Yet again, with regard to the collapse of Stadium Southland and the CTV Building, I appear to be the only engineer with an accurate overview of the critical issues, yet I am ignored and subverted at every step.

132. In 2008, the then Minister, Shane Jones, had gotten the DBH to organise a large *talkfest* in Auckland, which included many people from Government departments unrelated to building and construction, and many of the 'leading' members of the construction industry. Of course I was not invited. Two 'workstreams' resulted, one of which was setting up a committee of 'industry leaders,' complete with supporting sub-committees of even more 'industry leaders,' to report on productivity in the building and construction sector. On the main committee was the Chief Executive of IPENZ, Andrew Cleland, food technologist, and attendees included representatives of Treasury, which had devastated the productive and skills base of the entire industry in the 1980's and 1990's, and the Ministry of Economic Development, who had made a complete balls up of what became the Building Act 2004, ignoring all of my submissions and advice in the process.

133. The resultant 'Report of the Building and Construction Sector Productivity Taskforce' is nearly totally worthless (Appendix O). There is only one useful suggestion in 38 pages, contained in one paragraph, something I could have written in a few minutes. Yet this report took *11 months* to write, despite the authors supposedly being experts in the field. In fact, the authors of that report were senior members of the very companies and organisations that *are* the NZ building contracting sector. If these people knew what was required to deal with the poor and declining standards of genuine productivity in the NZ building industry, *why hadn't they done it already, and solved the problem?* Surely, as a matter of personal commercial interest, they would have enacted this training and reform throughout their own companies and organisations. Eleven months to write 37 ½ worthless pages is real productivity, isn't it?

134. As a result of the report, which was presented by Williamson to the Cabinet as 'the way forward,' the Building and Construction Sector Productivity Partnership was established in 2010, with much the same people and organisations responsible for that report involved again. What increase in productivity has this 'partnership' achieved in two years? I will be very surprised if it is anything other than zero. A few months ago, well over a year after the main Canterbury earthquakes, it was reported NZ would need to import lots of plasterers and painters. How long does it take to train a gibstopper or a painter, to at least a level fit to work under a competent leading hand? Couldn't this Partnership have trained one unemployed New Zealander to scrape, sand, fill, sand and paint?

135. By this stage, I had come to the realisation that Williamson was going to do nothing to even acknowledge the crisis, let alone deal with it, but he never had the decency to contact and retract his commitment to "get to the bottom of it." I wrote to him regarding the nonsense of the productivity report, making numerous damning point after damning point. He duly replied, only commenting on the one item of worth that there was in the report.

136. I have no intelligence network, feeding me information on all the shockers that I am aware of. Nearly everything just happened to 'cross my desk,' or I heard of in the normal course of my work, or I observed by simply looking at construction sites from the footpath while passing. Remember how John Gray said the DBH had to get out and 'pound the pavements.' If the BIA members had done this, the 'leaky building' crisis could have been identified years earlier.

137. By 2009, seven years after I had released my Open Letter, two major stadia had been collapsing because they could not support their own selfweight, other roofs had failed under selfweight, several shopping centres had had to be rebuilt during construction because of serious design flaws, and seismic design shockers continued to be submitted for consent. Not to mention numerous investigations of leaking apartments and houses, most of which exposed serious structural design and construction deficiencies, *unrelated to water damage.* (Refer Appendix π. Also confirmed by John Gray of HOBANZ). And *no one* in a position of authority was doing anything to even *acknowledge* the crisis, let alone *deal* with it.

138. In October 2009, I wrote to the Prime Minister, asking him to personally intervene. (Refer Appendix P). In 15 pages, I described the crisis, and asked him to intervene. I was essentially asking him to severely reprimand, if not dismiss, Maurice Williamson. I received an acknowledgement of receipt from his office, but my letter was just sent to the 'Minister responsible,' and Williamson replied. At least Helen Clarke would at least scribble her signature on a fob off letter prepared by others.

139. By this stage, I had just about run out of places to go. The last hope to get proper reform initiated appeared to be the Auditor-General. In August 2010, I prepared a 54 page letter of complaint to the Office of the Auditor-General, accompanied by an Eastlight folder full of *preliminary evidence.* (Appendix Q, less appendices, most of which actually accompany this submission in a rearranged order. Certain passages have been blocked out, to prevent identification of certain parties and projects).

140. Knowing full well that the Auditor-General can only investigate matters relating to the efficient use of taxpayer money, and *not policy,* I laid a complaint about the *performance* of:
    - The Institution of Professional Engineers New Zealand Incorporated, as the Registration Authority for the Chartered Professional Engineers Act 2002,
    - The Department of Building and Housing,
    - The Minister for Building and Construction, Maurice Williamson.

141. This complaint was certainly not dismissed as being without foundation, but the Auditor-General wouldn't investigate, claiming that I was largely dealing with areas of *policy.* That is not correct, and they should have investigated.

142. I have absolutely no objection to the CPEng Act 2002, and the concept that engineers must be well trained, currently competent, and practice within their areas of competence in a responsible manner is the very core of my Open Letter and subsequent efforts. My complaint was against the *performance* of IPENZ as the Registration Authority.

143. I have no objection to a stand-alone taxpayer funded department responsible for building and construction issues. I fought long and hard during the drafting and passing of the Building Act 2004 to get such a department *fit for purpose.* My complaint was the department's almost complete failure to deal with the crisis within the essential building professions, other than with regards to external moisture and timber treatment, although even that took them long enough.

144. Likewise, my complaint against Williamson was his willful failure to competently and efficiently carry out his taxpayer funded duties.

145. The letter of complaint was written and received before the 4 September 2010 earthquake. On page 39 you can read the following:

> *Precast concrete buildings in particular are a concern, and when a built up area is hit with a large earthquake, the widespread failure of precast concrete buildings will expose the myth that "NZ leads the world in seismic engineering."*

E. Critical Technical Issues Only I Cared or Seem to Care About, And Their Relevance to the Rebuild and Sound Seismic Design and Construction Practice

146. One very sound Christchurch engineer I respect summarised the key features of good building performance in the earthquakes as being:
    - good or at least reasonable ground,
    - a symmetric layout of stiff, lateral load resisting elements such that torsional effects are minimised, and
    - robust positive load paths.

147. I consider the general performance of the 'modern' buildings in the CBD to have been very poor, and several total catastrophic collapses were only avoided by the very short duration of the 22 February 2011 earthquake, and in one case, some unexplainable miracle.

148. The first two, two storey buildings I personally saw being constructed after the 22 February 2011 earthquake had me shaking my head and saying "Have these people learnt nothing?" No or little lateral load resisting elements to the front wall, precast spandrel panels serving no or little structural purpose, connected with one sided steel plate connections, and so forth.

149. As has already been shown in Appendix B, the building I can reasonably describe as 'the first building of the rebuild' performed appallingly in the 13 June 2011 aftershock, and had to be demolished. It was demolished so quickly I was not able to get around to photograph it, and I have to rely on this article from The Christchurch Press. Has anyone else presented this example of the reality of current NZ design and construction practice, specifically as it relates to the rebuild, to this Royal Commission?

150. Appendix R shows another building being constructed with appalling details. This building was devastated on 23 December 2011, despite being fully propped. These photos were posted on the web, and someone made me aware of them. The sound engineer I just mentioned happened to drive past it, and stopped to look. The owner, a building contractor, was apparently standing there stunned. The design was done by a professional engineer, CPEng in fact, had been 'peer reviewed,' and fully consented. And yet it was devastated by far from a massive earthquake. The building was clearly not completed, but the main walls were fully propped. Unlike what I describe below, there are no appalling bent and rebent starter bars projecting for the first floor diaphragm. But the concrete along the line of the cast in threaded inserts should be roughened through retarding and water blasting to a 5mm amplitude and be free of laitance – but it is as smooth as a baby's bottom. The design is highly eccentric, with no lateral load resisting elements to the front. The large concrete spandrel panels over the front serve no structural purpose other than to be a severe seismic hazard. Instead of proper robust connections, they have bolted on angles with minimal edge distance in a brittle, non-ductile material. These connections have failed catastrophically. Has anyone else presented this example of the reality of current NZ design and construction practice, especially as it relates to the rebuild, to this Royal Commission?

151. Please refer to Appendix S, which shows photographs from a talk I gave in Auckland in 2004. This shows two storey precast concrete shear wall panels, with projecting starter bars that will subsequently be bent into the topping concrete of a precast floor, to stabilise the wall and allow for floor diaphragm forces to be transferred into these walls. The construction shown is illegal, as I explain.

152. In 2000 or so, one evening I attended a talk on precast concrete panels given largely by Des Bull at the Auckland School of Engineering. The large lecture theatre was full to standing room only. The talk concentrated on slenderness, I believe, but I spoke up to address the critical issue of bent and rebent starters. Despite by that stage excellent threaded Reidbar reinforcing and matching threaded couplers and inserts being available and competitively priced, most 'tilt up' wall panels had (and continue to have) conventional deformed starter bars projecting from the wall panel, for subsequent embedding in suspended floor slab diaphragms, or much more critically, slabs on grade, because most of these walls are actually meant to cantilever from the base.

153. Unfortunately, for ease of shipment and handling, and to facilitate precast floor placing and many other site activities, these starters were (and continue to be) bent and rebent many times. Cold rebending of a ductile, Grade 300E bar with the minimum required internal radius of bend is bad enough, and very, very difficult to do properly. I had seen bars flattened hard against panels, to a near zero radius bend, then bent out to into the topping so that the wall panels would provide all of the lateral load resisting elements. I had seen starters bent, then rebent several times before concrete was placed. Not on my jobs, because I never (from memory) ever used such details. What I saw I saw from the road on other jobs, and I was disgusted. Unnecessary bending and rebending of conventional starter bars projecting from insitu and masonry walls did occur on my jobs, and I would read the Riot Act, only to have completely ignorant people say it didn't matter in response.

154. At that evening talk, when I described what went on on site, most people present were splitting their sides laughing at one point, but I wasn't. Only a handful of people in the room seemed to be concerned about this, and only I spoke up about it.

155. Please refer to Drawings 6, 13-A, 15, and 19 of my Open Letter in Appendix A. This nonsensical practice of consuming a reinforcing bar's ductility by mindless and unnecessary rebending featured in my Open Letter, but no one else seemed to care. But you will recall in Section 79, I mentioned the fracturing of Grade 500 starter bars and the prominent 'expert' engineer who would do nothing to stop the practice. It all finally hitting the headlines in the NZ Herald, and not due to me. As a result, the DBH deigned to consider this problem, and duly issued guidelines which said only Grade 300E starters were to be cold rebent, and only if bent and rebent to the correct minimum radius of bend (very difficult to do on rebend), and *the total cumulative angle of bend was to be no more than 180°*. In other words, a bar was allowed to be bent up 90° for transport and to allow the precast floor to be placed, and bent down 90° to fit in the topping, a total bend of 180°. But look at the photos in Appendix S. This was going on a few months after all of this information had been fully disseminated throughout the profession.

156. You can see that many of the starters are bent down, not up. They will then be bent up, and finally down. If done perfectly, that will still be 90^{o} down plus 180^{o} up plus 90^{o} down, a total of 360^{o}, or *twice* the allowable limit. Yet this nonsense carries on to this day in Auckland, on an enormous number of buildings, and although because of the time and place I could not photograph it, *I recently saw the same rubbish being constructed in Christchurch*, the city that is to be rebuilt to be "the safest city in the world, from a seismic perspective.'

157. This is one example I showed at a talk I gave, and challenged anyone to defend it. No one would. Yet this construction is stock standard in Auckland to this day. One 'preeminent' designer of precast concrete continued to allow the cold rebending of Grade 500 starters years after it was banned. What of the hundreds if not thousands of buildings built around the country, especially those that have to resist seismic loads by cantilevering from the base? All of the Grade 500 bars can only be expected to fail in a brittle manner (the ones that *didn't* fracture on rebend).

158. Poor diaphragm designs played a large part in my Open Letter, especially the First Version that you *need* to see *in camera*. In the Second Version (Appendix A), this is mentioned in several sections of the text, and shown on Drawing 31. Three absolute appalling examples form some of the shockers that have occurred since my Open Letter, but IPENZ refuses to acknowledge them. Two I shall expand on if I am called to appear before the Royal Commission. The third I shall only cover *in camera*, and even then you will be hard stretched to believe it, but it's true. Remember that in 2009 I asked Maurice Williamson for very modest funding to write such a guide and get is published, but got nowhere. At the same time, I asked SESOC, but was rebuked. I have spent 10 years trying to get comprehensive design guidance issued, and enforced, and the fees and the time for diaphragms to be properly designed on every job, using my refined truss method if applicable. But most of the shockers I have described did not need analysis – with reference to Willie Holmes' comments – they didn't even have a load path. Yet the BIA report said that diaphragm failure would rarely be catastrophic, and I have been ignored and subverted for a decade. But what about the CTV Building? What about all the other bad diaphragms in Christchurch, which just happened to 'fluke it' because the shear core was in the centre of the floor, and not on the periphery?

159. As a graduate engineer, I was never told how deficient in ductility standard cold-drawn welded wire mesh was. I was never instructed to use conventional saddle bars, and following the practice I learnt in a leading firm, and subsequent firms, I only ever used mesh in my floors, unless extremely high forces required much heavier reinforcing to be used. In 1997, I heard that a precast 'tilt up' wall panel, reinforced mainly with mesh, had suffered an unexpected, brittle failure. Problems with the lift off the casting bed caused the concrete to crack, and instead of deforming in a ductile manner, the mesh fractured. The close spacing of the mesh had always made proper placement of the mesh in the concrete problematic anyway, and appalling anecdotes of bad practice abound.

160. I immediately contacted David Barnard, a prominent member of the concrete industry in Wellington, who said additional tests were being conducted to assess the situation. I immediately stopped using mesh in any job I had control over. I mentioned it at length in my Open Letter. The BIA report said that mesh was only a problem if it

was required 'to yield.' Given that virtually all designs are based on yielding of the reinforcing, presumably this was referring to the formation of plastic hinges in floor diaphragms. But that is nonsense. My warnings were ignored for a decade, and the subversion of my taskforce ensured that nothing would be done until *after* a vast number of floor slabs in Christchurch were munted. (Appendix T). If *these* earthquakes had not occurred, brittle mesh would probably still be used as industry standard. There was never, ever any need for mesh to be used – conventional reinforcing bars could always have been used instead. In mid-2011, months after the wholesale failure of brittle mesh all over Christchurch, an engineer I know in Auckland was reviewing a design of a mid-rise commercial building where the diaphragms required serious design. He insisted the mesh be replaced in the design by conventional reinforcing bars, and the design engineer was willing to comply. But the project manager and the quantity surveyor were demanding that brittle mesh be used!

161. As can be seen from the CTV Building, proper confinement of the concrete core of a column is crucial under seismic loading. To ensure that the transverse reinforcing can confine the core, restrain the main reinforcing bars and resist shear forces, it is essential that both ends of all pieces of transverse reinforcing are properly anchored, even if the cover concrete spalls off. This is achieved by either hooking the ends at 135^{o} back into the core, or welding the transverse element back onto itself. These anchorage requirements go back to at least 1982, and are explicitly stated in the codes for both stirrups and spirals.

162. Refer Appendix U. Shown are:
    - Pages C10-18 and C10-19 from NZS 3101:Part 2:2006,
    - A photograph of a collapsed bridge pier from Kobe, 1995,
    - A photograph out of a glossy brochure for a major NZ concrete companyy circa 2003,
    - A photograph of a completely unanchored spiral in a pile from Auckland, 2004,
    - DBH Practice Advisory 8.

163. The diagrams on pages C10-18 and C10-19 show how rectangular stirrups are hooked back into the core using 135^{o} hooks. Because of the relatively small size of such stirrups, and how they are made, this good practice is almost always achieved in NZ.

164. Refer to NZS 3101:Part1:1982, Section 5.3.29.3:

    Anchorage of a spiral bar at the termination of the length of spiral shall be provided by an extra one-half turn of spiral bar plus either a 135^{o} stirrup hook or welding the spiral bar on to the previous turn to develop in tension 1.6 f_y or the breaking strength of the bar, whichever is smaller.

    Unfortunately, unlike overseas, it is virtually impossible to get contractors to construct such hooks at the ends of spirals, even when you draw the detail to massive size on a piling job for which there is only one drawing! Look at the photo from the glossy brochure, showing a column cage. Where is the spiral anchorage? Where is the spiral anchorage in the pile cage in 2004?
    Welding of the spiral is problematic because:

- It is very difficult to get even welding of Grade 300E spirals done properly, without 'blow out' and notching at the ends of the weld runs, and the danger of tack welding the underlying reinforcing,
- Ditto Grade 500E micro-alloyed, which is much more difficult to weld properly and it appears now should never be welded at all, and
- The prevalence of Grade 500E QT steel, which was only allowed into the country due to a complete balls up in the drafting of the new standard, and which must not be welded.

In many instances, even with so-called CPEng engineers supervising, completely unanchored spirals are supplied to site, and cast in without any form of end anchorage.

165. Because of this, I specifically asked the concrete standards committee responsible for NZS 3101:2006 for diagrams such as those on pages C10-18 and C10-19 to be included for spirals and hoops. Of course, I was ignored.

166. In 2005, I got two other engineers and a competent architect to co-sign a letter to the DBH, asking that they address this issue. DBH Practice Advisory 8 was the result. It only took the DBH *one year to write two pages on a matter about which there is absolutely no question whatsoever.* When I was sent a draft to review, and I used the word 'widespread' in a suggested modification, I was told that 'widespread' was an *emotive* word. Oh dear!

167. In 2011, I was called in by a couple desperate because their house had been endangered by completely unsupported excavations against the boundary on their neighbour's property. The neighbour's engineer was required to design some retaining piles forthwith. I insisted on 135^{o} hooks for the piles. I insisted on a large scale detail of these hooks on the *one* pile drawing, and explicit written instructions were added to the detail to *ram home the message.* So what arrived on site? Refer Appendix V – spirals with no hooks. We then got the reinforcing fabricator to send men around to bend the hooks on site, to the correct radius, which they did quite well, on the ones they bothered to do that is. So they had to come back again! No mention of this nonsense in that Productivity Report in Appendix O.

168. In *2008*, I was invited to be the second speaker at the NZSEE Conference. My paper was titled 'Resilience Urgently Needed for a Brittle System Producing Brittle Buildings.' Refer Appendix W.

169. In Figure 1 on page 3 one can see the 'Swiss Cheese' model for organisational failure developed by Professor James Reason. Each part of the process for the design and construction of, for example, a commercial airliner, can be considered as a slice of swiss cheese, with the odd hole (error or oversight) in each slice (stage). Hopefully, for one particular potential defect, like a cargo door incapable of handling the pressure differentials above 20,000 feet, whereas the defect in design or construction may slip through some processes, somewhere along the line one of the processes will lead to the defect being identified and eliminated.

170. Figure 2 on page 5 shows my 'Reason model' for the NZ construction industry with regard to unachored spirals in seismic resistant piles and columns. It's not a cheese,

it's a rind. Look at all the parties that so often allow the unanchored spirals to be constructed, when everyone of them should know to prevent it, and any one of them could prevent it. But it's worse than that. Remember the picture from the glossy brochure from the leading concrete company? And a concrete standards committee that refused to add even one simple diagram to help prevent this.

171. Refer now to Figure 3 on page 6, where I show a seismic resistant structure as a chain (remember Willie Holmes' "load path"), in which the failure of any link is catastrophic. Each link must be strong and tough – the odd link can be a little under size and a little weaker, but there must be no latent catastrophic weaknesses.

172. But what is designed and constructed all too frequently in NZ, particularly when diaphragms, brittle mesh and unanchored spirals are involved? Look at Figure 4, and ignore the piles. Is that not the CTV Building?

173. Then there are eccentric steel cleat connections, unchecked computer analyses, unchecked drawings, appalling understanding of welding fundamentals, and on, and on, and on .....

F. The Logical Fallacies of Argument *ad populum, ad verecundium* and *ad hominem*

174. Structural engineering is a field of applied science, and as such, the scientific method must apply. This must involve a dialectic between theory (which in this case includes idealised laboratory tests) and actual observation of real performance.

175. This dialectic results, sorry, should result, in error elimination through questioning of hypotheses and 'accepted' practices. Unfortunately, the 'Groupthink' that has pervaded the NZ structural engineering profession, especially since the fiat of the early 1980's that "New Zealand leads the world in seismic engineering," without *any* proof from real seismic events, has meant that not only are errors not eliminated, they multiply.

176. Because of the mass, size and timescale of the structures and loads we deal with, the 'universe' in which structural engineers operate is Newtonian and Euclidean. Relativistic and quantum effects do not apply.

177. Therefore, all structures must comply with the three fundamental requirements:
- static or dynamic equilibrium,
- a stress-strain relationship, and
- compatibility of displacements.

178. To these I would add the implicit derivatives of:
- viable load paths,
- constructability, and
- construction methods that do not ruin the desirable properties of the materials being used.

179. In order to substantiate my claims in this submission, I must deal with three completely *fallacious* arguments that are the *only* arguments that have been put up against my assessment of the state of engineering and construction, my resulting warnings, and my efforts for effective reform, before it is too late. These are the arguments *ad populum, ad verecundium* and *ad hominem*, the last being the most frequently used against me. These fallacious arguments have no place in science or engineering.

180. The fallacious argument *ad populum* (Latin for 'appeal to the people') holds that a proposition must be true because many or most people believe it – *"If many believe, it must be so."* Going against the scientific 'consensus' over 400 years ago, Johannes Kepler determined that the orbits of planets are elliptical, and this was confirmed over 100 years later by Isaac Newton. Yet the Prime Minister, the Minister, the DBH and IPENZ et al hold that my assessments and warnings are wrong because 'most engineers don't agree with [me].' Such an assertion is worthless.

181. The fallacious argument *ad verecundium* (Latin for 'from authority') is completely inappropriate if the testimony of an authority is outside its special field, or experts in the field disagree on the issue, or there is no supporting evidence to justify the position. I expand on this later, but the Chief Executive of IPENZ, Andrew Cleland, is a food technologist, experts in the field most certainly do disagree, the genuine experts do agree with me, and for there to be an overwhelming weight of evidence to support the position of the likes of the Prime Minister, the Minister, the DBH and

IPENZ et al, there would have to be an absence of the sound of stadia and roofs collapsing under selfweight or modest snow loads, and there is not.

182. As the brilliant physicist Robert Lindzen has pointed out, a decline in scientific standards and ethics has led to the situation where "professional societies .... are hierarchical structures where positions and policies are determined by small executive councils or even single individuals, ... where a handful of individuals (often not even scientists) speak on behalf of organisations that include thousands of scientists, and even enforce specific scientific positions and agendas." Think New Zealand, and read structural engineering, and he's got it to a tee.

183. The most fallacious argument of all, and the one I have been most subjected to, is the argument *ad hominem* (Latin for 'to the man). As it applies in this case, I am stated by embarrassed or scared opponents to be:
    - emotive,
    - unprofessional,
    - a scaremonger,
    - sub-professional,

    and to have:
    - put the profession in the gutter, and
    - stabbed it in the back.

    Apparently, therefore, eccentric steel cleat connections can be designed without considering the eccentricity, the near collapse of the Vector Arena never happened, and it does not matter that floor diaphragms are not properly connected to shear walls or spirals are not anchored. It's all OK, because "We say John Scarry is wrong."

184. Mahatma Gandhi said "Even if you are in a minority of one, the truth is still the truth."

185. Dante said "There is a special place in hell reserved for those who in a time of great moral crisis, turn their heads and do nothing." To which I ask, what is reserved for those who not only turn their heads and do nothing, but deliberately subvert efforts that have a real chance of addressing the crisis.

186. My favourite is from Euripedes – "Talk sense to a fool and he calls you foolish."

G. IPENZ – The Registration Authority to the Chartered Professional Engineers of New Zealand Act 2002

187. IPENZ is an incorporated society which supposedly represents professional engineering in NZ, and as that society, IPENZ is entrusted by Parliament with the fiduciary duty to act as the Registration Authority under the Chartered Professional Engineers of New Zealand Act 2002.

188. With regards to the *society*, according to IPENZ their Code of Ethics is based on the five fundamental ethical values set out in Rule 4 of the Institution as follows:
    - ***Protection of life and safeguarding people,***
    - Sustainable management and care for the environment,
    - ***Commitment to community well-being,***
    - ***Professionalism, integrity and competence,***
    - ***Sustaining engineering knowledge***.

    (My highlights, here and in the following sections). The current IPENZ Rules are attached in Appendix ρ.

189. Under IPENZ Rule 4.3. Competence Obligation:
    > *Members in the classes Distinguished Fellow, Fellow, Professional Member, Technical Member, Associate Member and Graduate Member* ***must perform their engineering activities in a careful and competent manner****, commensurate with their Membership class within the Institution (the "competence obligation").*

190. Under IPENZ Rule 4.4 Good Character Obligation:
    > *Members must conduct themselves at all times in a manner consistent with being a fit and proper person to be a Member of the Institution (the "****good character****" obligation).*

191. Rule 11.3 covers complaints that are received about a Member:
    > *Should the Chief Executive receive a* ***complaint*** *from any other source alleging that a Member has acted in breach of Rule 4, the Chief Executive* ***must*** *initiate action to deal with such complaint in accordance with the Regulations prescribed by the Board in pursuance of Rule 11.1.*

192. Rule 11.4 covers the case where information of a possible breach of Rule 4 comes to the attention of the Chief Executive:
    > *Should the Chief Executive receive* ***information from any source*** *which, in his or her opinion,* ***indicates*** *that a Member may have acted in breach of Rule 4, then the Chief Executive may deem the matter to be a complaint and initiate action to investigate the Member's behaviour in accordance with the Regulations prescribed by the Board in pursuance of Rule 11.1.*

193. The clear intent of the Chartered Professional Engineers of New Zealand Act 2002, as shown by reference to Section 40 of the Act, is that chartered professional engineers must be competent, must maintain current competence, and must act in an ethical manner. The Registration Authority is required to have, and administer, rules to that effect. Refer Appendix X for these rules.

194. Remembering Richard Lindzen's description of typical scientific societies today, IPENZ's character and actions are not driven by the many thousands of members linked in some theoretical 'collegial' network, but by the Board, the Executive, and those insiders around them.

195. I state categorically that as far as structural engineering issues are concerned, IPENZ is not fit to be the Registration Authority under the CPEng Act, and any Government that allows IPENZ to remain the Registration Authority shows contempt for the people of New Zealand.

196. A mechanical engineer called Peter Morgan is making a written submission to this Royal Commission, solely on the fitness, or more correctly, lack thereof, of IPENZ to be the Registration Authority under the CPEng Act. He will state categorically that "IPENZ is corrupt to the core." This Royal Commission needs to hear him in person.

197. I gave an overview of IPENZ's contempt for its own Code of Ethics in Section D above, and in the attached complaint to the Auditor-General. I shall not even deal with the widespread unethical and irresponsible actions of so many 'respected' Members and Fellows of IPENZ in ignoring the crisis and subverting reform here. I wish to concentrate on my dealing with the Board and the Executive, in particular, the Chief Executive, Andrew Cleland, food technologist.

198. As stated above, I first met with the then Deputy Chief Executive, John Gardiner, in early 2002. (John is one of the few IPENZ luminaries I exclude from criticism). He said "IPENZ had been hearing rumours" regarding the issues I was raising. But if IPENZ was the 'all seeing, all knowing expert body, made up of all of these world leading structural and earthquake engineers,' as assumed according to the argument *ad verecundium*, why had they only been hearing rumours. Why did it fall upon 'an engineer of no importance' to have to make them aware of the shockers contained in my Open Letter, shockers that have never been disproved, either as to occurrence or technical issues concerned? [The one technical thing I talked about with John Gardiner, and explained to him, was the appalling standards of floor diaphragm design. The performance of real diaphragms in the Canterbury earthquakes completely supports my warnings.]

199. I'm sure it was difficult for some of them, but the Executive of IPENZ did not at the time consider my Open Letter 'unethical.'

200. IPENZ, certainly prompted by me sending the Second Version to the Government, then set up their own Taskforce to investigate 'the profession,' which of course includes IPENZ as a body. Surprise, surprise, this Taskforce, which I communicated with only once through one meeting in which I was not 'examined' in any way, found that things really weren't that bad after all. But the Taskforce still recommended that IPENZ urgently develop technical and best practice guidelines, tasks it then proceeded to forget about.

201. In early 2003, I was invited by John Gardiner to give a talk on the issues surrounding my Open Letter to the IPENZ annual conference, a conference where real technical issues at least used to be discussed. IPENZ doesn't have such conferences any more. It mainly concentrates on the Awards Dinner, where IPENZ sanctioned 'success' can

be celebrated, and boring things like the connection of floor diaphragms to shear walls don't have to be considered. (Bear in mind that the year before, the Parliament of New Zealand had passed the CPEng Act, entrusting IPENZ with the fiduciary duty to be the Registration Authority).

202. As I waited outside the packed hall to speak, Murray Isdale, the then IPENZ Practice Manager (another man excluded from criticism) approached me and introduced himself. Murray then introduced the man behind him, the Chief Executive, Andrew Cleland, food technologist. As the current speaker finished, and some people moved in and out of the hall, I moved forward to enter. Andrew Cleland, food technologist, moved in front of me, and without turning his head in my direction, said "Mind your language."

203. Despite being the Chief Executive of IPENZ, Andrew Cleland, food technologist, has never once asked me about the real content of my Open Letter – the design and construction shockers, the endemic bad practices, the decline in skill levels, the unbearable pressures on the profession and on individual engineers – none of it. He only ever mentioned 'the language' *I* had used.

204. IPENZ then received the two spurious complaints that I had breached the IPENZ Code of Ethics, as described above. I will not go into the details of this episode, except *in camera*. I was invited down to IPENZ HQ in Wellington to attend a meeting of the taskforce of IPENZ members IPENZ had assembled to investigate my Open Letter, in which nearly all of the shockers were design, supervised or approved by IPENZ Members, Fellows and/or Registered Engineers.

205. Before that meeting, Andrew Cleland invited me into his office to discuss the complaints against me. He said that he didn't want it to appear as if it was a 'witch hunt.' I stated that the complaint from the Canterbury individual was without foundation, because the complainant had not even read my Open Letter, and knew nothing about it, or what I had done to try and prevent the shockers from ever occurring. Cleland said that it had been received, and would be 'investigated.'

206. I then said that by claiming to be one of the (disguised) firms in the Open Letter, the complaining firm was admitting to at least technically incompetent work, and was therefore itself subject to investigation and disciplinary procedures by IPENZ.

207. The only intention of my Open Letter was to say "this has to stop now, and comprehensive reforms must be enacted immediately." Disciplinary measures would only be used against those who refused to stop this nonsense. But I am sure I said to Andrew Cleland, that if IPENZ was prepared to come after me for writing the Open Letter, why weren't they investigating all of the appalling practices exposed in it?

208. Cleland responded that no complaint had been received. I pointed to (the equivalent of the current) Rule 11.4, namely:

> *Should the Chief Executive receive* ***information from any source*** *which, in his or her opinion,* ***indicates*** *that a Member may have acted in breach of Rule 4, then the Chief Executive may deem the matter to be a complaint and initiate action to investigate the Member's behaviour in accordance with the Regulations prescribed by the Board in pursuance of Rule 11.1.*

209. He said that no complaint had been received, and I said to look at the rule – no complaint was needed. He then blurted out "Look, there are people out to *get* you." I said that if engineers were 'out to get me' for drawing to IPENZ's attention the most appalling examples of bad design and professional attitudes, then *they* were in gross breach of the IPENZ Code of Ethics, and it was *they* who should be subject to disciplinary proceedings. He said "But that's just hearsay," to which I said that the complaint from the Canterbury individual was worse than hearsay and IPENZ was investigating that. He repeated "a complaint has been received ....," at which point I gave up and walked out to attend the Taskforce meeting.

210. In hindsight, Cleland's whole tone seemed to be "accept the punishment we will dish out, and that will placate the people out to get you."

211. After the meeting regarding the Taskforce, I met the Fellow who was the 'investigating officer' for the complaint against me. We, well mainly I, talked for about 45 minutes, and during the meeting Murray Isdale came in, and handed the investigating officer an audio cassette tape, which could only have been from the interview on National's Morning Report, during which a Fellow of IPENZ blurted out that I was speaking rubbish, and that the concrete at the tops of the piles in multi-storey buildings was *not* heavily loaded. (The Fellow's statement is of course nonsense).

212. Back in Auckland, I duly received a phone call from the then President, Gerry Coates. I went ballistic about these trumped up charges, and he said "But John, you were critical of engineering management." First of all, "diddums." Secondly, what did that have to do with the complaints? If any of these 'managers' wanted to come after me, why didn't they lay a complaint? Or were they happy to just be drivers behind the scenes?

213. Surprise, surprise, the investigating officer duly found that I had breached the IPENZ Code of Ethics, and the matter was passed for further action. Of course, this Fellow of IPENZ had completely ignored a completely wrong or blatantly dishonest statement on national radio from another Fellow of IPENZ on a matter of the utmost importance. But it was worse. Instead of judging my actions against the actual Code of Ethics (I was clean as a whistle there), he used some completely misapplied 'guidelines' derived from the Code of Ethics to fit me up, in accordance with instructions from above. He subsequently said he felt between a rock and a hard place. Of course, he took the easy, unethical way out.

214. *I* was and am not in contempt of the IPENZ Code of Ethics; *IPENZ* was and is in contempt of the IPENZ Code of Ethics, and therefore is not of the fit moral character required of the Registration Authority for the CPEng Act.

215. I contacted IPENZ HQ and asked for this nonsense to be stopped, but was told they would proceed.

216. Things were looking grim, but driving to work one morning I had a very interesting thought. A quick calculation of the fees IPENZ had taken in from structural

engineers since I had become a Member gave me hope. Then I calculated a few other sums. "Ah hah, I've got them."

217. I phoned IPENZ. Unfortunately, the Chief Executive, Andrew Cleland, food technologist, was not there, and poor Murray Isdale and John Gardiner were on the receiving end. I said that unless these trumped up charges were dropped immediately, I would be down in Wellington using the full force of the law against IPENZ and others, with the media in full attendance. The charges were dropped before the end of the day. Now if I was unethical, and IPENZ wasn't, why were the charges dropped?

218. Given the shockers that continued to occur, including those being done by the new Chartered Professional Engineers, in 2005 I saw red when IPENZ was claiming that "CPEng is a quality mark, and a mark of quality." A blistering draft letter to the Practice Board saw an initial meeting with Roly Frost, the President of IPENZ, another meeting with him and some of my close supporters, and then me appearing before the IPENZ Board on 4 October 2005. (Roly had said that his powers were confined to the profession, and reform would have to be limited to that – the 'mother Teresa principle' – "I can't solve the whole world, but I can save part of it").

219. I had expected Roly to have briefed the Board fully, but he had not, so I had to speak off the cuff. I showed them the photographs attached in Appendices C to E, and said that these were the construction equivalent of the sort of professional engineering practices that need to be addressed. I said that my Taskforce was needed, to directly address the crisis within the structural engineering profession itself. The best people would put out the best advice, guidance and requirements possible in the circumstances, as at least a first step to turn the crisis around. The Taskforce was to include Richard Fenwick, Charles Clifton, Barry Davidson and others. The whole purpose was education and assistance, but if anyone refused to alter their unacceptable behaviour, they would be hit with the full force of IPENZ's own rules and the CPEng rules.

220. The only one who spoke up in any sort of adversarial fashion was the Deputy President, Peter Jackson, who claimed that the response to the Matthews' test showed "the system was working."

221. After having made my case, I left and returned to Auckland. I was duly informed by Roly Frost that the Taskforce was to be set up, but whereas he had previously talked about reform being confined to IPENZ, he and/or the Board now wanted the DBH and the likes of SESOC and NZSEE involved. This was appalling, because if they got involved, *nothing* effective would happen. Also, there were stupid comments from the Board that "people who do a lot of tilt up, and perhaps an architect, or a lay person should be involved." Most of the Board members just didn't have a clue about structural engineering.

222. However, the DBH was obviously told about the Taskforce, because I was invited down for two lengthy meetings, mainly with Mr John Kay.

223. We waited and waited and waited for the go ahead. In late 2005/early 2006, Colin Nicholas and I were invited into a small group which included Richard Fenwick to

assist Jeff Wastney, the Registrar, in improving assessment procedures. (Jeff Wastney is one of the few people at IPENZ HQ who has the right to hold his head high. It is not his fault that far from 'CPEng' being 'a quality mark,' it at best means nothing and is in many cases a sham). This group only met once from memory, and lasted a very short time. It actually turned out to be a deceitful product of an act of unabashed perfidy, an act of depraved indifference to everything IPENZ is supposed to stand for.

224. This whole sordid mess is documented in Appendix Y and Appendix Z.

225. The reason we waited and waited and waited for the go ahead to set up our Taskforce was that seven weeks after I had met the Board and they had resolved to set up the Taskforce, the Deputy President, Peter Jackson, and the Chief Executive, Andrew Cleland, food technologist, subverted it, and the President and Board bowed their heads and let them, but not one of them had the decency to tell us. On the contrary, when Colin Nicholas and I met Roly Frost in February 2006, he still promised us the Taskforce.

226. A few weeks after that, when they were preparing to finalise the details of this depraved subversion, the Vector Arena came within a hair's breadth of total collapse under its selfweight, and the Board didn't have a clue, even though it was on the TV One 6 o'clock news. And even when they learnt about it, they still would not desist from their depraved irresponsible course of action.

227. I subsequently asked for a copy of the minutes of the relevant Board minutes. These were not given to me. Instead, the (by now) President, Peter Jackson, *kindly* sent me edited transcripts. These are included in Appendix Z.

228. I have only reread the first four pages of this. I will not waste my time on anything that follows. The first four pages from the minutes of 4 October 2005 are reasonably accurate in relation to my meeting with the Board, and clearly show the Board resolved for "the Chief Executive ... to provide a brief encompassing .... a *reconstituted structural taskforce, ...*" (IPENZ considered the first 'Structural Taskforce' to be the one that had written the whitewash report on my Open Letter).

229. From 24 November 2005, seven weeks after this resolution:

> *The Deputy President indicated that he had been in communication with a senior and respected structural engineer whose view was that there had been problems in the past in respect of design, but that these were largely fixed. If there were residual problems they arose where inexperienced engineers were inadequately supervised. The quality of construction was a more major issue, and in that respect it required the regulator to require monitoring by engineers to ensure that construction activities were performed to suitable standards.*
>
> *The Board noted that there will be no second taskforce, but rather four streams of activity as set out in document IB 05-11-11.*

230. The then Deputy President, Peter Jackson, FIPENZ (now DistFIPENZ), is a mechanical engineer, expert in puffs of wind on sails. He knew and knows nothing about structural engineering, the construction industry or the crisis it is in.

231. If you haven't realised by this stage, the Chief Executive, Andrew Cleland, is a *food technologist.* He was instructed by a Board resolution on 4 October 2005 to "**to provide a brief encompassing ..... a reconstituted structural taskforce**," yet seven weeks later he presented a completely different workplan to subvert that taskforce. He should have been fired on the spot.

232. Note that "The Board *noted* that there would be no second taskforce, but rather ...." The Board *noted*? They were instructed by the Deputy President, and they bowed their head and obeyed?

233. I respectfully request that this Royal Commission order the '**senior and respected structural engineer whose view was that there had been problems in the past in respect of design, but that these were largely fixed**' to appear before it, and ask him to justify his position in light of these shockers that have occurred *since* my Open Letter, shockers almost exclusively designed by CPEng engineers, and even Fellows of IPENZ:
    - The Waitakere Trusts Stadium (2004), which was massively overstressed at the point where the main roof trusses landed on their support columns. The roof was failing during erection because it could not carry even its own self-weight through these connections. This was designed by Alan Reay's company.
    - The original design of horrendously 'cut off' shell beams, only 225mm high, designed in the office of a 'pre-eminent designer of precast concrete,' which was condemned as incorrect and unsafe by NZ's two top concrete engineers, and the two co-inventors of shell beams, yet was approved by two Fellows of IPENZ, and lauded by a senior member of the NZS 3101:2006 committee.
    - The Vector Arena, which came within a hair's breadth of collapse due to at least two major deficiencies. But for a miracle, it almost certainly would have failed in service, and could have come down on 12,000 people.
    - The large shopping centre concrete floor slab diaphragm, which was designed as if 'simply supported' by walls at both ends, yet which in fact had to *cantilever* off walls at only one end.
    - Another massive floor in the same complex where, after having been shown how to analyse an L shaped floor diaphragm by the reviewing engineer, the 'designer' proceeded to ignore the massive forces at the re-entrant corner because he considered them "*errant forces."*
    - The large shopping complex in another city that apparently required *rebuilding* of concrete foundations, concrete beams and steel superstructure *during construction*, because of design defects.
    - The large educational building that had been designed and peer reviewed, yet had no viable means of resisting lateral seismic loads in the foundation system, had a transfer diaphragm at ground level that had not been analysed or designed, just assumed to be 'infinitely strong,' had a soft storey, had not had the main seismic analysis that was done by others checked, and that had grossly deficient stairs, including a feature stair that would certainly have collapsed as initially designed, and probably would have collapsed as redesigned by a Chartered Professional Engineer, until I pointed this out.
    - The major bridge whose seismic analysis and design did not make sense to the owner's reviewer, until it was pointed out that the analysis defied all common

sense, and instead of the bridge deck acting as a rigid diaphragm in the plane of the deck, it was wobbling round 'like a blob of jelly.' Even when fully explained to them, the designer and his superiors could not understand this absolutely fundamental deficiency.

- The large concrete and steel bearing plates for large ground anchors that formed a very basic structural system, yet two engineers could not analyse, design or detail them properly.
- The Australian supermarket building designed by a NZ firm that has failed due to eccentric steel cleat joint failure, a design detail that only I ever seemed to think about, until I got Charles Clifton interested.
- A similar roof failure in Whangarei.
- The Pepperwood Mews apartment complex in Waitakere City. The thirty two unit complex constructed from reinforced concrete is not only a leaking, sodden mess, it is so structurally unsound, it is a 'wrecking ball' job. It was designed in 2005.
- The 'first building of the Christchurch rebuild' in Appendix B. Just completed and fitted out, leaning over at 5^{o} after 13 June 2011, since demolished.
- The precast Christchurch building munted by the 23 December 2011 aftershock – Appendix R.
- The illegal construction that was going on in 2004, and continues to this day – Appendix S. This is an inevitable consequence of unacceptable engineering design practices and attitudes.
- The 4m high concrete retaining wall for a motorway that had an opening joint that would have ripped open as 'detailed.' Leaving aside the lack of any proper joint design, the 'not to scale' drawing hid the fact that the reinforcing would have been poking out of the concrete at the front and bottom of the wall/foundation joint if the hooks had been properly developed from the critical sections.
- The multi-storey apartment building in Auckland, designed circa 2005, where the following defect was only found because the building as a whole was a 'leaker,' including leaks through cracks in an external structural shear wall. This structural wall was designed and constructed as an assemblage of precast panels, acting compositely with heavily reinforced and confined end columns. Heavy horizontal reinforcing projected, with hooks on the end, from the ends of the precast panels, and had to be embedded in the end columns, something that could not actually be done because of the very heavy column reinforcing. How did the contractor fit the panels in place and complete the wall? He cut most of the projecting starter bars off, of course. This may have ended up as a 'site shocker,' but that was the inevitable consequence of the initial design deficiencies.

234. The alternative work schemes proposed by the Chief Food Technologist soon petered out and achieved nothing. A Fellow of IPENZ, Brian Hasell, a retired *roading engineer*, was appointed to handle this nonsense. In doing so, he was operating outside his area of competence, but IPENZ was fine with that.

235. I spent almost three months full time trying to get IPENZ to stop this nonsense, and act to address the undeniable crisis.

236. Jackson instructed the Board members not to talk to me. With only the slightest exception, the Board members agreed, and would not talk to me in any meaningful way. The purpose of a Board is to govern, not act as mushrooms. In acceding to this instruction by the President, they were not fit to be on the Board, any Board, and they were in contempt of the organisation's own Code of Ethics. And this was *after* the much publicised near collapse of the Vector Arena.

237. To those Board members who said "I'm sorry John, I am not prepared to discuss it," I yelled out "You're not fit to be on the Board," and slammed down the phone.

238. One Board member said that he felt they had spent far too long on the issue already. What, all of 3 hours? What did he expect to do as a Board member? Organise the hypocritical Awards Dinner, and cocktail gatherings with the President?

239. One Board member who agreed to personally convey the message of the subversion of the Taskforce and the Chief Food Technologist's alternate work schemes to the IPENZ Practice Board said "I don't really understand what it is all about?" Then why didn't she stand down?

240. I tried through Murray Milner (another man who tried to do the right thing by the people of New Zealand) to contact the members of the Practice Board. Murray said that he did not understand why the Taskforce *hadn't* been set up, but he was prevented from forwarding my e-mails to the Practice Board members.

241. Documentation regarding this whole sordid, unconscionable episode is in Appendices Y and Z. You will note that Nicki Crauford was on the Board at this stage. Unless my memory fails me, she is an 'expert' in management and the functioning of boards in organisations. My recollection is she was once quoted in a publication, stating that "the purpose of a Board is to *govern*." She has appeared before this Royal Commission. Get her back, and ask her to justify her actions, or more specifically, inactions, in light of all of the shockers contained in my Open Letter, and more particularly, the subsequent shockers described above.

242. IPENZ has weekly and monthly publications which purport to keep the membership informed of what is going on. But the membership of IPENZ were not informed of *any* of this; neither the setting up of the Taskforce, nor its subversion. But it gets worse.

243. One prominent structural engineer was most annoyed that I wrote my Open Letter. He has at every stage opposed the setting up of my Taskforce, or anything like it. His arguments against me have been of the fallacious *ad populum*, *ad vericundium* and *ad hominem* type, although he has never been nasty to me as a person, unlike many other 'leading engineers.' He went down to IPENZ HQ for one of their worthless *talkfests*, and even he was surprised that even the document IPENZ Engineering Practice Forum – Forum 06-11 (Appendix α), which purported to be an accurate record of important practice issues handled by IPENZ for the preceding year, had no mention of the Taskforce.

244. If any Board member had done the decent thing, and kicked up a stink and resigned, the membership would never have been told about it through the 'official' IPENZ

publications. Even Josef Stalin would be impressed by IPENZ HQ's complete control of information given to 'inform' the membership of what is going on.

245. IPENZ Rule 11.4 states that the Chief Executive may initiate an investigation at any time he suspects wrongdoing – he/she need not wait for a complaint. Rule 55 of the CPEng Rules (Appendix X) states that "the Registration Authority may inquire into any matter on its own motion .... if it has reason to suspect ...."

246. As stated above, the purpose of my Open Letter was to get the crisis into the open, and effective reform initiated. It was not meant to be grounds for disciplinary action, but it included ground for a massive number of disciplinary proceedings. The Chief Executive, Andrew Cleland, never asked me to identify the parties concerned. The only person IPENZ went after was me, with their fit up. The Chief Executive has occasionally issued a statement calling members attention to their ethical obligations regarding knowledge of unacceptable practices, and asking them to make complaints of all bad practices they are aware of. Of course, no such complaints come in, and the Chief Executive disingenuously claims this as 'proof' that there is no crisis.

247. Before our Taskforce was subverted, or at least before we were finally made aware of it, Roly Frost asked the Chief Executive to ask me for information on recent bad practice. I sent him information on two jobs, for which I had photos and addresses, but I did not know any of the identities involved. I do not know what came of this, but I doubt anything serious. I then made complaints about two engineers from one company, and one engineer from the other, for appalling behaviour. This is covered in my 2010 complaint to the Auditor-General. In both cases, the engineers were 'hit on the back of the hand with a wet bus ticket,' although the costs in one case would have hurt. One of these cases was an absolute whitewash, and the two investigating officers who are Fellows of IPENZ should be struck off as a result. Then there is Peter Morgan's experience. Complaints are not made by Members against other Members for three reasons. For many members, they consider appalling practice 'good practice,' the sort of thing they do every day. All are concerned about the personal cost of laying a complaint, namely unofficial 'blacklisting,' attempts at revenge and loss of work. But probably most compelling, they know that the whole process will be a farce, most often a complete whitewash, especially if the complaint is made against a Fellow.

248. [Deleted]

249. Carl O'Grady can give evidence of his recent correspondence with the Deputy Chief Executive of IPENZ, Nicki Crauford, in which he asked why IPENZ did not initiate disciplinary proceedings regarding this near disaster. Apparently, the issues were 'systemic,' and "no one person could be blamed." But surely a 'systemic' failure, with multiple engineers failing in their duties, is the most demanding of disciplinary proceedings.

250. You will recall the retelling of my argument with the Chief Executive in his office, when I kept saying that the IPENZ rules stated explicitly that no complaint was required to launch an investigation

251. I know full well that subsequent to his subversion of the Taskforce, and before the collapse of Stadium Southland, the Chief Executive, Andrew Cleland, met an engineer in Auckland specifically so he could be informed of widespread, ongoing, seriously deficient design practices by structural engineers. Another person was present at the meeting.

252. The engineer concerned does not wish to be identified in any way, because of the repercussions that come the way of anyone who dares contradict the prevailing 'groupthink.'

253. Cleland was told of all of the shockers this engineer has to deal with. Cleland asked for the engineer to lay complaints against engineers responsible for these shockers. The engineer refused, because of the inevitable repercussions for him and his company. But the engineer repeated again and again, that IPENZ did not need any complaint to act - both the IPENZ rules and the CPEng rules allowed IPENZ to investigate any *suspected* unprofessional behaviour. It is the Chief Executive, a food technologist, and IPENZ HQ as a whole, who have steadfastly refused to launch investigations and follow through with realistic disciplinary proceedings.

254. Please now listen to the interview on National Radio's Nine to Noon programme on 22 September 2010 with Cleland and me, following the collapse of Stadium Southland.

255. After refusing to explain his subversion of the Taskforce, he states:

> *".... poor work can be notified in the form of complaints, or information can be given to us, and if information is given to us,* ***without exception****, we deem it to be a complaint ...."*
> *".... that every time we receive information it is investigated thoroughly ...."*
> *".... the evidence by a large number of people independent of us, in fact, is to the contrary of what he* [John Scarry] *is saying."*

256. IPENZ is not fit to remain the Registration Authority under the CPEng Act until there is a complete clean out at Board level and the Executive, and root and branch reform of the organisation.

257. As described above, the membership are kept in the dark about the serious critical issues that confront the profession. For decades, when I mention IPENZ to senior competent engineers I respect, they replied "I pay my fees each year (or, the company pays them), but I'm buggered if I know why I bother."

258. From IPENZ's actions, I can only take it that they consider the sound of collapsing roofs and stadia "the sweet sound of success."

H. CPEng – 'Mark of Quality'

259. Section 5.2 of the Discussion Paper starts thus:

> *'Chartered Professional Engineer' (CPEng) is New Zealand's only statutory-backed **mark of quality** indicating an engineer has proven his or her current competence to practise as a professional engineer within New Zealand.*

260. Or, as IPENZ would have it, *"CPEng is a quality mark, and a mark of quality."*

261. Stuff and nonsense. I repeat the list of major shockers that I am aware of, largely through my own direct experience, that have almost exclusively been designed and approved, faults and all, by Chartered Professional Engineers, including Fellows of IPENZ, *since* I presented IPENZ with my Open Letter in September 2002:

- The Waitakere Trusts Stadium (2004), which was massively overstressed at the point where the main roof trusses landed on their support columns. The roof was failing during erection because it could not carry even its own self-weight through these connections. This was designed by Alan Reay's company.
- The original design of horrendously 'cut off' shell beams, only 225mm high, designed in the office of a 'pre-eminent designer of precast concrete,' which was condemned as incorrect and unsafe by NZ's two top concrete engineers, and the two co-inventors of shell beams, yet was approved by two Fellows of IPENZ, and lauded by a senior member of the NZS 3101:2006 committee.
- The Vector Arena, which came within a hair's breadth of collapse due to at least two major deficiencies. But for a miracle, it almost certainly would have failed in service, and could have come down on 12,000 people.
- The large shopping centre concrete floor slab diaphragm, which was designed as if 'simply supported' by walls at both ends, yet which in fact had to *cantilever* off walls at only one end.
- Another massive floor in the same complex where, after having been shown how to analyse an L shaped floor diaphragm by the reviewing engineer, the 'designer' proceeded to ignore the massive forces at the re-entrant corner because he considered them "*errant forces.*"
- The large shopping complex in another city that apparently required *rebuilding* of concrete foundations, concrete beams and steel superstructure *during construction*, because of design defects.
- The large educational building that had been designed and peer reviewed, yet had no viable means of resisting lateral seismic loads in the foundation system, had a transfer diaphragm at ground level that had not been analysed or designed, just assumed to be 'infinitely strong,' had a soft storey, had not had the main seismic analysis that was done by others checked, and that had grossly deficient stairs, including a feature stair that would certainly have collapsed as initially designed, and probably would have collapsed as redesigned by a Chartered Professional Engineer, until I pointed this out.
- The major bridge whose seismic analysis and design did not make sense to the owner's reviewer, until it was pointed out that the analysis defied all common sense, and instead of the bridge deck acting as a rigid diaphragm in the plane of the deck, it was wobbling round 'like a blob of jelly.' Even when fully explained to them, the designer and his superiors could not understand this absolutely fundamental deficiency.

- The large concrete and steel bearing plates for large ground anchors that formed a very basic structural system, yet two engineers could not analyse, design or detail them properly.
- The Australian supermarket building designed by a NZ firm that has failed due to eccentric steel cleat joint failure, a design detail that only I ever seemed to think about, until I got Charles Clifton interested.
- A similar roof failure in Whangarei.
- The Pepperwood Mews apartment complex in Waitakere City. The thirty two unit complex constructed from reinforced concrete is not only a leaking, sodden mess, it is so structurally unsound, it is a 'wrecking ball' job. It was designed in 2005.
- The 'first building of the Christchurch rebuild' in Appendix B. Just completed and fitted out, leaning over at 5^{o} after 13 June 2011, since demolished.
- The precast Christchurch building munted by the 23 December 2011 aftershock – Appendix R.
- The illegal construction that was going on in 2004, and continues to this day – Appendix S. This is an inevitable consequence of unacceptable engineering design practices and attitudes.
- The 4m high concrete retaining wall for a motorway that had an opening joint that would have ripped open as 'detailed.' Leaving aside the lack of any proper joint design, the 'not to scale' drawing hid the fact that the reinforcing would have been poking out of the concrete at the front and bottom of the wall/foundation joint if the hooks had been properly developed from the critical sections.
- The multi-storey apartment building in Auckland, designed circa 2005, where the following defect was only found because the building as a whole was a 'leaker,' including leaks through cracks in an external structural shear wall. This structural wall was designed and constructed as an assemblage of precast panels, acting compositely with heavily reinforced and confined end columns. Heavy horizontal reinforcing projected, with hooks on the end, from the ends of the precast panels, and had to be embedded in the end columns, something that could not actually be done because of the very heavy column reinforcing. How did the contractor fit the panels in place and complete the wall? He cut most of the projecting starter bars off, of course. This may have ended up as a 'site shocker,' but that was the inevitable consequence of the initial design deficiencies.

In addition, virtually all of the engineers responsible for the shockers in my Open Letter have become CPEng, as have those engineers who are responsible for 75-90% of 'leaky buildings' having serious structural defects unrelated to water damage.

262. If this is current competence, give me out-of-date incompetence. *At best*, the letters *CPEng* mean nothing.

263. Further into Section 5.2 of the Discussion Paper, it states:

> *"From its hearings to date, the Royal Commission has become aware of <u>instances</u> in which engineers have undertaken and completed work in engineering specialties outside their areas of expertise."*

The implication from this, and the opening statement, is that deficient design is largely down to engineers who are not CPEng, and/or who are operating outside their supposed areas of expertise.

264. But virtually every shocker in my Open Letter was designed or approved by the forerunners of CPEng, namely, Registered Engineers, including many Fellows of IPENZ, and far from lacking 'current competence and operating outside their area of expertise, many of the engineers and firms involved were considered to be 'leaders in their fields.' In the decade since my Open Letter was written, a decade that has been wasted as far as fixing the problem is concerned, enough has happened for me to write a completely new, damning Open Letter from scratch, using new shockers. The only change would be substituting 'Chartered Professional Engineer' for 'Registered Engineer.'

265. I wish to discuss in detail the Vector Arena. I have had to glean this information from various sources, no one has contradicted me or threatened to sue me (that makes a change), and feedback after my interview on Kim Hill's Saturday Morning programme on 26 July 2008 backed me up, although some of those comments are a little confused.

266. Apparently, an end connection to one of the major roof members should have had 10 large diameter high strength bolts acting in 'double shear.' 'Double shear' involves a multi-plate connection, in which two shear planes per bolt are used to resist the force, instead of a single plane. The calculations for the joint required 20 shear planes in the bolts of the joint. However, the drawing that was issued for construction showed this end connection to have only 8 large diameter bolts in single shear, resulting in only 8 shear planes, or only 40% of what was required by the calculations. Apparently, the excellent steel fabrication company queried this connection, but the person in the engineering design office only looked at the drawing that had been issued, not the calculations, and the inadequate joint was constructed.

267. The Arena was largely finished, and electricians were working installing wiring high up. An unsung hero was sweeping up the offcuts of wire when he/she saw some sheared off bolts lying on the main floor of the Arena. Instead of throwing these bolts away, the sweeper handed them to a person in a position of authority, and an investigation began.

268. Apparently, the joint described above had failed. This must have occurred the previous night, because the noise of a bolt failing could not be missed. Instead of bringing the roof down, the failed joint caused the affected member to jam down onto a column, in such a way that collapse was prevented. Soon, I shall describe the need, drummed into us at university by Richard Fenwick, for *all* structural drawings to be *thoroughly* checked. This I completely agree with and have complied with throughout my career, but the profession is in such a parlous state that in a perverse twist, this wrong, unchecked drawing and the failed joint actually saved us from a complete and utter disaster.

269. Amongst those brought in to investigate was Charles Clifton. He found that the main eccentric steel cleat connections in the roof were badly deformed. They had formed one plastic hinge, and he estimated the joints had reached about 95% of their total capacity, under the selfweight of the roof alone. The design firm had earlier objected to joint strength assessments based on the method I got Charles to develop, but when confronted with this, the design firm acknowledged there was a serious problem. The

main trusses were too high to be propped. Stiffeners were designed to strengthen the nearly failed eccentric joints. They had to be cut like scimitars to match the deformed profile of the joints. The welders were told that the act of welding could temporarily weaken the joints enough to cause collapse, but they went in and did the welding anyway.

270. If that unchecked partial collapse due to an unchecked wrong drawing had not occurred, the roof would almost certainly have come down in service, and could have come down on 12,000 people. Such a collapse would have made the CTV Building collapse look like a minor event. During this whole saga, numerous 'recognised' engineers were brought in to investigate the problems and write reports, except me of course, because I am not a recognised 'expert,' and I don't know what I am talking about.

271. Because of what must now be classed as the criminal irresponsibility of all of the parties charged with a fiduciary duty to protect the interests of the public of New Zealand with regard to building and construction, I have had to spend much of the last 10 years fighting for the reform that must come soon, before it is too late. This campaign, combined with related consequences, has taken an enormous financial toll on me. Because of this, I sought a contract engineering position at a large consulting engineering firm, and was taken on to do a bridge design.

272. I started, but soon became diverted onto a building for which the design was supposedly complete, but which soon was shown to have many serious defects. The engineer responsible for the design was a 'prominent' younger Chartered Professional Engineer who left the design office shortly after I started for personal reasons.

273. This engineer had apparently suffered from some severe personal problems during the design of this building, and had been required to satisfy some unreasonable demands for the building, from both within and outside the design firm, but the nature and breadth of the problems with the design were such as to seriously call into question the designer's own skills and training, which had all been in that same firm, and his CPEng status.

274. I set about checking the building, and another younger CPEng engineer was seconded from another office for several days a week to help out. Things were not helped by the fact that foundation construction was starting, to be followed by the main structure. The problems soon identified were:
    - The form of construction imposed on the job, using architectural precast panels 'stitched together' to form vertical and lateral load resisting elements made the structural analysis inordinately complex, given the type of building it was,
    - The ETABS analysis was done by a specialist outside consultant, but no one had checked this outside consultant's work before using the results,
    - The graduate working on the job, who is excellent engineering material but was not getting anything like the proper training or instruction, was told to check the resistance of the foundations to lateral loading assuming frictional resistance from the full weight of the building acting on the underside of the ground floor slab on grade, except the building was on

piles, with 90% of the total weight bearing 20m below the ground level. None of the piles were designed to resist lateral shear,

- Even ignoring this, no design of the ground floor slab as a 'transfer diaphragm' to carry the concentrated shear wall loads from near the perimeter of the ground floor slab, back to the rest of it, was carried out,
- Because of the absence of architectural panels at one level in one direction, the building almost certainly had a soft storey,
- No account had been taken as to how seismic loads on the heavy roof would be taken back to supporting elements,
- The typical precast concrete stairs were too thin for the spans concerned (a common recurring problem in my experience), and
- The main architecturally driven feature stair would have collapsed as designed, as soon as the temporary construction props were removed.

275. I set about checking, reanalysing and redesigning the main building as best I could. The younger CPEng on partial secondment from another office redesigned the typical precast stairs, and the main feature stair, adding additional supports the architects had originally opposed. I did not check this redesign, because I was busy with everything else and the job was being externally peer reviewed. I ended up doing most of the pre-pour construction observation for the job, including the feature stair.

276. This firm, like so many others nowadays, is not run along the lines of a professional practice, as it should. Instead, it has a corporate structure, with a 'management' management overriding the 'technical' management. To make matters worse, this firm was and is obsessed with 'leadership,' such that whereas, like nearly all firms, the technical training and genuine mentoring of young engineers is woefully deficient if not non-existent, just about every engineer over the age of 28 is required to go on 'leadership' courses *ad nauseum*.

277. During my time at this firm, I continued with my campaign for the reform of the industry and the profession. The news media in general was not interested, but on 26 July 2008, I was interviewed on National Radio's Saturday Morning programme with Kim Hill. As a result of that, I was invited in to address a regular meeting of the technical managers.

278. When it was my turn to speak, I said that the structural engineering section within the company was in crisis, and headed for complete collapse unless serious corrective measures were taken immediately. I said that 6 or 7 competent senior NZ trained engineers should be 'bought' immediately, stripped of any bad habits, and used, along with the remaining good engineers (and there are still several very fine ones) to form a core around which to provide the training the intermediate and graduate engineers desperately need, and are, in the main, crying out for.

279. To complement this, a comprehensive set of in-house design guides needed to be written, as a lead in to developing other much needed improvements to quality and productivity. I considered I had a good understanding of what was required, as the enquiring graduates in the office kept coming up to me and asking questions. My answers were informative, yet challenged the graduate to think deeper as well. And they must have valued what I taught them, because they kept coming back for more.

280. Unlike any similar comments I have made to the likes of IPENZ HQ, or the SESOC Management Committee, there was not one word of dissent. All of these long time, loyal members of the company agreed with what I was saying. One very senior person, highly respected by the engineers I respect, said "We have lived off our fat for 20 years – there is no fat left." Technical managers from other areas of engineering practice complained about skill levels in their areas as well.

281. I followed this meeting up with suggestions as to exactly what training the younger engineers needed, and the design guides that should be developed to begin with. Nothing came of my suggestions. One of the reasons appeared to be that if the 'management' management found out of these problems, "heads would roll." This was not unexpected, and is a disgrace that blights the profession. The 'management' management should have known there was this crisis of skills anyway. Otherwise, what on earth were they doing? They should have fired themselves. But there was a culture of fear in this organisation. Just like the profession and its completely unjustified claims to "lead the world in seismic engineering,' the 'management' management had declared itself to constitute 'leadership' of the highest class, and any negative feedback was not tolerated because, by implication, it indicated that the 'all seeing, all knowing' 'management' management was not perfect.

282. 'Negative feedback' is the most critical information of all if excellent performance is to be achieved. It is not only recognised in other fields of engineering, it is *essential* for stable, well-functioning systems. Negative feedback occurs when information about a gap between the actual value and a reference value of a system parameter is used to *reduce* the gap. If a system has overall a high degree of negative feedback, then the system will tend to be stable. Guided missiles hit their target because the guidance system's 'advice' is taken heed of, and the control surfaces are adjusted to point the missile at the target. Mechanical negative feedback systems have been used to control machines since the 16th Century, in the form of the centifugal governor, which features in James Watt's steam engine. The ballcock control in a toilet cistern operates on this principle. Hormones and glucose levels in humans are controlled by a negative feedback loop. But 'the groupthink of the consensus' in structural engineering has banned negative feedback, because it calls into question the self-declared excellence, and look at the mess we are in as a result of it.

283. The feature stair in the building in question was set for its final in-situ pour, and I duly did the site inspection. I took some digital photos of the formwork, precast sections and reinforcing, and showed them to the senior draftsman on the job. I cannot remember what he said, but it prompted me to think that the *redesign* may have had its own deficiencies. For the first time on this job, someone sat down and subjected this feature stair to a proper analysis and some proper, comprehensive engineering. The redesign was seriously flawed. I told this to my superiors, and of course they were disappointed. The external peer reviewer checked my calculations, and agreed.

284. While I waited for the architects to decide what type of strengthening they could live with, some senior staff members approached me, and asked me, an engineer working on contract, if I would kick up a stink with management over a job they were working on. For an important infrastructure job, which involved massive forces, the only engineer available to work on it was one inexperienced, largely unsupervised

graduate structural engineer. I helped him out as best I could, but there were no other engineers available to work on the job. Then an e-mail was issued to all of the staff, which contained a message from the Chief Executive of the company. It said that the graduate engineers should avail themselves of two opportunities to hear Roger Kerr of the Business Round Table speak. That was a red rag to a bull. I e-mailed back, telling the Chief Executive and the northern region manager what I thought of Roger Kerr and the Business Round Table, the damage they had done to the country and engineering, and that the graduates didn't need any of this nonsense, which could only lead to them *not* thinking, and what they desperately needed was *some porper engineering training.*

285. I was instantly dismissed, although I put my work in good order to assist others before I left. I had just saved the company from an absolute disaster, yet the Chief Executive, a man *exulted* by IPENZ HQ, fired me because he didn't have a clue what was going on in the company he had helped shape over decades. The northern region manager wrote to say I did not appreciate the high levels of in-house training that the graduates received. No, it was he who didn't have a clue.

286. I think I have made my case that 'CPEng' is not 'a quality mark.' At best, it means nothing. At worse, it is absolute fraud.

287. As if all of these CPEng shockers are not bad enough, there is an extremely serious consequence of it all. Many of the senior engineers involved in the shockers described in my Open Letter had come through a system which had not been devastated by what went on in the 1980's and 1990's. They were exposed as young engineers to a wide number of well-trained engineers and draftsmen, with the MOW around to maintain standards of a sort. But these same senior engineers, partly as a result of horrendous deleterious outside forces, were remiss in properly training the younger engineers they managed. Those younger engineers have now risen in the ranks, often by jumping from firm to firm, to positions of management. They never learned how to do the work properly themselves – how can they now be expected to properly train and influence the young engineers they manage?

I. CPD – Continuing Professional Development

288. I think I have clearly shown in Section D above that long before this term was mentioned, I devoted an enormous amount of my time to 'continuing professional development.' The enormous amount of reading and questioning I did, working through the best texts and papers is proof of that.

289. Unfortunately, CPD as it is formally promoted as a requirement of CPEng is, in the main, a worthless farce. The reality is that it constitutes nothing more than 'box ticking.' Most of the shockers described in the preceding section, shockers designed and/or approved by Chartered Professional Engineers, could not have occurred if the university training, in-house training *and* the continuing professional development programmes were worth a fig.

290. My comments with regard to 'official' CPD are:
    - Its most promoted feature is 'seminars,' for which considerable fees must be paid. In some cases, the more you pay, the more 'brownie points' you accumulate, whether you learnt anything or not,
    - Some of the worst engineers I know are the most frequent attendees at these seminars,
    - Many of these seminars, especially those run by IPENZ, are on 'waffely' subjects like management and leadership, not structural engineering,
    - Some of these seminars are excellent, with excellent useful course material, but
    - Many are little more than 'infomercials,' aimed at promoting products and systems, but not teaching the engineers how to design these products and systems properly, and
    - Many of the seminars may cover a really useful topic, but the 'notes' are invariably almost unintelligible reproductions of the Powerpoint slides put on the screen.

291. For any graduate, working through a book like the 50mm thick 'Design of Welded Structures' by The Lincoln Arc Welding Company, 1966, is worth far more than 100 of these typical seminars. I said as much when I gave my talk to the 2003 IPENZ Conference. One head in particular was nodding up and down in agreement. That head belonged to Richard Fenwick.

J. University Education, and Education in the Workplace

292. We are warned to beware of Greeks bearing gifts. That goes double for academics claiming to have *all the answers* to problems in seismic engineering. This Royal Commission was told many good things about the low damage PRESSS system. Appendix β shows some of the 'classic' PRESSS beam conceptual diagrams. But what these diagrams do not show is a floor slab. One of, if not the first PRESSS building was the 39 storey Paramount Towers in San Francisco. This building has 225mm thick post-tensioned cast in-situ floor slabs stressed onto the beams. How are the beams going to deflect as shown in the diagrams with such a slab stressed onto them? Has the problem of the massive beam overstrength *any* slab creates, making a nonsense of the concept of a reinforced concrete 'weak beam – strong column' mechanism, been solved? Have you been told about the damage that the 'low damage' PRESSS walls must impart to floor slabs, in all by the lowest of buildings?

293. As shown in my Figures 3 & 4 of my paper and address to the 2008 NZSEE Conference (Appendix W), engineers who design real buildings must get *everything* at least 95% right, and not 95% of things right and ignore the rest.

294. University training at its best, can only be an essential initial grounding in structural engineering. There is such a vast array of 'theoretical' knowledge, practical experience, existing and new structural forms and systems, and variable existing building stock for university training to be anything other than a start. The critical training is what is supposed to follow on in the workplace, building on what should be a sound initial grounding. Unfortunately, the sound initial grounding has tended to be less than ideal, and the critical on-the-job training is almost non-existent. Hence, the crisis we are in.

295. This nonsense of 'nationally and internationally benchmarked and accredited standards' is just that, nonsense, especially if IPENZ has anything to do with it. People flocked to Oxford and Cambridge for centuries prior to any international ranking system.

296. [New Zealand universities **as a whole** developed in a new country to be world class before any of this nonsense. Since the introduction of this and similar nonsense, these universities have degenerated in quality across the board. This has been exacerbated by the transformation of universities across the board from (genuine) centres of excellence to 'businesses,' where 'paying bums on seats' are the be all and end all, and to places of 'positive discrimination,' not to mention a vast array of sub-standard courses that have no place in a university. Many poorly prepared NZ products of the NZCEA system are joined by overseas fee paying students who can barely speak English, to somehow form classes that are capable of dealing with extremely complex, advanced subjects.]

297. Getting back to engineering, the accords and 'benchmarks' do not raise standards, they erode them. We are bringing ourselves into line with countries that have the most appalling and unethical engineering standards, standards which intertwine engineering academia and practice. A few years ago, a large earthquake in Taiwan brought down many modern reinforced concrete buildings supposedly designed along the best American lines. Designed for fees as low as 0.25%, some of these buildings

had empty kerosene cans stacked into the centre of what should have been solid reinforced concrete columns, to cheat on the amount of concrete being used. We should be chasing excellence, in the hope we catch good practice, and not setting any of our engineering standards in relation to countries with entirely different, and often suspect, construction industries.

298. I have read ENG.ACA.0021, a submission on the Education of Structural and Geotechnical Engineers, from the University of Canterbury. Referring to Section 5, I agree with the need to ensure a more thorough education of structural engineers, and that time to teach structural engineering within the basic BE degree (I don't know where the 'Honours' comes from – I got mine from finishing in the top part of the class) must be limited. However, I disagree with the presumption that a masters level qualification per se is desirable for some undefined class of 'complex' building. I most specifically disagree with the implicit statements in Section 7 that the proposed masters level course will produce *experts* in structural or geotechnical earthquake engineering. I shall come back to this later, but I know *PhD* graduates from both Canterbury and Auckland who cannot carry out a competent ETABS analysis, or design relatively basic steel connections properly, let alone identify industry wide problems like appalling diaphragm design, brittle mesh, cold rebending of reinforcing, eccentric steel cleats and try to do something about it.

299. There are definitely some basic principles that all graduates, whether BE or ME, need to know inside out, and if they don't, they should be sent back to university until they do, at the *university's* cost, but even an ME can only be considered the start of the really comprehensive engineering education, which must be done on the job. It is the enormous range of problems that structural engineers have to deal with, the enormous magnitude of what we deal with, the severe constraints that are put on us by real world conditions and the existing building stock, and the often insuperable restrictions placed on us by other parties we have to deal with. I know of genius mathematicians and scientists in their teens and early twenties – I know of no such equivalence in structural engineering, because such young people simply cannot have the real world experience necessary.

300. In *'the good old days,'* before the destruction of the productive base of the industry and the introduction of irrational 'performance measurement' regimes, many of the lecturers in structural engineering had real world experience. Bob Callendar, who rammed into me from the start the essential requirements for lateral restraint in steel members, had for years been a senior, hands on, structural design engineer at the MOW. Richard Fenwick, who, more than anything else, rammed into us the need to check structural drawings *thoroughly*, knew this from years of experience in actual practice, including running his own consultancy. And although there was an expectation that the best students would go on to do Masters and PhD's, the focus was always on doing *real world* applications. Similarly, the intention of all of the masters and PhD students I knew was to complete their studies, and immediately get into real world, designing real structures.

301. The proportion of university staff who have worked for any reasonable time designing and supervising actual buildings and other major structures has declined. Then the funding nonsense of the 'Performance Based Research Fund,' a 'measurement' procedure that originated, I believe, at Treasury, has taken a

stranglehold on the engineering schools. It was Treasury that deliberately devastated the productive base of the profession and industry in the 1980's and 1990's.

302. Under this scheme, a significant part of the discretionary funding (i.e. the funding not granted per student) that all university departments receive is based on their 'performance,' as measured under this scheme. And until very recently, there was only one way of measuring performance. This was the number and 'quality' of 'research' articles a department got published in 'high brow' overseas journals. 'Quality' was assessed against the following three criteria – Research Quality, Contribution to the Research Environment, and Peer Esteem.

303. This is absolute nonsense, detached from all reality, that only the likes of Treasury could come up with. *Real* professional schools like engineering first and foremost have to maintain the existing knowledge, before any advances can be made. Even Einstein said he "stood on the shoulders of giants," namely, the likes of Newton, Clerk-Maxwell and Faraday.

304. Colin Nicholas was a first rate consulting engineer who took early retirement, so he could go into the Civil department in the Auckland Engineering School and teach students proper structural design. The part of his own training he seems to rate the most was the first year or 18 months after graduating, when his employers put him on a drawing board, and gave him a thorough grounding in that, including thinking how the building would be built, before allowing him to move onto the next step. His greatest delight in his work at university appears to be in receiving letters from students, who show off their first real design and thank him for the training he gave them. Yet under the PBRF nonsense, the Civil department would be punished for employing him. To get around this, Colin has to be given a special title – 'Designer in Residence.'

305. A couple of years ago, I went to the university to check a design procedure with Charles Clifton. He said that he and Colin had significantly increased the amount and complexity of the structural design content of the undergraduate degree, so much so that the students grumbled that it was impacting on the time available to do other course work. But once the students graduate, the feedback they receive is:
    - "You were right to give us as much as you did, because there is so much a structural engineer has to know," and
    - "We receive no on the job training."

    Both of which *I* have been saying all along. Some firms have 'graduate training programmes, and 'mentoring.' The first generally consists of learning how to dress properly, and how to talk in public. The latter is like having a big brother to talk to, in generic terms. But the rigorous direct training, and more importantly, 'learning at the knee' of a first rate practising engineer, including picking up all of his/her anecdotes and tips, is simply not there. It is not there because there are not enough such engineers around, and the time, fee, management and external pressures mean the core of good senior engineers left can't pass on their knowledge effectively. There are exceptions. Some individual engineers do train their graduates well, but these instances are the exceptions.

306. Associate Professor Charles Clifton is, in my opinion, about the best structural steel engineer in the world. He has rigorously reviewed all of my technical arguments

since 2002, and not found them wanting. I keep telling people they have to suspend disbelief before I tell them about some of the practices and attitudes I describe. Despite obviously not wanting the things I describe to be true, he will tell you he has never found one of my examples of bad practice to be made up or exaggerated. On the contrary, his own prior knowledge as the senior structural engineer at HERA made him aware of some problems, and he has discovered more than enough problems since 2002 to support my stance. He, and other close supporters of the highest calibre, have still tended to hold out hope that things weren't quite as bad as I say, but since the collapse of Stadium Southland, and the 22 February 2011 earthquake, I believe even that hope has faded. Not the hope for major reform, just the hope that it was not needed.

307. In his prominent positions over the last 28 years, including being Chairman of the Steel Structures standard committee, Charles (with others) has built on the work of others to promote and codify design and construction procedures that have seen structural steelwork rise from nothing, to take 50% of the multi-storey market in NZ. The two best performing high-rise CBD buildings in the 22 February 2011 earthquake were two steel buildings designed in accordance with his procedures (Appendix γ). He not only developed world best practice for the design of critical eccentric cleat steel joints, he has designed world recognised procedures relating to the performance of steel structures and composite slabs in fire conditions. The list goes on and on. So what happened when his 'Evidence Portfolio' was internally reviewed through three rounds since 2011 in accordance with the Performance Based Research Fund? It received very different rankings each time, from 'emerging researcher only' to 'internationally recognised.' Apparently, his unusual background, including a great deal of practical experience and 'real world' industry involvement, did not fit readily into the PBRF system, and presented the internal reviewers with considerable problems. My method of assessing him would be to ask "Who do they all turn to when they have a really big, really hard problem with structural steel?"

308. The only good thing that can be said about PBRF, which must be dispensed with immediately regardless of tinkering, is that participation on standards committees and applied research to develop national standards is now recognised. But not teaching students how to be competent structural engineers.

309. Unless I specifically state otherwise, all of the words in this submission are mine and mine alone, as they were in my Open Letter and since then. Contrary to some initial *ad hominem* attacks that claimed I was having words put in my mouth by people with their own agendas, my close supporters do not put words in my mouth. If anything, they try to stop me saying things, or say it in a less 'direct' manner. These are my words and my words alone, and any attempts to 'punish' others by withholding funds as a result will be criminal.

310. Much of the funding for actual physical testing at the universities comes from the Natural Hazards Research Platform, which is administered by GNS and NIWA. The mission statement of the NHRP is *to make NZ more resilient to natural hazards*. There are five themes: Geological, Meteorological, Societal, Risk and Engineering. This is also the order of the funding of those themes (surprise, surprise), with engineering getting the least funding, despite being the one most critical for meeting the mission statement.

311. I wish to expand on this, but will only do so *in camera.*

312. It has to be accepted by one and all, but especially the Civil departments in both Auckland and Canterbury, that the training of competent structural engineers must be a seamless and continuous process, starting at university, but certainly not ending there, and that many 'mundane' areas of knowledge and practice are actually far more important to sound engineering design and seismic building performance than theoretically perfect non-linear analyses or push over analyses, which aren't so perfect anyway because they invariably ignore the true effects of the floor slabs.

313. Don't get me wrong in respect of researchers and academics at the universities. Recently, I engaged on behalf of a client the University of Auckland to conduct physical testing and advanced non-linear finite element analyses. The work was first rate, and has been of immense value. But researchers and academics can provide but part of the solution to having a properly functioning structural engineering profession and construction industry, one that *truly* does lead the world in seismic engineering. One impediment in the past has been extreme sensitivity of academics to any questioning of their theories, perhaps for fear of loss of reputation if they admit to being wrong. Several very serious, well founded questions have been asked of the 'perceived' seismic consensus over the years, and were met not with a rational discussion, but dismissed. This must stop. The constant valid questioning of assumptions and conclusions is an essential part of the true scientific method.

314. One researcher told me that researchers go through three phases. First, you are starting out, and no one pays any attention to what you are saying, irrespective of how good it is. Then you get a reputation, and every (good) thing you say is taken notice of. Then you are past it, and much of what you say is flawed, but everyone accepts what you say without question.

315. Charles Clifton gets his BE students to do very comprehensive design assignments, incorporating 'classical' multi-storey frames. These are very demanding assignments, and most useful training for the real world design of such structures. However, a graduate is likely to be asked to design anything but the type of job he has studied at university. I recently presented Charles with a number of likely jobs a graduate would be assigned to, often without any proper supervision and guidance, and asked if his graduates could handle them. He said "There's a limit to what we can teach them." That is true, and any ideas that university training can produce 'an expert' is, at best, wildly optimistic.

316. Appendix ε shows images of the 104 storey Sears Tower and the 100 storey John Hancock building in Chicago. Given access to a mainframe computer, a copy of the SAP analysis package and the wind loads from tunnel tests, as a graduate I could have made a good fist of analysing these buildings, designing the main steel members, and designing many of the main frame connections, thanks largely to the advanced engineering and analysis courses I did under Ian Buckle and Barry Davidson for my Masters. However, I was almost completely unprepared the most of the work I was confronted with in the first few years of my career.

317. Refer to Appendix ζ. These photographs show the Olive View Hospital building after the 9 February 1971 San Fernando earthquake. The second and third photographs were included on page 125 of 'Reinforced Concrete Structures' by Park and Paulay, published in 1975. A soft storey failure at the ground floor has occurred. Despite extremely large permanent displacement, a total collapse did not occur, because most of the columns were highly confined with a heavy, closely spaced spiral that was apparently well anchored at both ends (the right hand photo on p.125 of Park and Paulay). The left hand photo on p.125 shows a 'munted,' apparently rectangular column which must have had very light, poorly detailed transverse reinforcement. The NZS 3101:1982 committee included at least three PhD graduates of the University of Canterbury. Two definitely, and the third must have, had knowledge of the photographs shown on p.125 of Park & Paulay. Most of the other committee members must have had knowledge of these photos as well. How then, could Section 6.4.7.1 (b) of NZS 3101:1982 ever have been written. This led to the R6-250 spiral in the CTV Building, (it could have been up to R6-288), and similar reinforcing in other buildings that have since been demolished.

318. In addition, this committee, and the academics on it, ignored sound practice embodied in the Structural Engineers Association of California (SEAOC) 'Blue Book' seismic code of the time, sound practice that if implemented in the design of the CTV Building, would have prevented collapse. But I shall cover that further in the next Discussion Paper.

319. Any presumption that universities 'know it all' is completely wrong, and I am not referring to 'evolving knowledge.' One critical problem is that academics are often unaware of the disconnect between what their idealised perception of good practice and 'the codes'is and what is done in practice. The Christchurch CBD is relatively compact, and a short drive from the University of Canterbury. There are close, in fact, too close links between the University of Canterbury and several consulting firms. Why couldn't these academics see that several multi-storey buildings in the CBD were going up with CTV Building type spirals and minimalist if not non-existent beam-column joint reinforcement, despite the requirements of Section 9.4 in NZS 3101:1982? Why did they give no thought to precast flooring, which violates just about every rule in the code for one way slabs, or brittle mesh, or the near complete absence of proper diaphragm design in Christchurch, when one of the *fundamental* principles of structural engineering (and the SEAOC Blue Book) is to have a viable, sound load path. The same goes for the University of Auckland, and most other august engineering colleges.

320. At about the time the CTV Building was being designed, I learnt the significance of proper diaphragm design from a graduate, Dr Chris Thom. I do not think he learnt about diaphragm design at university. It certainly wasn't his PhD subject. He simply figured it out from first principles. For a proposed 12-16 storey reinforced concrete shear wall building in Wellington, he had to deal with massive shear forces in the transfer diaphragm slab at the top of the podium structure. Despite having at least one side of each web of the C shaped core shear walls fully attached to the diaphragm, he had 'drag beams' out both ends of the web into the slab. To handle the massive forces around the walls, and to resist buckling, he had a 600mm thick cast in-situ slab around the core, tapering to 200mm thick where the floor met the perimeter

podium walls. Mainly to transfer these diaphragm forces, he had 28 *kilometres* of HD32 reinforcing bars in the slab.

321. Conversely, I am not aware of any academic or PhD graduate who ever gave the critical eccentric cleat steel connections a single thought, let alone a second one. Clearly, the situation is more complex than the simple ranking of PhD is better than Masters which is better than Bachelors. We need enquiring minds, free of 'groupthink,' and *proper* training *after* university.

322. In my Open Letter and since, I have raised numerous critical issues, covering areas of 'theory,' practice and especially, the training of engineers. As a result, I was asked to give *one* general, one hour talk to undergraduate students at Auckland. Of course, I have regular communications with some staff members from both Auckland and Canterbury, but neither university department has ever contacted me to enquire 'what are the real problems?' Clearly, they believe they have everything under control, but clearly, they don't. After this submission, I do not expect any such phone calls will be coming my way.

323. One 'low brow' concept that Charles Clifton and Colin Nicholas insist is taught at university, but many others do not, is *how to properly check a structural drawing.* Most of the critical information that a structural engineer conveys to a contractor is shown on the structural drawings. It is *absolutely essential* that *every* structural drawing is *thoroughly checked in its entirety*, but, unfortunately, this is often not the case. It is crucial that the design intent is accurately conveyed on the drawings, and simply the risk of claims arising from mistakes in drawings is a compelling reason that every drawing is thoroughly checked. Unfortunately, thorough checking of drawings is often not done, despite all of the 'internal peer reviewing' that supposedly goes on.

324. Such thorough checking was rammed into us at university by Richard Fenwick, with his 'green pencil/red pencil' method. The checking engineer was required to look at everything on each drawing, in a systematic manner. Everything that was correct was marked through in green, everything that was not correct was marked through in red, and corrective notes added for the draftsman to follow when correcting the drawings.

325. Richard's method actually involved an independent structural check of each element as well as the 'drafting' check to see the design intent was conveyed properly. I normally do the structural check of my own (or others' designs) as one pass, and then carry out the detailed drafting check, using the modern equivalents of a yellow highlighter if correct, and red pen if it isn't. That way, it is clear at the end if everything has been checked. This checked print is given to the draftsman, the corrections checked, and so forth.

326. Examples of this are shown in Appendix η. The drawings in this case are not necessarily full of errors, they have just been marked up to show the process. This practice is the 'lowest of low brow,' but absolutely essential. All lecturers and tutors in design must ram it home to their students, and their students must never stray from it. Unfortunately, many drawings go out of offices unchecked or poorly checked.

327. More than any other profession, structural engineers do not exist in splendid isolation. Critical to the proper functioning of design firms and construction companies are 'engineering technicians.' These people traditionally gained qualifications such as the New Zealand Certificate of Engineering or the New Zealand Certificate of Drafting from the 'old' technical institutes, the ones that used to train world class apprentices as well. These technicians would traditionally work as draftsmen, Clerks of Work, in engineering laboratories and test facilities, or on site for contracting firms. These qualifications have been largely renamed, and 'the institutes' have, in many cases, tried to become 'university' type institutions. The quality of engineering education provided by these institutions is now highly variable, with *some* institutions having descended to a 'dumbed down' level that is completely unacceptable. There is a witness who can inform this Royal Commission of all of this. I cannot convey any of it, because it would lead to him/her being identified, and he/she would have to deal with the unjustified attacks that would ensue. But this witness will appear before you, provided it is completely *in camera*. This person needs to be heard. Please call this person to appear, *in camera*. If you do, I can provide the identity of a 'user' of the 'product' of these institutions who will fully support the main witness in his/her warnings. I do not believe the 'witness' and the 'user' have ever met, and I learnt this information from each of them completely independently.

328. One last point I would like to make regarding the 'production of experts' by the universities concerns the founder of the firm that designed the CTV Building. Having graduated from Canterbury with a PhD in structural dynamics, if I am not mistaken, he would 'officially' be classed as 'an expert' in the design of complex structures. If my memory of his testimony is correct, he worked for two years, before going out on his own. Perhaps he did work through books like The Design of Welded Structures? But he should have perhaps spent more time 'learning at the knees of others' before going out on his own. That way, the squashing failure at the main support points of the Waitakere Trusts Stadium as designed by his firm may have been avoided.

K. The Role of the Professional Societies

(a) Introduction

329. The US President Harry Truman had a sign on his desk in the Oval Office which read 'The buck stops here,' and he *meant it.*

330. IPENZ claims to "set the standard." Well, look at the standard IPENZ has set. IPENZ should be 'struck off.'

331. SESOC and NZSEE claim to be *the authorities* for overall structural engineering and seismic engineering practice. As such, they must be held responsible for all of these shockers.

(b) IPENZ

332. What more do I need to say? Just two things.

333. The IPENZ document 'Standards and Regulation for Building Construction in New Zealand,' (ENG.IPENZ.0001F), constitutes lying by omission. Where are all the shockers described in this submission? These shockers cannot be the products of anything other than a profession and an industry in crisis, yet IPENZ has kept this from you.

334. The second thing I need to say *in camera.*

(c) Other Professional Societies and Organisations

335. Please watch the video of TVNZ's Close Up programme of 10 February 2012, which featured an interview on the state of the industry with the then Minister of Building and Construction, Maurice Williamson, and me.

336. In this interview, Williamson effectively labeled those engineers and I who met him on 13 December 2008 as liars and incompetents. This, despite the fact that our assessment of the extent of the 'leaky building' crisis is universally accepted, and the Waitakere Trusts Stadium and Vector Arena are known to have been failing under their selfweight. When he was supposedly told that what we, and especially I, told him was "wrong" and "not true," he never came back to challenge us. He just ignored us. I shall return at length to deal with this Minister in the next Discussion Paper, but he did say the likes of IPENZ, the NZ Geotechnical Society (NZGS), the Structural Engineers Society New Zealand (SESOC) and the New Zealand Society for Earthquake Engineering (NZSEE) were the bodies that stated I was "wrong," and what I said "was not true."

337. I recently contacted the Chair of the NZ Geotechnical Society, David Burns, who is a friend of the man whose house I saved from disaster, as covered in Section P of my Open Letter, pages 52-56. David said that NZGS had never spoken to any Minister of Building and Construction over the years, and certainly not Williamson.

338. That leaves NZSEE and SESOC. Not only are members of NZSEE and SESOC up to their necks in all of these shockers, their management committees cannot in all conscience comment on this crisis, unless they are prepared to acknowledge it, because of *massive* conflicts of interest of so many of the management committee members.

(d) NZSEE

339. NZSEE has never contacted me to enquire as to the issues I raised in my Open Letter and since, despite the worst shockers in my Open Letter relating to seismic resistant design and construction.

340. However, Peter Wood, the Immediate Past-President, did go out of his way to invite me to be the second key-note speaker at the 2008 NZSEE Conference (Appendix W). My dire assessment and warnings went unchallenged, but I am not aware of anything NZSEE has done since to affectively address the crisis.

(e) SESOC

341. My main personal experience has been with the Management Committee of SESOC. Shortly after releasing the First Version of my Open Letter, I met the full committee for about 30 minutes. Using precast shell beams are an example, because they are almost always incorrectly designed, I said that what was immediately needed were some comprehensive design guides, for common items like shell beams.

342. One committee member responded "We can't have that, because that is boxes, and if you teach people what is in the boxes, they won't know how to design what's outside the boxes!" [I swear, I'm not making this stuff up.]

343. A self-appointed sub-committee was then set up, to 'judge' my Open Letter. Several of the sub-committee members had a severe conflict of interest, to say the least. This sub-committee subsequently reported back to the membership such gems as:

> *"We do not clearly recognise that in some cases design professionals are not achieving acceptable outcomes and that it is not always the fault of the territorial authority or other systemic failures in the industry."*

344. In 2005, I was elected to the SESOC Management Committee. The first meeting I attended featured an *ad hominem* attack on me, and that set the tone for the next 12 months.

345. Before being elected, I was working to get IPENZ to set up the structural Taskforce, and I informed the SESOC Management Committee of this. I said that the Taskforce had to quickly deal with the major issues, and SESOC could follow up over the long term, producing, for example, the Anchor Bolt Guide I proceeded to draft, which I hoped would be one of many.

346. When the Taskforce was subverted, and I was trying to get it reinstated, I was told in no uncertain terms that the area of structural engineering practice was *SESOC's prerogative*, and the SESOC Management Committee *would take it from there*. So what did SESOC do to address the crisis? *Absolutely nothing.*

347. In 2009, following the long delayed publication of my Anchor Bolt Guide, I was fired from a large firm after preventing the collapse of a large staircase. I approached SESOC for modest funding to write three design guides in areas which, like anchor bolts, 'slip through the cracks' of academia and the codes, but which are essential. These were:
    - A guide aimed particularly at graduates regarding how to carry out computer analyses of real structures in a design office environment, and in particular, the absolutely essential requirements of how to fully check all such analyses, (this was particularly relevant to Stadium Southland in 1999, when it was deflecting excessively during erection under its selfweight, partly because half the 'live load' had been left out of the analysis, such that roof had to be cut, jacked and 'strengthened,' only to collapse under a minor snow load in 2010),
    - A design guide for structural floor diaphragms, a problem that featured significantly in my Open Letter, and a problem that only I seemed to be seriously concerned about, despite some efforts on Des Bull's part, (this is particularly relevant with regard to the CTV Building, and *many other* munted buildings in Christchurch which were just lucky enough to have their shear cores inside the floor plate), and
    - A practical guide on welding aimed particularly at graduates, who generally have a very poor appreciation of this topic, along with a good many more senior engineers, (particularly relevant to the collapse of Stadium Southland under modest snow loading).

    Apparently, much of the discussion regarding this request was no better than the 'boxes' nonsense described above. My request was declined, but I was told that SESOC was going to commission a guide on strengthening of concrete beams using carbon fibre, or some such. Three years later, I think they may be getting around to starting that one.

348. The SESOC Management Committee prepared and sent off to the Royal Commission, without any input from the membership, 'Preliminary Observations from Chch Earthquakes.' (ENG.SESOC.0001). Refer Appendix μ.

349. I immediately responded to the Management Committee with my letter of 5 September 2011. (Appendix ν). Referring to Section 11 of the SESOC submission, on p.5 of my letter I wrote:

    The SESOC Management Committee can no longer ignore this absolute crisis in structural engineering. It has a fiduciary duty to protect the public of New Zealand, and must fulfill that duty to the best of its ability, without fear or favour.
    To ignore the crisis in structural engineering, and leave Section 11 of The SESOC Report unaltered, will constitute lying by omission.
    If I am wrong, show me where, but I am not, and I do not deserve a renewal of the ad hominem attacks, such as being called "scurrilous," "unprofessional," and "sub-professional" I am none of these. Nor do I deserve the contempt of being

ignored when I am shown to be right, time after time after time, on matters of the utmost public importance.
The fact that I am the only one who continues to speak out cannot count against me. Truth in a scientific field is not, cannot be, based on consensus; if it were, there would be no progress, only stagnation and decline.

350. I was promised a letter in response, but never received one.

351. Near the end of the Close Up programme, immediately after I called for his resignation, Williamson actually offered me a 'blank cheque' provided I could get the likes of IPENZ, NZSEE and SESOC to say they agree with me:
> "*... what I'm going to say is John Scarry will get his way, I give him this guarantee now, we will do everything he is after if he can bring those big groups of professional engineers .....*"

352. This is unprecedented. All due to my efforts, with the support of some of the best engineers in the country, and shockingly, only coming to pass because of the crisis in the profession and the industry.

353. I was not the only one to take note of this, and SESOC was the key. If SESOC said they agreed with me, the others would have to follow suit, even IPENZ, because IPENZ claims to recognise SESOC as *the* authority when it comes to structural engineering technical issues and practice.

354. Another engineer contacted SESOC to see if this 'blank cheque' could be 'cashed' on behalf of the profession and the wider industry.

355. I met with a representative of the SESOC Management Committee, along with this other engineer. SESOC was interested, but seemed only prepared to ask for '10 to 20 cents on the dollar,' and would settle for five.

356. While certainly not meaning to personally insult me, the SESOC representative asked what role I intended to play. Apparently, *I* was the problem (surprise, surprise), because the mere mention of my name caused a lot of engineers to 'switch off.' [That is an impossibility, because they never 'switched on' in the first place.]

357. I was promised a draft letter that would be sent off to Williamson. I'm still waiting.

L. The Solution

358. Unfortunately, a detailed written explanation of the solution to the problems regarding IPENZ, CPEng, the universities and the professional societies must wait until the next Discussion Paper, because it falls under 'Roles and Responsibilities.' Also, given the length of this submission, and the limited time available to write it, the deadline for the submission as I type is less than four hours away.

359. I'm sorry, but I have run out of time. If I am to complete the entire submission and meet the deadline, I must reserve a description of the required solution until such time as I am called to appear before the Royal Commission regarding this Discussion Paper: Training and education of engineers and organisation of the engineering profession.