



# **Collaborate and Deliver**

**Rob Manning**

**Presidential Address 2010**

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**The Chartered Institution  
of Building Services Engineers**

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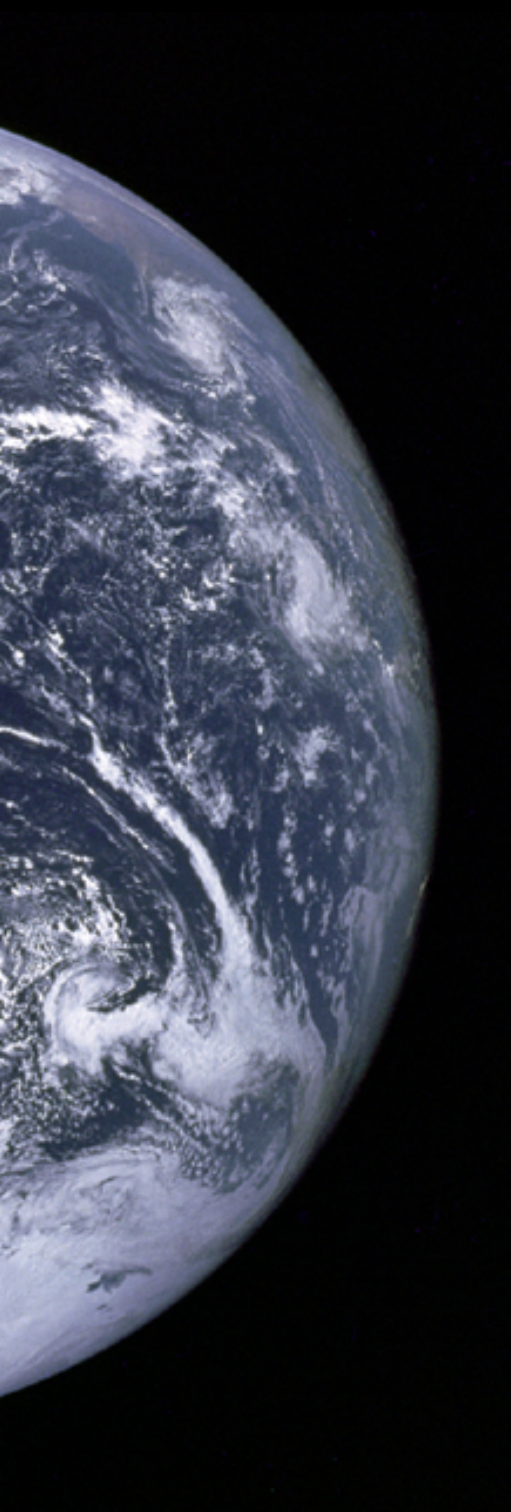
Rob attended South Bank Polytechnic and as an undergraduate joined Oscar Faber in 1972. He became a full time employee after graduating and enjoyed a broad training in design and construction processes. Then in 1982, wishing to see more of the world, he joined a contracting company in Zimbabwe.

In 1987 he moved back to the UK and worked with two consultancies in building services, exercising his technical and management skills on a variety of projects including data centres, exhibition centres, healthcare and commercial offices.

In 2003 he moved back to Faber Maunsell, which is now known as AECOM and is engaged in the delivery of support to the healthcare sector both in Europe and also with the AECOM Global Buildings Business Line. As a CIBSE member he is committed to promoting collaboration through education/training, better information management and contracts which incentivise the delivery of our environmental objectives.

**Rob Manning BSc(Hons) CEng FCIBSE**





# Introduction

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On the 11th April 1970 – Lovell, Swigert and Haise were on board Apollo 13 on their way to the moon when a fuel cell exploded. It left them low on power, low on water and with rising carbon dioxide levels. We then got the famous quote “Houston, we’ve had a problem”. The crew and mission control worked together. They planned to slingshot the module around the moon and then fire the last booster to kick Apollo out of moon orbit and back to earth. It worked and on 17th April, the module and crew landed in the Pacific Ocean. Within three minutes, helicopters were there to whisk the crew away.

Lovell has since said “If I’d waited for some miracle I’d still be up there”. He also said “Leadership, team work, initiative, perseverance – these things make for getting an almost certain catastrophe into a successful recovery”

Back on planet Earth in 2010 we can also say “we’ve had a problem”. Like Apollo 13 we’re told that we’re passing through space, running low on power, low on water and we have rising levels of carbon dioxide. We are experiencing climate change and nations are suffering catastrophes and seeking to mitigate the effects.

Governments around the world are recognising the impact of climate change and the importance of scarce resources such as fuels and water. Legislators are calling upon engineers to reduce carbon dioxide emissions from new and existing buildings and to reduce dependence on energy imports, particularly where cost stability and security are uncertain. Influenced by international institutions such as CIBSE, national legislators are beginning to recognise the broader economic and social issues associated with energy, water and waste.

It’s likely that building owners will respond quickly to the unavailability and increased cost of energy and water. They might respond less quickly to the need to mitigate the impact of climate change but, none the less the objectives are mutually compatible.

The water, the carbon dioxide and the energy agendas require us to use resources more efficiently.



## Just what is the problem we face in the construction industry?

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### **Globally**

Even the climate change sceptics don't usually argue with the logic of reducing our dependency on fossil fuels. If those fuels last a thousand years it still means an unsustainable future for mankind globally. The rate of industrialisation in China, India and other emerging economies is simply staggering. Their emissions, taken together with those of mature economies such as the USA, means that some nations, including the UK could reduce CO2 emissions to zero tomorrow and barely make any impact on climate change.

Each nation needs to spend its resources wisely. We have to be realistic about how far and how best to reduce the CO2 emissions of our buildings. We have to recognise the need to adapt to a changing climate which still seems likely to come in spite of our best efforts at carbon dioxide reduction.

### **Nationally**

In the United Kingdom as an example, we are charged with reducing carbon dioxide emissions by 80% by 2050. To do that, as well as the 1% of the stock we build new each year, we also need to address the

existing building stock. Even if every new non-domestic building replaces an existing one, it still means that well over 66% of the 2050 building stock already exists. There are currently about 26 million buildings, so we face the challenge of refurbishing up to 18 million buildings by 2050. Close to half a million a year, for forty years. To put that into perspective, it is over 50 buildings an hour.

It requires a scale of endeavour which is probably unparalleled in peacetime, and for which we are not prepared. The time and cost needed to turn these



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aspirations into reality is huge and you can decide for yourselves if it's going to happen through building improvement alone.

Much of the reduction has to come from greening of energy supply, but we must be ready to undertake the refurbishment task where building owners require it either because they are driven by simple economics or they are driven by legislation such as the Carbon Reduction Commitment.

### **Solutions – “Just do it”**

The building industry needs to create mechanisms which bring all the construction professions together to deliver this scale of change to our new and existing building stock. As engineers in society, regardless of the outcome of inter-governmental discussions such as those in Copenhagen we need to “just do it”. “Just do” the

real engineering required by our national governments and our clients.

Lovell said “if I'd waited for some miracle, I'd still be up there”. The Apollo 13 team couldn't wait for a global policy to rescue them. The time has come to really prove that the people, who procure, cost, design, supply, construct and operate buildings, are taking sustainability seriously.

### **Industry challenge**

Our challenge is twofold, to deliver new buildings to strict environmental criteria and to improve the existing building stock to reduce CO2 emissions. Because of these two targets, the balance of work for CIBSE members in some countries will shift. New construction projects will continue of course where economic conditions permit. There will also be an increasing demand for CIBSE

members to build long-term relationships with owners and their buildings in order to improve environmental performance. In so doing we will at last start to build databases of real operational performance which will inform knowledge based learning and research.

- Long-term building improvement is an opportunity for CIBSE members from all roles and disciplines.
- We need to make carbon reduction projects our own territory and not allow others to take our natural ground.

In my year as CIBSE President I look to focus upon how people in construction will turn the environmental aspiration into proven reality by collaborative working across the whole industry.

# The importance of all roles in delivering our environmental aims

To read Terry Wyatt's address [click here](#).

When Apollo 13 faced catastrophe the crew and mission control team knew their ultimate objective and the importance of their role in delivering that objective. Teamwork is also vital to ensure delivery of sustainable buildings.

I believe we must recognise all the individuals who make up the project teams. The only way we can meet the demands of comfort, environment, safety, cost, time and build quality is to have the right people with the right interests in the project team from the beginning. Furthermore as an industry we need to better communicate and incentivise the environmental objectives so that all construction professionals are recognised for their part as key deliverers of comfortable, sustainable buildings.

Let's have a look at part of the route to a successful building: Ideas created at concept stage pass to production designers who develop information for contract use. After that the design role passes to specialist contractors who produce drawings which will be used to build the fabric and install engineering systems. The building is constructed and then passes to operational engineers who have to run and maintain it.

Often the multitudes of participants are all from different companies, each with different paymasters and at each baton change there is the opportunity to lose sight of the original objectives.

Hopefully as we go through the baton changes the level of understanding increases – sadly that is not always the case.

## Clients and cost advisors

It is essential to have informed clients who can provide or at least confirm the briefing which should include clear environmental objectives. The costing of those objectives requires cost advisors who understand the means to their delivery.

## Concept designers

Some of you will remember the Presidential theme of Terry Wyatt in 2003, "Adapt or Die" which is available from the CIBSE website. He predicted that consulting engineers would focus more on conceptual design, that contractors would take more ownership of production design and that we would see an increasing conceptual focus on building performance, particularly energy performance and carbon emissions. He predicted correctly and the evolution of building physics has been a major step forward for our industry - it will grow and be adopted as a standard throughout.

To be truly successful the concept design stage has to involve all the designers, suppliers, contractors and all the specialist disciplines. These individuals all contribute to the environmental and functional performance of buildings.

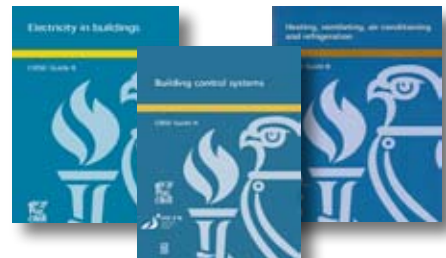
CIBSE has always promoted the importance of our early involvement in construction projects and now it is a reality. Legislation and planning requirements are finally in place to support our role in the design process from the time the client or developer first considers a project.

Part of our job is to make buildings that not only look good but also work well, feel good and that lift our spirits. We have to blend the passive design of the building with active engineering of systems from day one.

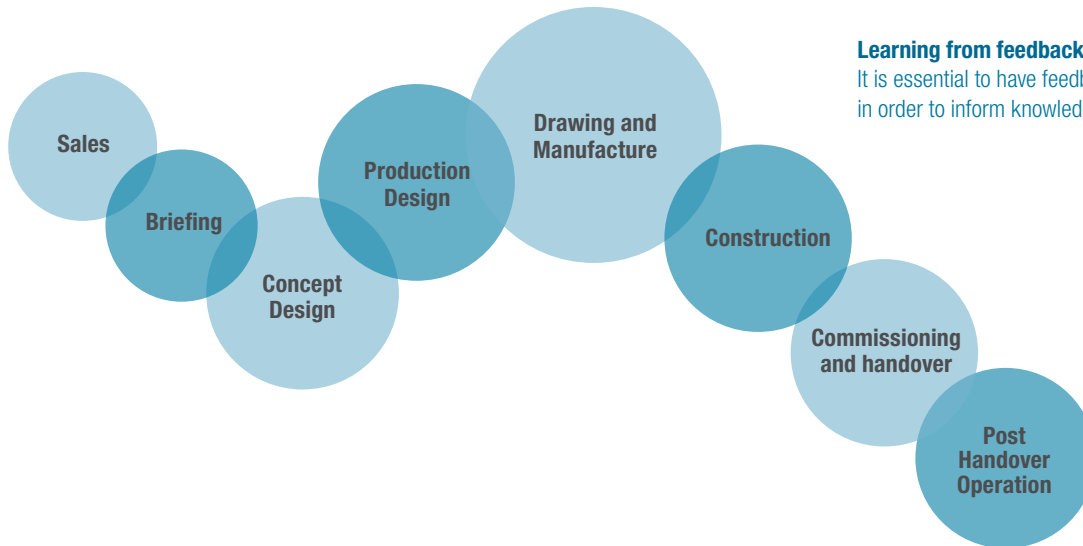
[Informed building science is essential for sustainable buildings.](#)

## Production designers

After the concept design stage there is usually a baton change to a different kind of designer who has to take the concept and deliver design information for a contractor to price and construct. The ownership of technical design and production information is shifting to contractors but is often sub-contracted to design consultants. There remains a need for educated and trained engineers to undertake the technical and production design of "active" engineering. This is a critical baton change, the stage when the aspirations of the concept designer are challenged for the first time.



It's the first reality check, "you didn't seriously think that we could do that did you?" The production designer must none the less recognise the intent, and through "active"



### Learning from feedback at all stages

It is essential to have feedback at each stage in order to inform knowledge based learning

engineering add value to deliver the environmental objectives which were set at the concept stage. For example, during production design it has always been essential to properly understand and describe how engineering controls are intended to operate and optimise the balance between comfort and energy use. It's a key role of the designer to write the controls operating description. The controls specialist can then use their own proprietary equipment to install and later demonstrate the controls, such that the system operates as the designer intended.

Sound “active” engineering and controls are essential for sustainable buildings.

### Construction

In the building delivery process there are a number of construction professionals under the general heading of contractor – they include estimators, supply chain designers,

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buyers, planners, site managers. The requirements to deliver on time and on budget are very much in focus at this stage. There are often multiple packages of work

which can potentially add to the risk that key environmental objectives can be overlooked. If the contributors at this stage do not clearly understand the environmental objectives and are not incentivised to meet those requirements then it is hardly reasonable to expect them to meet the challenge of delivery. For example – specified equipment with low energy demand is often replaced during procurement, because an alternative offers a lower capital cost or a better delivery period. [Informed construction professionals, incentivised to meet the environmental objectives are essential for sustainable buildings.](#)

### Commissioning

We know that commissioning is essential to delivering comfort and meeting the predicted energy consumption. Designers have to witness the effectiveness of commissioning and accept accountability for delivery of the

environmental objectives. For example, handing over a building which has not been fully commissioned may well satisfy the short term demands of the end user and the construction commercial team but that building is not likely to deliver low carbon, low energy and low water usage.

Thorough commissioning is essential for sustainable buildings.



## Operators

We know that leaving an end user/operator with nothing more than an operating and maintenance manual is not good enough. Operational engineers must be involved and understand the aims of the building and how to operate and run the building effectively. I fully support the promotion of the Soft Landings framework which smoothes the process of commissioning, hand over, operation and performance measurement. Under Soft Landings the designer and the contractor are engaged for up to three years to visit at intervals and monitor the buildings energy performance. They advise upon where it differs from expectation and how the end user might improve performance.

Informed operational engineers are essential for sustainable buildings.

## Recognising and informing all contributors

You may be wondering why I have been telling you what you already know. I will leave you to conclude from your own experience if the processes we all know about are being conducted effectively. Our industry is racked by low fees, low tender prices and adversarial practices. Let's not kid ourselves that good legislation and low carbon design translates automatically into low carbon buildings. Regrettably, where post occupancy evaluations have been conducted the evidence suggests that we are not delivering the performance standards that we aspire to.

Essentially what I am doing is urging us to recognise that the roles of briefing, costing, concept design, production design, construction, commissioning and operation

are key to delivering real environmental objectives through collaborative working.

My first call is to urge CIBSE to promote the roles of client procurement, budget costing, concept design, production design, supply, construction, commissioning and operation as key contributors to delivering real environmental objectives through collaborative working. I call for CIBSE to take a leading role in publicity such that every person in client procurement, in costing, in design, in supply, in construction and in building operation is recognised for their contribution and knows where they fit in the great plan of delivering sustainable buildings.



# Collaboration in education and training

To read Doug Oughton's address [click here](#).

NASA put the ground staff and the crew of Apollo 13 through the most intensive training. When the fuel cell exploded the astronauts were catapulted into a terrifying ordeal and everyone involved had to fall back on their education and training. At first their chances of survival were put at only 10%.

During the recovery process every action they took mattered desperately and every careful step they took improved their chance of survival. One of the vital factors in the whole adventure was that every person had been educated and trained for their work as part of the team.

We also need a successful recovery.

We need our businesses to come out of this global recession with the skills in place to continue to deliver on our environmental, economic and social targets. Recent research carried out by CIC and Summit Skills in the UK shows that there is a strong risk that potential graduates may abandon the industry. We must take careful steps to develop enough skilled people for all roles and disciplines.

If you want a good primer on the importance of training, I commend to you the Presidential address of Doug Oughton in 2002 which you can find on the CIBSE website.

We can no longer take it for granted that there is a flow of people who have an understanding of the requirements of building performance as well as an awareness of how to work in the construction industry. In fact to put it more

clearly I'm afraid that our flow of recruits is actually drying up. It's true to say that people from differing educational backgrounds are entering the industry because they are driven by a passion to improve the global environment but they don't always see CIBSE as a natural home. Engaging with these men and women is a key objective for CIBSE and we look to our very active Young Engineers Network for help in this regard.

We have said that to deliver sustainable buildings requires the exponents of building science and exponents of building engineering. We also need the "green" understanding of site construction professionals so that they are equally motivated and can help to really deliver the environmental objectives. We have an enormous need for training of engineering technicians to install, commission and control both traditional and new energy and carbon saving equipment and systems. We need operational engineers in place who are truly trained and able to operate the building and deliver the sustainable intent of the design specification.

We have a particular need for people who can embrace and manage all issues and interface with the client. Most clients cannot deal with highly technical information which often disregards the broader objectives of the project. We need people who have social, political, and financial awareness as well as an understanding of the construction industry and knowledge of building science and engineering. These people will be business

people trained in risk management, trained to understand the financial objectives of all parties and trained to understand change control and management within contracts. They will be project managers of building science and engineering if you like, they will call upon the specialists to contribute and they will be the trusted voice putting the individual contributions into context for other parties to the contract. We need people who are able to deliver a project from start to finish.

Education in building science, engineering and management is essential for clients, designers, suppliers, construction professionals and operators if we are to deliver sustainable buildings.

CIBSE is delighted to be working with the Royal Academy of Engineering to promote education in both building physics and building engineering. The Institution continues its initiative to deliver On-line Learning to the desk-top and to encourage membership for people from all disciplines and roles.

[I am asking CIBSE to further engage in dialogue with skills councils, educationalists and with business leaders in all roles and disciplines to understand the skills needs and understand how those needs will be met.](#)

# How can systems assist our collaboration for better buildings?

Although it looks crude to us now, the Apollo 13 mission was supported by the most advanced information management system. Information management in tandem with training is a powerful collaborative tool.

So let's turn our attention to the whole business of collaborating through systems:

Back to those buildings throughout the UK which need significant refurbishment if the UK is serious about achieving an 80% carbon dioxide cut in the next 40 years. We must identify systems and processes which can be adopted across the board and provide standard practice models to build and refurbish "low carbon" buildings. We simply can't afford the cost in either monetary or human resources to refurbish our current stock on a building by building basis, in which "every building is a prototype". The construction industry must develop a mass market delivery model for refurbishment which also provides the operational information needed to deliver "low carbon" buildings. To move towards our 2050 target we need to offer the public a range of standard solutions which they can buy as they would buy any other product. It is a task which is barely started and it needs the entrepreneurial spirit shown by the likes of Bazalgette and Brunel of the Victorian era. Like those Victorian engineers we need to find means to fund this refurbishment. As an example, would it make a house buyer happier and move towards the 2050 target if stamp duty was held as a fund which could only be released for expenditure on items from a pre-priced menu of CO2 reduction items such as

insulation, glazing and boiler replacement..

## Building Information Management

One approach which is available now is known as 'building information modelling' (BIM) and can help the industry to deliver environmental targets by managing long-term information about building performance. BIM can inform the building process bringing reduced risk and improved effectiveness for those who use it. It provides a reliable basis for operational decisions during the entire life cycle of the building from cradle to grave. It's a visual model (usually 3D), and each object in the model can carry information about itself – that information can be functional or operational and can also include calculation routines. The model is created in collaboration with all construction professionals and provides a shared knowledge resource about the building. It's important to recognise that this is not just a drawing technology. It's a management activity for the project team and is a potential contributor to optimised delivery of sustainable buildings. We need to talk to the leaders of central and local government, client companies, design companies, suppliers, contracting companies and facilities management companies.

And we need to persuade them that 'building information modelling' can;

- *Enable collaborative working and information exchange across design, construction and operation.*
- *Reduce the number of errors and omissions in the design and construction process.*
- *Reduce the amount of wasteful re-working*

*and improve the performance of participating companies by engaging the right people at the right time.*

- *Assist to deliver real reductions in carbon dioxide emissions, water use and energy use through collaborative working between designers, contractors and operators and by retaining clear environmental objectives throughout the building lifetime.*

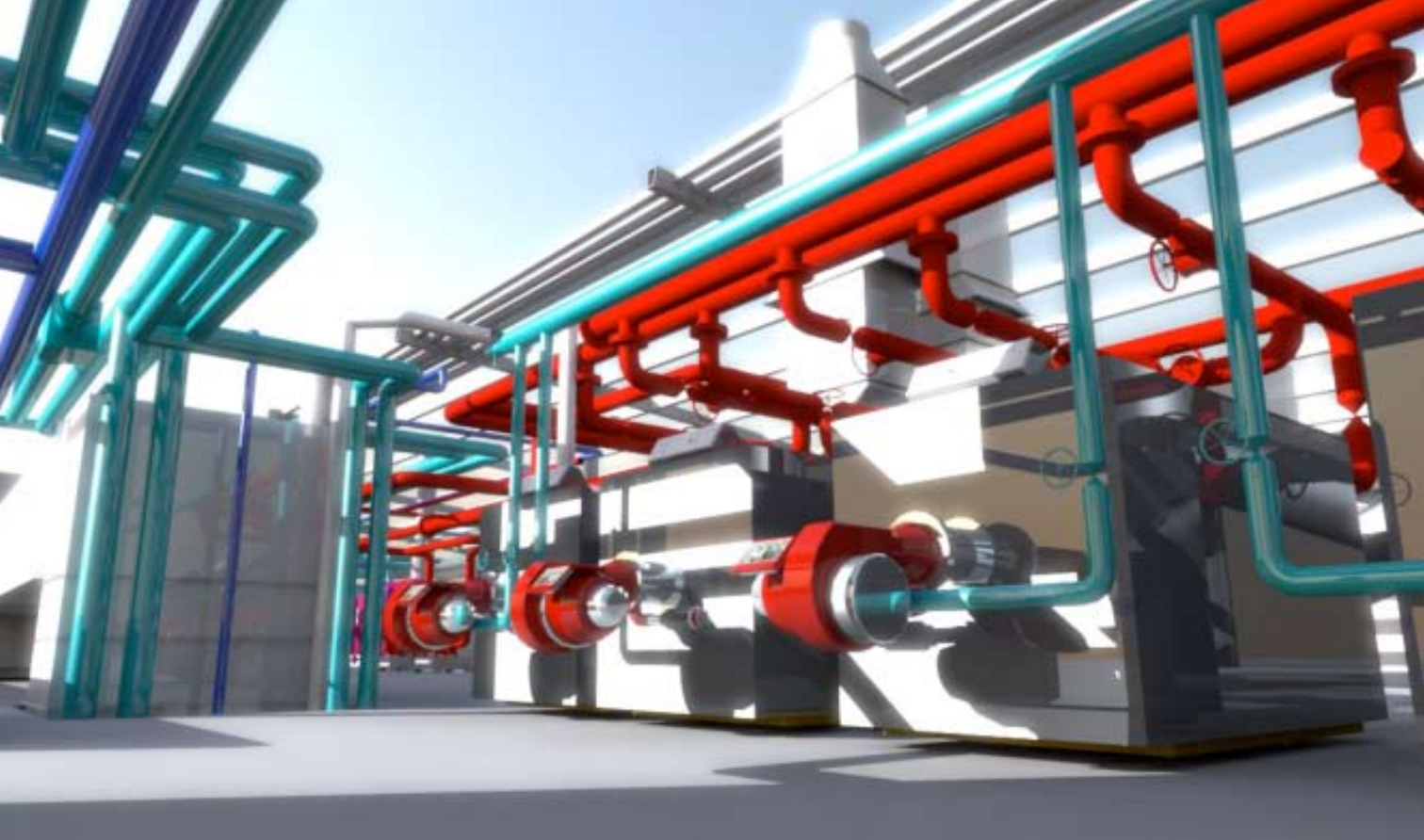
These are real business drivers and must be championed by project leaders who understand what they can get from collaboration using the building information modelling approach.

The use of building information models will develop in stages from being contractor driven, to having partial designer contribution to being a fully collaborative development.

The use of the information model will prompt many questions;

- Will this mean still further changes in the work profile of our companies?  
*Yes – most certainly.*
- Will contractors take increased ownership of the building model?  
*Yes – most certainly.*
- Will the cost of the model come from the current overall budget allocated to design and construction by the client?  
*This is up for negotiation.*

So will the resulting improvements pay for the production of the information model?



- *The answer is “yes most certainly but in varying degrees for each contributor”. Each project has to measure key performance indicators such as the number of ‘requests for information’ in order to demonstrate the benefit of using the model for each contributor.*

To remove wasteful re-working will probably mean changes to design appointments. It might mean that trade contractors will take design information and single line drawings from the end of the Design Development stage. Why after all would clients accept wasted time with design consultancies

producing a full design model which then has to be re-created for fabrication and installation? Why not involve the trade contractors earlier and develop a model which the contractor owns and trusts in terms of content and dimensional accuracy? It is fair to say that clients, designers, contractors and operators will have to expect changed terms of appointment and contracts. Improved information management is essential for sustainable buildings.

*I am asking CIBSE to recognise and promote building information modelling because it demands collaboration, and it can be used*

*to ensure that the environmental requirements of the brief are understood and measured every bit as much as the time, quality and cost requirements. I am asking CIBSE to support building information as an enabler to leaner, less wasteful design and construction processes.*

# Contracts for collaboration

I started my education in this industry in the same year as the Apollo 13 mission. That education involved working with other students, architects, structural engineers and quantity surveyors on design projects. As students we had aspirations to design for the whole building. We used passive and active techniques to deliver energy conservation as we called it then. After such a good start I remember being surprised by the fragmented industry that I joined. There was a "blame and claim" culture amongst clients, designers, and contractors.

Forty years on and you can tell me if the industry has changed?

There is still a fundamental issue about the forms of contract used to deliver buildings and I believe it is a showstopper for low carbon delivery. The current recession means that adversarial business behaviour by all participants is more prevalent than ever. Will our current forms of contract enable us to deliver low carbon? Are we so busy fighting alligators that we forget our intention was to drain the swamp? To maintain focus on

sustainable buildings requires collaboration, clear statements of objectives which remain incentivised throughout the project lifetime, and clear direction on how to deliver.

It needs a well defined common goal like that of the Apollo 13 team.

It needs the various planning, supply, building and engineering professionals to work together with more understanding of environmental objectives. To really deliver low carbon we require a different approach to contracts, design appointments, incentives and insurances. There have been various attempts at developing forms of contract to facilitate real collaboration and they have resulted in varying levels of success. There will always be disputes which will go to legal process but if the industry really wants to deliver then we have to find a form of contract which incentivises team behaviour. We will need sensible risk sharing and to minimise the cost time and quality impacts of errors and omissions. We will not succeed with forms of contract which encourage adversarial behaviour as a means to commercial recovery

from low pricing. We need contracts which require us to deliver an asset which meets the operational performance requirements, rather than just delivering a practical completion certificate.

Contracts which encourage collaborative working are essential for sustainable buildings.

I am asking CIBSE to engage with fellow institutions, trade associations, clients and business leaders and to identify, enhance and promote the contract forms which offer incentives for the team to collaborate not only to deliver on time, budget and build quality but also to meet the environmental requirements of the brief. I am asking CIBSE to seek and promote contracts which make operational measurement of environmental performance an integral part of every project and for the information to be acted upon by designer and contractor for three years after handover.



# What would I like my presidential legacy to be?

## For CIBSE;

I look to see the Chartered Institution which deals with Building Science and Engineering continue a journey

- To become the voice speaking with the public and government about the environmental targets for buildings
- To become the learned society and knowledge network which strongly influences education and research for all roles and disciplines
- To become a natural home and provider of guidance for all roles and disciplines involved in the science and engineering of the built environment

I look for CIBSE to promote and achieve its part in meeting the broad objectives of the whole of the construction industry.

## For the industry;

To be a sustainable industry we need good profit and turnover. We need work that we enjoy and which others wish to take part in. We need job satisfaction from the higher aspirations of delivering on time, on budget, to the required build quality and from meeting our environmental objectives.

The industry will be much better placed to succeed in meeting its commercial, social and environmental objectives through a team approach enabled by collaborative contracts and appointments. It will need to use new approaches to the design role. It will need to improve the use of building information management. Above all it needs the



education, training and recognition of top class people in all design, costing, construction and operational roles. CIBSE cannot achieve these aims on its own and must collaborate with other institutions, trade organisations, industrialists, educationalists, vendors and government bodies. It is a big task, almost too big to consider, a bit like a journey around the moon, but if we want improvement we must face up to the task of changing how we work and take the small systematic steps to improve our chances of success.

## Will we still be in our predicament in 2050?

I leave you with the words of Lovell – “Leadership, team work, initiative, perseverance – these things make for getting an almost certain catastrophe into a successful recovery”.

*“Leadership, team work, initiative, perseverance – these things make for getting an almost certain catastrophe into a successful recovery”.*

**Jim Lovell,  
Apollo 13**

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