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The decade of the façade engineer

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The decade of the facade engineer

A BIG ASK

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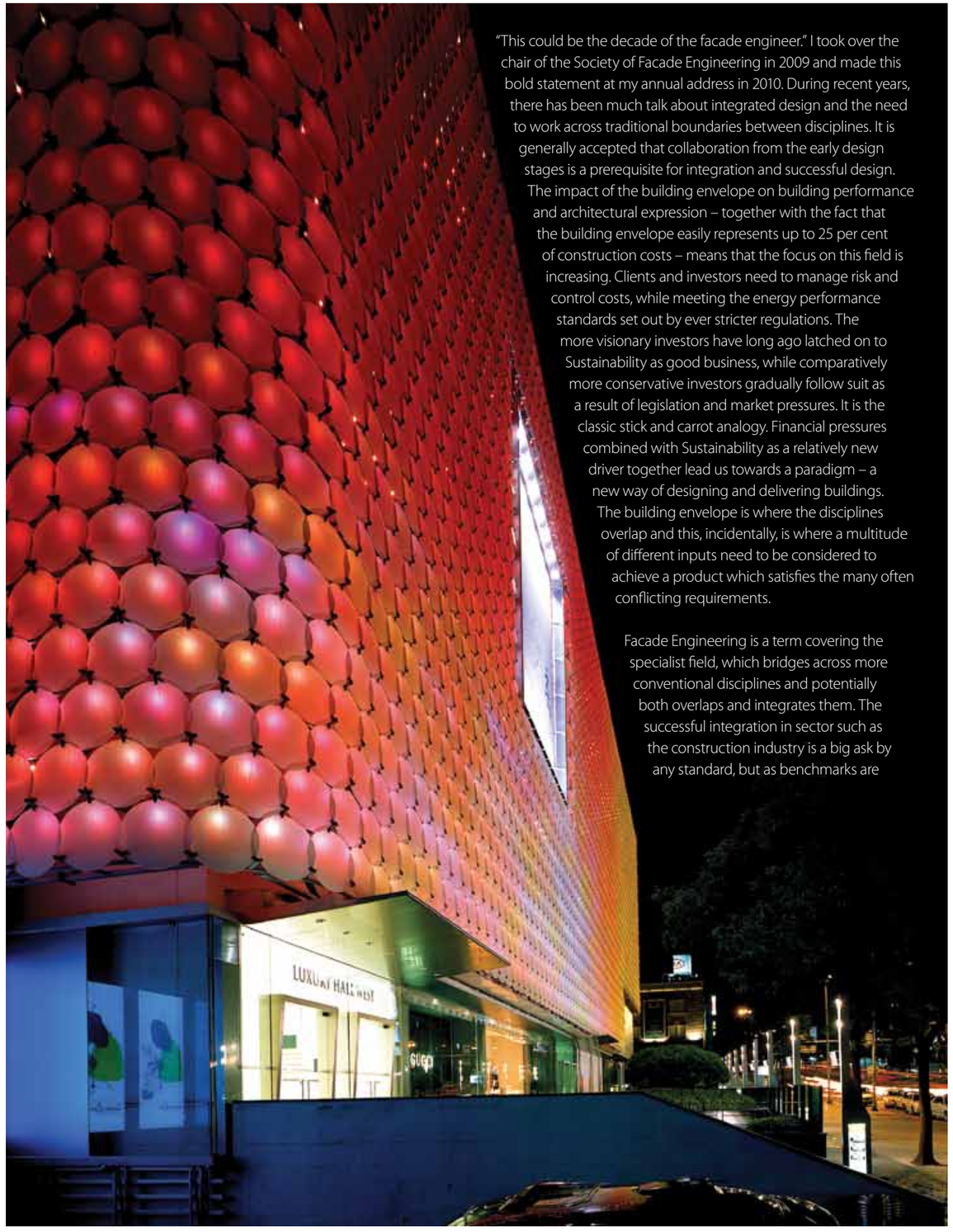

"This could be the decade of the facade engineer." I took over the chair of the Society of Facade Engineering in 2009 and made this bold statement at my annual address in 2010. During recent years, there has been much talk about integrated design and the need to work across traditional boundaries between disciplines. It is generally accepted that collaboration from the early design stages is a prerequisite for integration and successful design.

The impact of the building envelope on building performance and architectural expression – together with the fact that the building envelope easily represents up to 25 per cent of construction costs – means that the focus on this field is increasing. Clients and investors need to manage risk and control costs, while meeting the energy performance standards set out by ever stricter regulations. The more visionary investors have long ago latched on to Sustainability as good business, while comparatively more conservative investors gradually follow suit as a result of legislation and market pressures. It is the classic stick and carrot analogy. Financial pressures combined with Sustainability as a relatively new driver together lead us towards a paradigm – a new way of designing and delivering buildings.

The building envelope is where the disciplines overlap and this, incidentally, is where a multitude of different inputs need to be considered to achieve a product which satisfies the many often conflicting requirements.

Facade Engineering is a term covering the specialist field, which bridges across more conventional disciplines and potentially both overlaps and integrates them. The successful integration in sector such as the construction industry is a big ask by any standard, but as benchmarks are

changing the disciplines are forced to wake up and smell the coffee. The hope is that more people in our industry will recognise the importance of facade engineering as a means of delivering integrated design, more young professionals will see a possible career in this exciting field, and more clients will come to expect and begin to request – as a matter of course – that accredited professionals work on the delivery of their projects.

The building envelope fascinates because of its obvious impact on architectural expression and the spaces we design. Successful design, engineering, and production of building envelopes require integration across disciplines. The building envelope has an unparalleled impact on the perceived qualities of architecture – in terms of both aesthetics and performance. Besides performance and aesthetics the building envelope represents very considerable risks in terms of all of the things that can go wrong and delay the construction and/or lead to costly problems during the in-service life of the building. The value of assets is affected significantly by the building envelope and so its durability is of paramount importance to owners of building portfolios and owner-occupiers.

Façade engineering is the art of resolving aesthetic, environmental and structural issues to achieve the enclosure of habitable space [Society of Facade Engineering]. The boundaries between the many disciplines involved in the process of design, supply, installation, testing and operation of building façades is becoming blurred. For buildings to achieve high levels of energy efficiency and create a comfortable environment for the users, there must be appropriate dialogue between architects, façade engineers, building services engineers, structural engineers and contractors.

The Society of Façade Engineering brings these people together in a forum where they can work together to advance knowledge and practice in facade engineering, promote good practice and ensure that today's increasingly complex building façades meet the many and varying performance criteria. In particular, it addresses the complex issues in building physics of thermal insulation, ventilation, lighting, solar control, and acoustics.

The Society was established in the United Kingdom but the Membership is international

and working groups have recently been established in both Australia and Hong Kong as part of the effort to operate internationally in an increasingly global market.

The term facade engineering has been used for the past twenty five years to describe specialist services not usually covered by the more traditional disciplines but rather bridging across them. A broader term such as building envelope engineering would be more appropriate as the field is usually taken to comprise not only the facade but also roofs and, very importantly, the interfaces between systems.

Integrated design takes on different meanings depending on context. It can be taken as shorthand for integration of disciplines and the aspiration to not try and engineer an architectural vision, but develop solutions, which work well at every level. For sake of argument: the shape of a roof may be driven by a certain ventilation strategy, while at the same time working well structurally and generating a beautiful space. Another example is the way building design should be sustainable, integrated with the urban context as well as the use of resources and energy – aspects, which require a range of skills not necessarily pertaining to traditional building engineering disciplines.

Traditionally facade engineers have ended up in the specialist field after being involved in the design of building envelopes as structural engineers, building physicists, architects, or as technical personnel involved with the design of systems. While the specialist field appeals to many technically minded young engineers and architects, the apparent lack of a home institution and a route to Chartership has often caused problems in terms of professional development and career opportunities.

In the past, few academic institutions have offered courses in facade engineering at Masters level. In recognition of the importance of the field and in response to the growing need for skills in this area, more institutions are starting to offer Masters courses, which can be followed by students or by professionals wishing formal training as part of their professional development. Examples of these courses include the MSc and Diploma course in Facade Engineering at University of Bath (United Kingdom), the International Facade Master at Detmolder Schule für Architectur und Innenarchitectur (Germany), and Technical University of Delft (Netherlands). More universities are following, a European network has been formed, and the education on offer is being linked to the activities of the SFE. It is generally expected that the graduates of these

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courses will eventually become members of the SFE, while the SFE membership classes and the pertinent requirements will set out a path for professional development of these alumni.

Over the past years, the facade engineering discipline has been offered as an optional specialist service, potentially adding value to projects. Hence, demonstrating credentials and capabilities of individuals is a natural part of the commercial activities of the specialist practices. The relatively recent introduction of professional accreditation by the Society of Facade Engineering (SFE) now offers an objective set of standards as a measure of the professional competency. The SFE Membership classes (Associate; Member; Fellow) provide a measure of professional experience in a field, which is not covered by other existing institutions. The members of the SFE can use their membership certificate to demonstrate competence, which is one of the main benefits of membership. The designatory letters MSFE or FSFE help clients and employers of specialists distinguish between accredited individuals and those operating without formal accreditation.

Whereas skilled facade engineers are typically capable of developing fully detailed design for fabrication and construction, the trend is that the facade contract is put out to tender with a performance specification. This is in recognition of the fact that different tendering specialist contractors will have different and potentially equally appropriate solutions, delivering the desired intent as expressed in the tender documentation. This is in contrast to prescriptive design, where the responsibility remains with the designers developing the tender documentation. In the case of performance based specifications, the successful tenderer becomes responsible for developing solutions that meet the specified performance. Clearly, the specification needs to state unequivocally the requirements, but the specialist contractor also needs to demonstrate clearly that the requirements are being met. Successful delivery of building envelopes to a performance specification therefore depends on competent facade engineers developing the solutions for the specialist contractor, while the client on the other hand usually needs competent facade engineers to check that the specified requirements are met. While this may appear obvious or even trivial, it can be surprisingly difficult to find competent individuals to handle these responsibilities and look after the interests of all parties involved. When problems occur, it is usually because these roles have not been handled appropriately.

Sketches are a fundamental part of the development of facade details and communication between the various members of the design team and other stakeholders. The sketch is powerful as a very immediate means of communication and, while the format clearly sets out principles and subtle details, it also clearly shows that the design is in development. A CAD drawing may be seen as a final design even if, in reality, it is an early draft and full of

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flaws. A catalogue of sketches is a good starting point for development of solutions in response to project-specific requirements.

Details are traditionally drawn up in two dimensions whereas the real challenge is to resolve the interface details in three dimensions. The widespread use of CAD means the details may be mistakenly read as resolved, whereas they may not be fully developed at all. We say that the devil is in the detail and this is particularly the case for complex building details. An experienced designer will be able to think the detail in three dimensions and also be able to sketch it freehand. The ability to sketch is one of the keys to thinking on your feet and developing buildable solutions. There is a generation gap between, on the one hand, the wiz kids who master advanced CAD software but have limited design experience and, on the other hand, experienced designers with limited knowledge of – and interest in – CAD tools.

When we deal with the relatively complex projects, we need to develop solutions which are technically feasible, within the available budget, while delivering the architectural vision. Compromises are inevitable and so the challenge is to develop solutions which meet (or exceed!) the client's brief, manage expectations along the way, and work closely with the contractors to minimise or avoid problems during construction. A typical example would be the delivery of a fluid form architectural building envelope in a relatively rational and economical way. The way you break down the fluid form into discrete elements is inevitably a compromise for the architect. Technically, it needs to be feasible and buildable. And it needs to be realised within a given budget or it's back to the drawing board.

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