



The Chartered
Institution of Building
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THE TOOLS FOR THE JOB

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Graham Manly has served the building services industry for 40 years. After completing a three-year Higher National Diploma in Environmental Engineering from National College (now South Bank University), he joined J Jeffreys (now Balfour Kilpatrick) where he became a Senior Design Engineer.

In 1972 he joined mechanical service contractor A G Manly & Company, was appointed Contracts Director in 1977 and Managing Director in 1982. He retained a key role in technical matters, including commissioning, system performance and maintenance.

Following the acquisition of the company by multi-service contractor Gratte Brothers Group in 2000, he is currently Business Development Director, with special responsibility for technical innovation and development.

Graham has pursued many industry interests for over 30 years, particularly in education, training and technical research, and has been personally involved in many major BSRIA research projects and HVCA/CIBSE career initiatives.

He has been an elected member of BSRIA Council since 1973, a non-executive director 1989-1994 and served as its Chairman 1991-93. He has supported many of the technical and educational activities of HVCA. Having served on its Technical and Research Committee since 1973, with 10 years as Chairman, and as a Council member 1986-95. He was also involved in the development of a quality assurance certification body for the industry and was a director of CQA from 1989-2000. He is a nominated director of the new Sector Skills Council for the Building Services Industry, Summit Skills.

Graham has contributed extensively to the work of the Institution, serving on membership, education and training committees and inspiring a number of initiatives aimed at raising the profile of Building Services as a career and promoting recruitment and training. He is taking his personal vision of the Institution being 'inclusive' of all building services specialists by ensuring that all those actively involved can find a home and support network within CIBSE. To this end he has been central to the CIBSE 'Developing membership' initiative.

Graham has lived in Surrey all his life and shares leisure time with his wife, gardening, boating, visiting the theatre and in charitable activities.

Reflections of the industry (as I see it)

When I consider the range of engineering covered by the heading 'Building Services' and the variety of roles and duties of a Building Services Engineer, I think how exciting, challenging and responsible it is. Indeed, for many years I acted as an enthusiastic promoter of the Industry at schools and career events.

However, after a 40-year career mainly at the delivery end of the Industry, I see some other elements as well, which sadly remove the gloss from what should be a shining profession. Concerned that my advancing age may be distorting my views and sentiments, I checked them against those of a dozen or so leaders of other major companies in our sector. To my personal relief on the one hand, but disappointment on the other, my perception was endorsed. So what are these observations?

- Commercial pressures affect professionalism.
- The contractual environment creates conflict.
- No one wishes to take responsibility.
- Old-fashioned installation methods and materials prevail.
- There is a lack of social and environmental responsibility.
- The workforce has inadequate experience and competences.
- The client does not receive the satisfaction he expects.

Now two things must be acknowledged about this list. First, it clearly does not apply in every situation and we do have exemplar projects, teams and people, but it is the other 90 percent that most of us see. Secondly, to some degree it does represent a general reflection of society and not just building services.

If my observations are right, what an indictment for an Industry but more importantly, given the challenges that we clearly face, is it already too late to turn the tide?

I believe that the simple answer is yes if we do nothing, but if we take the right action, then the future is bright.

In reality real change across the Industry is difficult and will take time to achieve; but the main prerequisites for change are the vision, the will and the commitment. So where do we start? Fortunately I do not believe we need to re-invent the wheel, for there are already many initiatives, research findings, policies, techniques and exemplar projects, which can and should be adopted, but sadly these are still the exception.

For those of you who do not see a problem, or believe you already possess and apply the solutions – do not switch off, for your influence will only sway the majority once 30 percent of the Industry thinks as you do.

Unfortunately our industry is so diverse and fragmented that arrangements that can be demonstrated to work for one situation might not be relevant or appropriate for another.

We know, and have demonstrated, that we have the capability of delivering some of the world's most exciting, challenging, complex and even energy efficient buildings. The abilities and know-how exist, but sadly do not yet extend very far across the Industry.

What are the issues and what needs to be done?

Contractual arrangements

Commercialism and financial accountability are now a way of life and clearly represent a significant shift over the last 20 years. Although I would not wish to propose a return to the old system of whatever the cost, the client seemed to pay, especially in this global market, we should be aware of what we have lost. Professional practices obtained work and retained clients by virtue of their ability and performance (not price, as they all operated the same fee scales). Not a bad incentive. Whereas today, many seek to undertake the minimum that they can get away with, without upsetting anyone or failing in their contractual responsibility. Understandably so, given the meagre fee they are paid.

Furthermore, as professional organisations were hitherto chosen on the basis of performance and working relationships (not price), invariably they were able to generate a co-ordinated teamwork approach, built up over many projects, although not necessarily for the same client. The phrase 'Professional Team' was coined; sadly on many projects today, the separate disciplines often seem to wear different coloured shirts.

How does this affect many of today's designs? Well, they are often not co-ordinated, sometimes non-achievable and usually the result of the engineer attempting to solve the technical challenges created by the architect or vice versa. Inadequate voids or plant spaces always lead to bad installations and compromised or expensive maintenance.

The right approach must surely be integrated design, where the major disciplines work together from the outset and contribute to understanding and overcoming each other's requirements. ASHRAE President, Richard Rooley's, proposal for a couple of publications entitled 'Engineering for Dumb Architects' and 'Architecture for Dumb Engineers' may be a little insensitive, but it makes the point.

We must not forget that two other attributes are also required: 'trust' and 'respect' - and both have to be earned. Three years ago Professor Max Fordham OBE said in his Presidential Address, "*We have to become respected partners at the conceptual stages of design.*" This was an aspiration, not a demand, for he acknowledged that architects had earned their place and engineers must do the same. I ask that we focus on how this can be achieved, as generally we do not have the appropriate competences to justify an equal status. I will however, attempt to address this later.

The contractual arrangements in the construction industry have been the subject of endless debate, review, proposal, revision and back-peddalling for many years. Clearly, various parties have different views, and most of us - including our clients - have suffered as a result of totally unreasonable contracts or provisions. Twenty years after its demise, even nomination has many good points. What is abundantly clear is that lowest price selection rarely produces value for money, either in terms of the quality of the service or product, or the final bill paid.

Cost is, however, an important element in all transactions and I am not advocating that our clients or anyone in the supply chain should pay more than is reasonable or is needed. There are, moreover, two ways of obtaining low cost solutions: first, just buy cheaply - but you will probably end up with a 'cheap' job; the alternative is to create efficiency in design, procurement, team working, product selections, installation and management. This way you could achieve an economical, well-engineered solution - but sadly the two methods are mutually exclusive.

The latest BSRIA research gives some cause for comfort by revealing that the percentage of M & E work procured by clients and main contractors on the basis of price only has fallen from 31% to 19% over the last four years. Whilst that awarded as a result of negotiation or partnering has increased from 22% to 36% over the same period.

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Ten years ago, Sir Michael Latham's report 'Constructing the Team' was published. He was not particularly far sighted, but certainly astute enough to

recognise that team working with common goals and objectives is essential in achieving a successful outcome for both the client and the players. Last year the Strategic Forum for the Construction Industry, under the chairmanship of Peter Rogers, issued its six-point plan. The first of these was: *"the value of projects carried out by integrated teams and supply chains should be increased from 20 percent in 2004 to 50 percent by 2007."* The current assessment is that the number is less than 10 percent.

The Government's 'Achieving Excellence' Procurement Guide has been updated and now specifically includes the message: *"It is important to work as an integrated team from the earliest possible stages on an open-book basis to identify risks throughout the team's supply chain."* An integrated team is deemed to consist of designers, contractors and specialist suppliers and the following elements are considered essential:

- early supply team involvement;
- clear incentive payment mechanism;
- continuous improvement processes; and
- joint commitment to best whole-life value.

So what is an integrated team? Well, it has officially been defined as simply one in which all of the players – clients, designers, constructors, specialists and manufacturers – display at the outset a determination to work together and to succeed together.

Despite this being the official view of the Office of Government Commerce, do people really believe that they get best value not only by accepting the lowest price tender, but then by driving it down through on-line reverse auctioning? Peter Gershon, Chief Executive of OGC does, for he said, *"Electronic reverse auction is an effective tool for delivering significant value for money gains across the entire public sector."* So what a mixed message. Is it therefore not surprising that the private sector is continuing to experiment with a complexity of forms of procurement to provide what it perceives as the best solution? Surely

buying a 'service' as if it was a market stall commodity cannot possibly be the right answer for anyone and certainly generates a very poor image.

Sustainable development

Despite the contractual jungle, which tends to put commercial considerations at the top of the business agenda, many of us are aware of the social, economic and environmental impacts of the construction industry, and the need for us to address the 'sustainability' issues.

Malaysian Architect, Ken Yeang, responsible for the Bishopsgate Towers at Elephant and Castle named the 'Green Skyscraper' and a host of similar buildings throughout the world, believes: *"All architecture ought to respond ecologically to the natural environment as a whole."* For him integrated engineering design is a must, if we are to achieve buildings with minimal environmental impact.

However, it is a fact that a large number of practitioners in our sector do not understand the concerns, and even more do not acknowledge the need for us to address them. The non-acceptance of the Kyoto Treaty by the USA and now by Russia does not help and the latest statistics from the EU indicate that of the European nations that did sign up, only Sweden and the UK are likely to hit their 2010 targets and many are failing miserably.

Anyone who heard my predecessor, Terry Wyatt, speak on this subject must be aware of the continuous creep in energy requirements which, unless addressed in some way, **must** contribute to global warming and more importantly climate change.

As a nation, our actions have relatively little direct impact, but we have a voice and influence, neither of which can be effective unless we set an example. However, even if the majority of the nation supported that view, decisive actions will not be taken solely as a result of moral or social responsibility. So is there a

business case for seriously attempting to reduce the consumption of fossil fuels especially in the UK?

1. Our indigenous supplies of oil and gas will be virtually exhausted by 2010 and coal extraction is now uneconomical. We will then be dependant on imports with all the concerns of reliability of supply, price, balance of payment implications (let alone the energy consumption associated with the transportation process).
2. Our electrical power generation capacity will reduce by over 30 percent by 2020 when the nuclear plants are decommissioned and some of the older coal stations are beyond their useful life.
3. The recent sub-economic price of energy and the associated lack of investment in the electricity infrastructure will have to be reversed, and together with fuel levies will impact on material and operational costs. However, the continuous development and use of more electrical products and devices is naturally increasing the power requirements. Also the strong possibility that climate change to 'hotter' summers combined with the public's experience of air conditioning at work, in shops and the car will lead to comfort expectations and demands in the home.

The combination of the above factors must put pressure on our ability to reduce energy use and although buildings account for nearly 50% of the UK's carbon emissions, the average commercial or residential building owner is unlikely to be too concerned in the short term and will need to be influenced and convinced. I applaud the Government's commitment on carbon reductions, but acknowledge that it must demonstrate its determination through its actions.

Clearly, the Building Regulations provide a vehicle, but although it is unrealistic to expect any Government to impose requirements that significantly add to the cost of business, let alone the consumer and householder, we must encourage bold steps in the forthcoming update of Parts L1 and L2.

The Government does, however, have a major role to play in leading by example through the procurement and refurbishment of public buildings. Generally such buildings are anticipated to have a minimum 30-year life and running costs **must** be factored in to any specification or employers' requirements.

The imposition of building labelling and the regular monitoring of actual building performance against that predicted during the decision phase will be a useful tool and an incentive to make us aware of the manner in which it is being operated.

But what can the Building Services Industry do to promote and influence the purchase of energy efficient buildings, systems and products and how can we ensure that the client's wishes are not lost, down through the supply chain?

Too many procurement decisions are based on initial capital cost, whether it is to meet a budget, justify the selection or to save money. The ongoing running costs are irrelevant to most specifiers, designers, installers and manufacturers and even many building developers and owners do not have responsibility for them.

The Royal Academy of Engineering report 'Long Term Costs of Owning and Using Buildings' identified the 1:5:200 ratio as the relative cost of construction, operation/maintenance and use of buildings and fully justifies this point.

The Building Regulations can and should impose operational energy targets for the whole building, but choice of system or product could also be based on a combination of capital cost plus energy and maintenance costs over say a five-year period. Many manufacturers are committed to improving the efficiency and reliability of their products, but feel they invariably lose out if this increases the initial cost, even by 10 percent. How, for example, do you sell a chiller with a COP of 3.5 instead of the usual 2.5 if it is 15 percent more expensive? And more importantly, if you cannot sell it, where is the incentive to develop it? Whereas I suspect that if you could sell enough, maybe the price premium could be reduced or even eliminated.

Should the Industry require all energy-consuming equipment to be quoted in the following way?

Price of equipment, delivered to site, including commissioning	£26,300
Cost of energy consumed over 5 years (XXX Formula)	£42,500
Cost of maintenance over 5 years (YYY Formula)	£15,000
Total cost over 5 years	<u>£83,800</u>

The energy and maintenance costs would have to be calculated on standard Industry formulae (appropriate to the product) consisting of operational hours, percentage loads, fuel price and maintenance labour rate. Responsible manufacturers with quality products and R & D departments must see the benefit and the potential, so perhaps their trade association, FETA, should take up the initiative. The current work on the establishment of seasonal energy efficiency ratios (SEERS) for chillers is a forerunner to this paradigm.

A similar form of comparative presentation could be adopted for various systems when their use is being considered or proposed, e.g. fan coils, chilled ceilings, traced hot water, and lighting controls. How many people who make these selections actually know the relative total cost as listed above? The truth is, we all should. Maybe then, we could start to earn our place at the conceptual stage. For, unless we are there at the beginning, we will have great difficulty in influencing the outcome.

So often Engineers are required to provide solutions to technical problems presented by others but, with our knowledge of design parameters and operational performance of both buildings and systems, we should lead the team's thinking, but this needs credibility and trust as well as knowledge, and that will not be achieved overnight. We must ensure that there is a feedback loop of learning between design/selection and operation, and contractual arrangement must provide for this.

The fundamental requirement is for engineers to have, and be acknowledged to have, the comprehensive understanding and knowledge necessary to discharge their duties professionally.

Innovation and off-site fabrication

I would like to regard the building services industry as modern and progressive, where innovation is encouraged and adopted, but this is not the case - not because of a shortage of ideas or innovators, but invariably due to the millstone of tradition. Understandably, new concepts, products or even materials have to be proven over time and, in the world of risk aversion, custom and practice often appear to be safer options.

The uptake of pipework jointing, using either mechanical couplings or pressfit technology, plastic and multi-layered piping or adjustable wire supports has been painfully slow, and yet all have been in use in Europe for over ten years. What is more, they all have proven benefits including installation time and cost, as BSRIA information has shown. So what chance is there for some of our more exciting innovations or integrated products?

The concept of off-site fabrication or assemblies is far from new, but over the last few years many drivers have come together to put the thinking on the agenda of many projects. These include:

- Improved/guaranteed quality
- Increased speed of installation/site time
- More efficient use of skilled trades
- Overall improvement in Health and Safety
- Less waste (materials and resources).

Assembled products like multi-services, chilled beams and modular wiring systems are now commonplace, and complete areas such as package plant rooms and toilet pods are gradually increasing in popularity. But it is a commonly-held maxim that pre-fabrication/pre-assembly of building services generally is not a realistic solution. According to BSRIA 'Off-site Fabrication Report 2003' only 3% of building services were supplied as a result of OSF in 2002 and the major barriers to it were perceived as:

- Lack of suitable suppliers

- Higher cost
- Lack of in-house expertise
- Resistance to change.

The first two of these are, to some degree, a function of business volume, but the others are a challenge for the industry. Everett Rogers in his 'Diffusion of Innovations' curve identified that the first 2½% of individuals using a new concept were the Innovators, but it was not until the uptake by the next 13½% (the Early Adopters) that the concepts were in timescale terms halfway to reaching the majority. OSF therefore has a long way to go before achieving that benchmark and will demand enlightened and educated thinking from the whole project team in future.

It is acknowledged that some services installations do not lend themselves to pre-fabricated assembly for many different reasons, but the majority certainly do. The Labour Party manifesto applies here: Education, Education, Education – for quite simply:

- Designers must understand the practical and economical design solutions that enable OSF and ensure input to the Architect at concept stage;
- Main Contractors need to learn the timescale benefits and the construction sequences and constraints;
- Services Contractors and Specialist Suppliers must work together to develop standard solutions and assembly facilities (including testing) and provide input/guidance to the Designers and Main Contractors.

This may be quite difficult to achieve in a typically tendered and procured environment but consider how easy it is for an integrated supply chain. All it then requires is a suitably skilled and knowledgeable team that has the competence to deliver the shared vision. Surely this must be the way to demonstrate and deliver a more professional service and product to our clients.

The real lesson, however, is that for OSF to be of real benefit, it must form a fundamental part of the integrated and co-ordinated design strategy for the building – another reason for the engineer to be involved at the concept stage.

Resources and competences

A great deal is made of the financial size of the Building Services Industry: £20bn per year, often 30% of building cost and growing. With smart design this may reduce but someone still needs to evaluate the concepts. In common with many of our fellow construction professionals, we are an ageing workforce. Statistics show that the average age of those working in our sector increases by four months every year. This in itself is not sustainable and we have a problem if we believe the industry is not dying, but indeed likely to grow as a result of the demands for energy efficient design and operation of products, systems and buildings. Let us not forget that **lack of competent resources results in resources who lack the competence** - a sure way to kill off any business. Sector Skills Development Agency (SSDA) research in June 2003 found that: "Thirty-nine percent of employers have knowingly taken on staff who have been less skilled than they would have liked, in the last 12 months." Dare I suggest that this percentage might be even higher in our sector? The nation substantially lost its manufacturing ability through lack of investment; I hope we will not fall into the same trap with our indigenous technical skills.

Another of the Strategic Forum's strategic aims is to recruit and train 300,000 qualified people to the construction industry by 2006. This is across all trades and includes management, technical and craft grades. Given a minimum of a two or three year process, that requires them to all be currently undergoing training; or perhaps the majority will be imported.

So what are the key issues relating to the recruitment and appropriate training of our future technical workforce and how can they be addressed? My discussion with many of the Industry's leading companies (referred to earlier) identified the following:

- i. Low image and understanding of Building Services, by the public and Government;

- ii. Shortage of dedicated HNC/D Courses with poor regional coverage (caused by insufficient demand);
- iii. Content of many existing first-degree courses not providing the educational needs of employers;
- iv. General low level of investment in training by employers (mainly done by the major companies, but only for their own requirements);
- v. Lack of practical training/knowledge (especially by designers);
- vi. Need for more emphasis on 'soft skills' to enable engineers to undertake leadership roles.

This list was, however, no surprise, for it confirmed the results of an industry survey, which was summarised by Doug Oughton in his Presidential Address, *'The Supply Chain to the Profession'* only two years ago. Sadly the statistics indicate a worsening situation since then with two more Building Service BEng and three more HND courses now closed through lack of numbers.

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The degree to which the industry, academia and even this Institution can agree on the problem, let alone the solutions is a dilemma and a challenge. The one fact that seems fairly inescapable, based on the above statistics, is that (to paraphrase my predecessor) we must "**act or die**".

I do not profess to have the answers, but this address provides an opportunity to share my thoughts, in order to stimulate debate across the sector and with Government, which may lead to a turn around in this essential and socially responsible element of the UK Economy.

The Building Services sector certainly needs to promote its responsibility and role in the creation of an acceptable environment for all our daily activities. This is particularly relevant to some sections of the younger community. However, in this high tech age how can we excite and encourage recruits to join the Industry, let alone generate public awareness of it, if we continue to hide our engineering? Understandably, plant is invariably consigned to less usable areas of a building like basements and roofs, and services are generally concealed in ducts, ceilings and floors for aesthetic reasons. However, with web-cams we can project real

images or diagrammatic information to plasma monitors in building entrances. I had the pleasure of visiting the largest building in Hong Kong last year, the newly completed International Finance Centre No.2 and the control room was lined with dozens of screens displaying the status of all the services equipment. What a shame that only a few people ever saw it. Imagine the awareness and interest that could be created from a display wall in the Ground Floor Reception Area at the Canary Wharf Towers.

Clearly it will take more than this, but my point is that, although most people today take technology for granted and do not give a thought as to how it works, they do appreciate that behind a modern day product (car, washing machine, computer, mobile phone), it is technology and even engineering that make it function. That is not the case with the built environment, which is seen as a static edifice created by the architect and the builder.

The usual links with young people must be actively encouraged and pursued including:

- support with science weeks at schools;
- help with technical projects at schools and provision of materials;
- provision of work experience opportunities;
- production of exciting web site images and information; and
- personal contact and recruitment.

If each Building Services Engineer identified and encouraged a suitable new recruit only every 15 years, the resource problem would be solved.

The real problem is more fundamental, for despite the range of abilities, knowledge, skills and competences, which the industry requires, we are not managing to attract appropriate recruits or train any of them satisfactorily. This statement is not intended to offend those who have benefited from a first class training programme and a really worthwhile academic course; my concern is with the rest.

[Insert slide - pyramid diagram]

Numerically, the industry requires some bright candidates capable of a second degree who can be the future leaders, specialists, researchers and tutors, but they are unlikely to have a building services background or first degree. I consider this to be unsatisfactory, for in many cases within two years they act as practising engineers with little industry experience or overall competence.

It is acknowledged that many professional firms in fields such as accountancy recruit graduates with unconnected degrees, but they do have a structured and formalised training programme thereafter. We should encourage this to be the norm and require it to include a period of industrial/practical experience (if not already obtained) for all those who have not studied building services and wish to practise it.

A larger group will be the core of the industry at the 'technical level'. Not only should they graduate in a degree, which includes building services subjects, but also their knowledge should include interdisciplinary working and their experience **must** include practical and commercial training. Last year's Think 2010 conference identified that future skills and competences will involve 'less depth and more width'. It is inconceivable that as engineers, we should expect to be consulted, let alone respected if our technical proposals are found to be wanting, practically or commercially, which is no more than would be expected of the structural engineer.

Past President, Professor Max Fordham OBE, whom I perceive as being one of our most charismatic and visionary engineers, was also realistic and practical, when in his Presidential Address, he wrote *"Very good ideas are wrecked if the details do not work properly and the person who has a new idea has to be enabled to make sure the details of the construction and commissioning do not let it down."*

One of the problems is that even those who agree with this ideal have difficulty in achieving it - surprising really, considering that the amount of 'design and construct' work now undertaken has doubled in the last two years. I am saddened to report that this situation is largely caused by the actions of many of

the major multi-service contractors. For gone are most of their technical staff and designers (and those who are left are in their fifties).

Design is now outsourced, usually to consulting engineers, and therefore contractors do not perceive the need to educate and train engineering staff to such a high level of technical knowledge. Thus generally, there is a reduced level of movement of staff from contracting to consulting and almost zero the other way, resulting in hardly any skill or knowledge transfer.

Contractors are attempting to provide a basic technical qualification (e.g. HNC/D) plus a range of operational training in project management, programming, leadership, PR and presentational skills, as well as commercial and contractual matters. The culmination of this should be considered as a degree or equivalent qualification. Consulting engineers on the other hand are recruiting school leavers or graduates with little or no practical background or experience, which furthermore they are generally unable to provide.

Enter the Secretary of State for Education and Skills. Charles Clarke may not have intended to be the friend of engineering or construction, let alone building services, but he may unwittingly be assisting us.

The drive to achieve a UK workforce, 50 percent of whom have a degree or Level 5 qualification, has led to an unprecedented increase in university courses and places. Most of the courses are, however, either in 'popular' subjects or not directly related to employment opportunities. Furthermore, there is no relationship between numbers of course places and job vacancies. Not that supply and demand will solve our problem, for there are already reckoned to be three times as many jobs available as there are graduates in building services related degrees.

The other result of this paranoiac drive has been for schools to encourage continuous study and university entry (it also helps their performance statistics) and be less than generous in their attitude to work-based learning or vocational qualifications. Parental and peer expectations have also encouraged this sheep-like approach to higher-level qualifications.

Ironically however, all this has proved to be unsustainable, in that there are so many graduates employed in jobs for which a one-week crash course would have been sufficient, that the first level degree is being seriously devalued. Furthermore, the education bill is rising too fast and funding cannot keep up. If the spectre of spiralling student debt, including course fee repayments, causes some to question the wisdom of this lottery approach to continuous learning, then let us seize the chance to put in place an attractive employment- based vocational programme, which delivers industry needs, produces a competent and respected workforce and in time achieves Mr Clarke's targets of raising the qualification levels of the sector.

My own research has identified a few key elements, which have been positively recognised by many employers as forming a framework for the future:

- (A)** A nationally available and recognised training programme to achieve N/SVQ at Level 4 in building services engineering, including attainment of HNC/D in building services engineering related subjects. This qualification to be obtained in conjunction with a minimum of two years work-based learning and experience (preferably practical).
- (B)** Suitable part-time undergraduate courses to provide the additional credits required for BEng recognition. These modules to include options in project management, construction skills, planning, interpersonal skills, team building, leadership, advanced design, building performance and energy management, (this would enable engineers to undertake learning in areas appropriate to their interest or needs).
- (C)** Development of existing full time BEng courses to four years with a compulsory industry third year and including more industry related modules and applications, as in (B) above and therefore helping to develop the relationship between industry and academia.
- (D)** Expansion of the part-time and distance learning Masters programmes to include integrated design, facilities and contractual management,

environmental and energy management as well as advancement of the fundamental technologies.

How would this assist the recruitment and training of our future workforce? I do not believe in categorising people or job roles but this range of courses could fulfil the employment requirements as follows:

(A) would provide a training programme appropriate to the needs of many engineers especially in contracting (including estimating, project management), product sales, maintenance management and most technical support roles; provide a bridging course for capable candidates from a craft background and satisfy academic requirements for Eng Tech.

(B) could provide a follow on to (A) for those able and willing to advance their knowledge especially in areas of particular interest or relevance; could be pursued at any reasonable time during one's training or career progression whilst still in employment (given employer's support); achieve an internationally recognised qualification (and status) and satisfy academic requirements for Incorporated Engineer.

(C) would provide a standard HE qualification for those choosing to continue in full time education whilst incorporating industrial experience, a chance to select specialist modules in final year based on knowledge of industry opportunities gained in third year working and ability to use earnings to offset university debt; would also provide more useful and practical graduates for recruitment by consulting engineers than at present.

(D) could enable graduates to advance their learning in specialist areas (usually with employer's support) at an appropriate time, and satisfy the academic requirements for Chartered Engineer.

This structure would allow people to achieve according to their needs and natural ability and (B) and (D) could provide a formal framework for CPD.

Numerically, the industry requirement is likely to be 60 percent achieving (A), 30 percent (B) or (C) and 10 percent (D) as indicated by our earlier triangle although these percentages will vary between consulting engineers, contractors, manufacturers, facilities managers, etc.

So much for the theory; who bears the responsibility and has the ability to turn it into practice? The answer must be, we all do, but in particular: major employers, academia, the Sector Skills Council and the Institution, together with some Government support.

Major employers (especially contractors) once took the lead in providing training, supporting colleges and courses and even creating a National College for the sector (now part of South Bank University). They will need to do so again in some form, providing lecturers with industry experience, assisting with project works and site visits. The Chief Executive of Constructing Excellence, Dennis Lenard, actually predicts that within ten years the construction industry will have its own university, as in Japan and Australia. The new Centre for Engineering and Manufacturing Excellence (CEME) at Dagenham, a truly 'vocational university', is surely an example of this.

Academia like any other business has to respond to customer demand by providing courses that are attractive and beneficial to the student, relevant to the employer, and economically viable in a competitive environment. By working closely with industry in a co-ordinated way, I believe this can be achieved. There are already individual arrangements between certain universities and employers, but these are fragile and lack a broader industry approach.

Who is better to carry this out than the Sector Skills Council for building services engineering, Summit Skills, which received a five-year licence from the Secretary of State for Education and Skills in January this year?

Sector Skills Councils are responsible to employers to:

- reduce skills gaps and shortages;
- improve productivity, business and public service performance;

- increase opportunities to boost the skills and productivity of the workforce; and
- improve learning supply, including apprenticeships, higher education and national occupational standards.

These tasks cover the whole of the sector's workforce, calculated at over 550,000 including craft personnel, and therefore represent a major challenge. However, Summit Skills is best placed to develop appropriate career paths for the creation of suitably skilled and competent technical staff.

The Institution can and should, however, play a pivotal role in encouraging, supporting and even leading many of the actions necessary to bring about beneficial change. Whilst resources are clearly limited, it should act as the enabler that through its links, positions and influence can be a catalyst for others to deliver.

As custodians of the industry, we have in the past failed to take that lead and as an Institution we have increased unnecessarily the qualification requirements, reduced the intake and failed to make membership relevant to the workforce or the employers. This now has to change, but without reducing the knowledge, experience and competence of the individual.

The all-round professional used to have all the skills relevant to his trade, whether craft or technical. Now the range of specialist skills is too great for most individuals to have competence in all. A problem for academia, employers, the workforce and even the Institution – for how do we fairly acknowledge the relative abilities of such diversity of specialists? We must be up to the task, for this will be the nature of the future of our industry and our Institution. I am delighted that after two years of work led by Past President Doug Oughton, in April we received Privy Council approval to amend our by-laws regarding membership qualification requirements to allow us to broaden our membership, and recognise the role of Associates and now include them as Corporate members.

Lord Sainsbury of Turville, the Parliamentary Under Secretary of State for Science and Innovation wrote in his forward to the new UK Standards for Professional

Engineering Competence produced by the Engineering Council, *"The UK economy depends on improved business performance, which in turn relies to a great extent on the competence of our engineers and technicians. The UK has a proud engineering heritage, but in an increasingly competitive world our engineering competence must reflect the needs of business and industry for astute and experienced creators and managers of technology."*

The Institution therefore has a duty to ensure that its actions satisfy that requirement. Furthermore, it must collaborate with other industry partners - especially sister professional bodies involved in construction like RIBA, RICS and IStructE - to develop a unified approach to mutual problems, whether contractual, technical, financial or competence based.

The Government is not impotent in directing and driving action and change, and indeed many of its recent statements confirm its intentions and wishes. The White Paper 'Realising our Potential' published in July 2003 puts skills and competences at the heart of future learning processes.

These aspirations provide an encouragement, but if vocational qualifications are to be regarded as having equal status, should part time students not receive the same financial support as those in full time education up to the same level? Why should there not be an educational credit or voucher scheme for every individual, sufficient for 360 academic credits (equivalent to BEng degree or N/SVQ Level 5), redeemable at any time during one's working life? In this way those who do not choose to continue into HE from school, would not lose the opportunity later, probably when they are more sure of the most appropriate course of study.

Finally, given the huge number of employers in the building services sector and with 70 percent of the workforce employed in those firms with less than 24 people which are termed SMEs, the vast majority of which do not have the resources/capacity to provide adequate training, should not the financial cost of training be more evenly spread? Then even those employers who see it as an investment for their future will be encouraged to 'sponsor' a few more, to ensure

that the industry has sufficient people with sufficient competence – it has worked before.

Perhaps it is time that the Industry faced up to a levy and grant system again, as with the Construction trades, but it would need statutory backing. Admittedly, clients would eventually pay any additional charge, but I am sure they would see it as money well spent if, as a result of an appropriately trained workforce, we could deliver better quality buildings, which provide client satisfaction – in itself an essential part of Constructing Excellence.

In Conclusion

I suspect that, as with most things in life, on their own they will have little effect, but with a co-ordinated and concerted effort, if all the above actions were implemented, I believe we would start to reduce the general decline in workforce competence. We may even acquire the necessary skills and understanding to develop successful team working at both design and delivery stages, sufficient technical and commercial knowledge to justify the case for energy-efficient buildings, and designs that lend themselves to off-site manufacture and pre-assembly.

You never know, but when we have acquired the 'tools for the job' we might be regarded as 'Competent Persons', which for certain categories of engineer may eventually justify the title 'Professional Engineer'. That may then enable us to realise Max's ambitions "*to claim our place at the concept stage and create designs that really work in practice.*"

It is conceivable that this might also raise the profile and status of the Building Services Engineer, create a profession for us all to be proud of, and thereby solve the problem of future recruitment.

Please discuss.

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