The Heritage Society of Engineers Ireland

The Conservation Engineer Monday 10th May 2010

Text to accompany Powerpoint lecture.

Chairman, I would like to thank the Heritage Society for giving me the opportunity to talk about Conservation Engineering and perhaps present a platform for discussion on this discipline, which has been much neglected, if not altogether ignored, within the engineering profession in Ireland.

But first I would like to apologize for my no-show in January, due to a mishap with a bit of ice, which resulted in a suspected broken neck and exciting air-sea rescue helicopter rides and what-not. Gladly, for me at least, I have fully recovered, although I suspect that the wife still sometimes thinks that I am a bit of a pain in the neck. Anyway, I'll try and not be one tonight, make this reasonably short, and I hope you may find it interesting enough to ask questions afterwards.

I am aware that some of you will know more than I and others possibly less on the subject of conservation. Please bear with me if I overstate the obvious at times and for any omissions. This is not meant to be a lecture.

It may seem strange to some of you that in this time of catastrophic economic collapse I should advocate that we turn to the past for inspiration, rather than concentrating solely on opportunities in future technologies. So let me stress, first of all, that conservation and the protection of our built heritage does make economic sense and that an engineer can contribute to this in a most practical way, that is; in the protection, conservation and restoration of our built heritage, which is fast becoming one of our major tourism revenue earners.

It goes without saying that our heritage is unique, and not just to us, but also to the visitors to our shores, some of whom comprise our 80 million strong diaspora.

As shown in Slide 2; according to Failte Ireland, in 2008 tourism contributed € 6.3 billion to the Irish economy, being 4% of GNP. Some 3.4 million tourists visited historical/cultural attractions and a quite staggering 76% visited heritage houses and castles, with 60% of all tourists visiting our national monuments.

It has been found that such activities also rate very highly with domestic holiday makers.

Tourism has become much more sophisticated nowadays, and visitors expect to see monuments and heritage buildings in good condition, well maintained, and well presented. Gone are the days of the ill sign-posted, dilapidated and dangerous ruin amongst the nettles.

Further, the Government, even in this year of 2010, is understood to be allocating some €11.5 million under a budget capital provision towards our built heritage. This includes an array of projects and grant programmes, which involve the County Councils, The Heritage Council and the OPW. As some of the money is for grant in aid, it will have a multiplier effect, and the gross sum spent on conservation and related will be far in excess of this figure.

This figure does not include the work undertaken by the private sector, or, for example, the National Roads Authority, which has spent many millions in recent years on the repair of masonry bridges within its care.

But there is another dimension to this. Let us take a broader look beyond the immediately practical economic approach.

Our *permanent*, and I use the word guardedly, built heritage is an intrinsic part of our past, which is our inheritance, our birthright. The past lets us know who we are and where we come from, and if we don't know where we are coming from – we certainly won't know where we are going.

Our past, of course, is well recorded in history, which tells us about customs, events, social intrigues, politics and wars. But history, as the written word, can be revised – it often is - and in the re-telling it can get distorted or some of the subtleties can get lost.

On the other hand; a heritage building, be it a monastic settlement, a castle or a dwelling, can not be *revised*. Physically, it remains what it was meant to be for the builders and occupants at the time of its construction, reflecting their needs as well as the politics, the social and economic values of the time. An *oubliette* or a dungeon in an Irish tower-house was precisely that, and all that that represented. It could never be described as a *correction chamber* in modern parlance. Buildings never lie.

That is the reason why the significance of a heritage building is not just architectural. In fact, as specified in the Planning and Development Act, 2000, it can have any or all of the following: historical, artistic, technical, archaeological, scientific and social significance as reasons for Protection.

On touching a (carved) stone laid in a medieval wall, who would not wonder about the person who put it there hundreds of years ago? Some might also wonder about the person who will touch it in 500 years time! It is our job, that of the Conservation Engineer, to see that they do. By protecting our past we are ensuring our future.

William Morris, one of the most celebrated conservationists and a founder of SPAB, the Society for the Protection of Ancient Buildings in 1879, put it beautifully, as Slide 3:

We are the trustees for those that come after us.

So, what would be a good definition of a conservation engineer? I'd suggest that it is perhaps one with the right *attitude*. Let me explain by taking a look at what a conservation engineer is usually faced with and comparing it with the more conventional situation.

In a conventional situation, an individual or society decide to undertake an activity and this activity will require a building or structure to achieve its objective. It could be, for example, creating a dwelling, a place of work, a hospital or simply crossing a river. After planning and consultations, a site is eventually made available on which to build. Hopefully it is clear, open and flat and a new structure is created.

In contrast, the conservation engineer is faced with an existing structure; usually one built hundreds of years before. As it is already built, it hardly needs an architect to design it or perhaps even an engineer. However, it is likely that the structure, a 15th century abbey or possibly an 18th century Georgian mansion, will be broken or sick, or both, and in need of remedial works.

It is the *nature* of these remedial works which will be important. We can assume that in both of these examples, the abbey and the mansion, they are heritage buildings and as such will be listed as Protected Structures under the Planning and Development Act 2000. It will be

essential, therefore, that the materials used and methods adopted enshrine the principals of good conservation practice.

These principles are stipulated in Guidelines published by the Department of the Environment, Heritage and Local Government and also laid down by ICOMOS, the International Council on Monuments and Sites, in its various Charters. (ICOMOS is a non-government organisation and an advisor to UNESCO's World Heritage Committee).

A conservation engineer has to understand the philosophy and principals of conservation and be familiar with the methodologies and the techniques involved.

Fundamental to these principals are as Slide 4: - *minimum intervention; repair like with like and in like manner* and, ideally; *the procedure should be reversible*. In strict conservation terms, the idea is to maintain the structure as it is, discretely holding its stability and sensitively undertaking other repairs, as and where required, for instance, with regard to weathering. Possibly (and perhaps strangely), when the work is finished, the structure should look more-or-less as it was before the work was ever started.

On the other hand, a conventional engineer might be tempted to take the easier route of demolishing and rebuilding a replica. This is not acceptable. Simply put, we are not in the business of creating *imitation antiques* and a loss of a heritage building is a loss of cultural patrimony which is finite and irreplaceable.

What is often overlooked and should be born in mind is that the fabric, materials and workmanship of the past, are just as important as the architectural or historical significance of the building.

So, when the conservation engineer sees a leaning tower, she (or he) just makes sure that it is stable and prevents it from leaning any more. When a conventional engineer sees a leaning tower his (or her) first impulse is to knock it down and re-built an *improved* and vertically straight one.

[If you are wondering about the *he & she* bit, the good wife corrected this paper!]

In fairness, it may well be that the conventional engineer is influenced by issues of safety, makes assumptions and perhaps fails to properly assess the cause of the lean, and therefore does not adequately consider acceptable remedial alternatives under conservation criteria.

Clearly, from a structural perspective *reversibility* can be problematic, but with good advocacy, reason will prevail and where there is no other option than to introduce an additional member as support, or to introduce modern materials (steel & concrete), design sensibility decides what would be compatible and appropriate in a given situation.

Structural interventions can be controversial. At times, in order to maintain a commonsense approach, I believe the engineer is entitled (and may be well-advised) to ask the question: *If the ancients were here now what would they do?*

So, the right *attitude* is an approach which embraces a conservation philosophy, underpinned with knowledge, training and experience.

The Conservation Accreditation Register for Engineers (CARE), which has been recently established under the administration of the ICE and the IStructE, in the UK identifies engineers skilled in the conservation of historical structures and sites, be they buildings, bridges, harbours, riverbanks, canals, industrial sites or natural landscapes. These engineers

may either be working as lead consultants on projects where engineering is dominant or sub-consultants on projects with a significant engineering content. As shown in Slide 5; they must have an appreciation of disciplines and interests extending well beyond their professional training as engineers and must also show that they understand the philosophy and methods of the conservation of historic work.

So far I have presented the rather puritanical conservation approach. One step up or down – depending on your point of view – is restoration. While **conservation** retains a building as *it is*, keeping a ruin as a ruin, **restoration** is restoring the building to what *it was*. This restoration must never be speculative and can involve much research as well as a design team, often comprising an architectural historian and an archaeologist. The restoration process will likely include conservation repairs as well as re-construction using traditional materials. Examples would be the replacement of a roof, re-building of collapsed or missing walls and say, reinstatement of fenestration. It could also involve the structural repair of severely cracked walls or addressing foundation failures, and so on.

Quite often restorations include **renovations** and possibly **refurbishments** with the addition or upgrading of services and introduction of modern conveniences, such as kitchens, bathrooms, central heating and whatever. Understandably, a new owner of a heritage building, while seeking to re-establish the ambience of its original period of, say, the 17th century, will wish to live with the amenities and comforts of the 21st.

All the foregoing is shown in Slide 6.

Occasionally, restorations can also involve the addition of ancillary buildings to avoid excessive intervention and in tampering with the spatial layout of the original structure, thus destroying its character, and to do with the need for additional accommodation and utilities. We are now entering the sometimes contentious issue of the *architecture of additions*, which is always a challenge and clearly comes under the remit of the conservation architect.

You may suspect that I am beginning to drift away from the role of the conservation engineer and starting to enter the realm of the conservation architect, but in truth, there are times where these two overlap. In conservation, it is sometimes felt that the conventional definitions of architect and engineer (and the demarcation lines between the two) do not always readily apply in situations where the building or structure already exists.

This is perhaps one of the areas where Engineers Ireland might consider as worthy of exploration and possibly tease out the issue – if there be one - where confusion can sometimes arise in tender documentation regarding description of skills.

The main contribution of the conservation engineer, however, will be structural, where a building or structure is under stress due to failure or pending failure. Sometimes this may call for a fairly sophisticated design solution, but more often than not, it involves just common sense combined with experience. However, it will always require an intimate knowledge of materials and methods of construction of the past, relative to the period of the building.

Other areas involving the conservation engineer, albeit not exclusively, are concerned with decay and consequential remedial works, fabric replenishment, damp treatment and the introduction of services.

Depending on the nature and scope of a project, all the foregoing can come under a multidiscipline design team, or simply fall within the brief of the conservation engineer.

But here, once again, the difference between the conventional engineer and the conservationist can be usefully illuminated.

Structural engineering is essentially about maths, physics and chemistry. In new build there is an emphasis on maths, often dealing with one material such as steel, concrete, or even timber, the properties and behaviour of which are well known. The priority is to design for strength.

In conservation, dealing with an existing building, there is a higher emphasis placed on physics and, to a lesser degree, on chemistry. Working with existing structures and fabrics means that the elements making up the structure are by no means homogeneous. Issues of stiffness, permeability and even development or presence of salts can arise. Load lines often travel through elements that can articulate under stress and even sometimes regain stability. A greater knowledge of and experience with a wider variety of materials is required. It is essential that the conservationist understands fully how the building works and is able to assess its failures forensically.

Perchance some of you still remain doubtful about the merits of the concept of conservation, let me make it clear that - it is the law. Slide 7 states that Part IV of the Planning and Development Act 2000, Architectural Heritage, means what it says. Protected Structures are *protected*. There is also the National Monument Acts for pre-1700 buildings and structures.

Incidentally, from my experience, the involvement of a conservation engineer at an early stage can save the client considerable sums of money. Conservation, if correctly executed, can actually be good value for money, particularly in making the best use of an existing building, with the minimum of change or intervention, whether it is an actual Protected Structure or not.

Quite often the role of the practicing conservationist is to balance between heritage and sustainability, a continuously debated issue, where the theoretical knowledge and practical experience of the conservation engineer can and does make a valuable contribution.

Before I move on to a few examples, a few very brief words should be said about the other stake holders in the conservation of our built heritage. But this I will leave to Slide 8 and 9 due to time constraints. Indeed, this could be the subject of a separate talk.

Dept of the Environment, Heritage and Local Government. Overall responsibility with legislation, Advisory services, Protection, National Monuments etc.

The Heritage Council. Policy inputs and promotion – wide brief, not just the built heritage. Heritage Week.

Office of Public Works. The OPW is responsible for the maintenance of buildings in state ownership, National Monuments as well as many other tasks.

Planning Authorities. Planning Permissions and Planning Officers**.**
County Conservation Officer. Hold a special brief under Part IV of the Act, Built Heritage.

Non-government bodies.

CIF: The Construction Industry Federation which has its own Heritage Group.

RIAI: our colleagues in architecture, where the RIAI has a grading status in Conservation Architect. Grade I, II & III.
An Taisce: With its watch-dog mandate to protect our heritage amongst other things.
IGS: Very actively promotes an interest in and encourages the protection of our built heritage and maintains a register of practitioners.
DCT: holds a specific brief for Dublin and produces policy documents, undertakes surveys and holds CPD courses in conservation disciplines.

BLFI: The relatively new Building Limes Forum Ireland encourages expertise in the appropriate use of building limes and education in its preparation, application and after-care. Lime is a vital material in conservation and has multi-uses. The BLFI is a forum for both the specifier and the practitioner to discuss issues and attend events etc. The Minister recently launched its new book *Lime Works*. The web site is www.buildinglimesforumireland.com with its special forum site for members. Brochures on the desk.

Education.
UCD & TCD and Universities in the UK including the Scottish Lime Centre near Edinburgh and West Dean College near Chichester, York and others.

Training.
FAS undertakes courses. A report of the National Heritage Training Group (NHTG) on Traditional Building Craft Skills has recently been published.

There is also the Institute of Historic Building Conservation, the **IHBC** within the UK.

I am sure, but hope not, that I have overlooked somebody!

Although this talk is not a discourse on particular projects, it is more about the concept, philosophy and role of the conservation engineer and a plea for his or her recognition, but here are a few simple examples illustrating the issues being discussed.

Photographs of examples are shown in Slides 10 to 16, as follows: -

10. Georgian House: A rare 18th century Georgian four story over basement terraced house. Kevin Blackwood Architect. Investigation of collapse due to fallen pillar in basement. Task: To stabilise structure with minimum intervention and not to disturb occupant!

11. 15th Century tower-house: Correcting cement pointing with lime harling involving tests involving the Scottish Lime Centre.

12. Collapsed masonry wall: Collapsed wall during construction as per photographs.

13 & 14. Collapsed column: Remedy to collapsing arch due to disturbance from additional loading due to UBs inserted earlier in combination with Carrig Conservation.

15. Bridge repair: Repairs to bridge involving drilling into the voussoirs. While this may be necessary it is exceedingly intrusive and can challenge the basic structural integrity of the bridge. In most cases, it is better that the spandrel area be used for lateral retention.

16. Medieval retaining wall: Retaining a retaining wall with Mott McDonald.

Maybe it won't go unnoticed that four of foregoing involved corrective procedures due to a combination of inadequate specification, methodology and workmanship.

Regrettably, there are many instances of poor design and workmanship throughout the country. Unfortunately far too many, where bad *conservation* procedures have taken place and where work has often to be corrected, usually doubling the cost, delaying the project and giving conservation a bad name. Surely there are lessons to be learnt from this and one must be that there is most certainly a role for the Conservation Engineer.

But we may be pushing against an open door. Slide 17 shows: -

- The Heritage Council tells me that the increase in response from engineers interested in their recently compiled register was very significant this year.

- Our own Academy of Engineers recently published a report on climate change, which involves a heritage awareness dimension.

- In October, Ireland is hosting the International Advisory Committee Meeting of ICOMOS in Dublin (ADCOM). This will include its International Scientific Council (ISC) on the Analysis and Restoration of Structures of Architectural Heritage (ISCARSAH). A request is being made to meet with Engineers Ireland and perhaps even hold an event to exchange ideas and review the situation in Ireland.

- Lastly, the Department of the Environment, Heritage and Local Government has invited professional organisations and others with related expertise in the Built Environment to express an interest in assisting in the implementation of the actions identified by the Government Policy on Architecture Advisory Committee (GPAAC) as priority actions for 2010 & 2011. Apparently, a panel is to be established from which specific expertise will be sought in relation to each action being advanced on a case by case basis over the next two years. I am sure that Engineers Ireland is aware of this, and that there is a heritage component within the remit *Government Policy on Architecture Advisory Committee*.

So what now?

In the words of the founders of the Conservation Accreditation Register for Engineers **(**CARE), there must be many amongst you who have an interest and acquired disciplines extending well beyond your professional training as engineers, and can readily comprehend the philosophy and methods of the conservation of historic work. And others who could easily do it with just a little effort, if they so wished.

If a Resolution was permissible, I would propose as stated in Slide 18: -

That Conservation Engineering be made a recognised discipline within the Institution. If recognised and fostered, it could greatly contribute to the sustainable protection of our built heritage, elevate discourse on the topic, and bring a more practical approach to both policy creation and implementation. Engineers Ireland has a role to play and a contribution to make, in the field of conservation.

Thank you for you staying awake and for your attention.