

**ACADEMIC EXPERTISE**

the centre for the **BUILT ENVIRONMENT**



# THE CENTRE FOR THE BUILT ENVIRONMENT (CBE)

CBE is a knowledge transfer initiative, aimed at improving the performance of the construction sector and enhancing the quality and sustainability of the built environment.

CBE links small and medium sized enterprises (SMEs) to the resources and expertise available from the project partners:

The School of the Built and Natural Environment at Glasgow Caledonian University

The Mackintosh School of Architecture, Glasgow School of Art

The Department of Architecture, Strathclyde University

The CBE is a unique partnership of these three institutions and a focal point for the construction industry and academic co-operation in Scotland. The project funding bodies are European Regional Development Fund (ERDF) and Scottish Executive Expertise Knowledge and Innovation Transfer (SEEKIT).

## CONSULTANCY AND RESEARCH

Through CBE, companies have the opportunity to increase their competitiveness by interacting with the world class experts. Employees of SMEs can learn new skills, expand knowledge, undertake research and use the resources within our three partners' institutions for the development of innovative processes and products.

No matter how much expertise exists within an organisation there can be times when it needs to outsource consultancy related to a specific project, new legislation or development of an idea which will result in a competitive advantage for the company. Over 150 academics at the three institutions cover virtually every aspect of the built environment. Many of them are experts in their field and gained considerable industry expertise before joining academia. The CBE is an excellent resource for the industry, acting as a channel for the provision of consultancy, advice and research to allow SMEs in the construction industry and related professions to access and benefit from this expertise and become more competitive.

## BESPOKE IN-HOUSE CONSULTANCY

CBE can facilitate a programme of consultancy sessions on topics either related to specific projects you are working on or a general topic you wish to develop expertise on to gain a competitive edge. For example this could be related to health and safety, construction management, renewable energy or new legislation. The advantage of this service is that you can have bespoke consultancy from an expert delivered in - house with content specific to your needs and at a time that suits your business. We can work with you to develop the programme material to ensure that your exact requirements are being met. Please contact CBE and ask for the Business Development Manager if you would like to find out more about this popular service.

# OUR PARTNERS

## GLASGOW CALEDONIAN UNIVERSITY – THE SCHOOL OF THE BUILT AND NATURAL ENVIRONMENT (BNE)

The School is the largest in Scotland and one of the leading schools of its kind in the UK. It is highly regarded internationally, with organisations and governments in countries including China, Australia, Malaysia and New Zealand regularly seeking the advice of its staff. Clients for our commercial services include a wide range of companies, from small and medium sized local firms to leading global players, and public sector organisations, including Health Facilities Scotland, SEPA, Scottish Executive, Strathclyde Fire & Rescue and many local authorities throughout the UK.

Research is central to all of the School's mainstream activities and supports the University's strategic vision for the year 2010. The main feature of our research ethos is our partnerships with industry, commerce and other academic institutions in the UK and overseas. The overarching theme of the School's research activities is sustainability and sustainable development, with all our research activities involving direct input from industry and practice. This means that research outputs are applied, providing direct benefit to our industrial and practice partners.

## THE MACKINTOSH SCHOOL OF ARCHITECTURE

Architecture has been part of the teaching at the Glasgow School of Art from the middle of the nineteenth century. The Mackintosh School of Architecture has a strong focus on consultancy and research services to industry. The Mackintosh Environmental Architecture Research Unit (MEARU) was established in 1993 and has built a successful track record providing these services. The Unit undertakes strategic and applied research into sustainable building design, responding to a growing commitment to user-centred, low energy, eco-sensitive architecture in the context of increasing global concerns. Other areas of specialization include large scale urban computer visualisation and building defect investigation.

## DEPARTMENT OF ARCHITECTURE, STRATHCLYDE UNIVERSITY

Described by the Royal Institution of British Architects (RIBA) as having a research portfolio of outstanding range and quality, the Department of Architecture's research activity was rated 4 in the 2001 Research Assessment Exercise (RAE). The Department has achieved a high grading in successive RAEs, putting Strathclyde in the top three or four architecture schools in the UK. The strategy for achieving this quality and range has been to set up research units to provide a critical mass of research effort in selected areas. One of the units - ABACUS - was a flagged group in the 1996 and 2001 RAE, equivalent of 5\*. Staff in the School have a large publications output. On average, the Department has contracts for funded research of approximately £0.5 million per year.

# CONSULTANCY CASE STUDIES

## A REPORT ON THE WEATHERTIGHTNESS OF WINDOWS AT DUNDASVALE HIGH RISE FLATS

The Mackintosh Environmental Architecture Research Unit (MEARU), based at the Mackintosh School of Architecture, was commissioned by Charles Scott and Partners, on behalf of Queens Cross Housing Association and Glasgow Housing Association to investigate the causes of wind and water penetration to the windows of the high-rise flats at Dundasvale Court.

The background to this investigation was a history of problems with the windows since the original timber windows, which had become rotten, were replaced with PVCu units. Many tenants had experienced wind and water penetration, and none of the remedial measures previously attempted had resolved these problems. As the blocks are due for a programme of over-cladding, an independent study was deemed necessary to identify the root causes of problems.

MEARU undertook a series of investigation, which included the following:

### **Record information**

Information on the construction and performance of the blocks was gathered from a variety of different sources. Existing notes and drawings were provided by the Queens Cross Housing Association, Charles Scott and Partners, and Glasgow Housing Association. The archive of Mitchell Library was also consulted to obtain record drawings of the original building warrant drawings for the construction of the blocks.

### **3D site model and dampness mapping**

A 3D computer model of all three blocks was constructed, showing affected windows, to visualise how these sites were distributed over the blocks. This was used to identify areas of further investigation, including preferred flats for the survey and possible sites for disruptive investigation

### **Survey and questionnaire**

MEARU conducted a sample survey and questionnaire of 19 flats that were reporting problems of dampness and draughts. The survey recorded basic information about the flat and the questionnaire asked tenants about sites of draught and water penetration and possible relationships with weather.

### **Disruptive investigation**

In order to examine the performance of the windows and surrounding areas, a water-jet test was conducted on sample windows, after which the windows were removed and the construction inspected. The water had a blue trace dye dissolved into it, to allow the possible paths of water to be seen.

### **3D model of the opening**

Based on information obtained from record drawings and the disruptive investigation a 3D computer model was produced to examine the 3-dimensional arrangement of the window and to demonstrate potential paths of water penetration.

### **External survey of east façade**

A survey of east façade accessible from the mast-climber was also carried out. All the windows were photographed and opening sizes recorded.

### **Pressure test**

A window pressure test was conducted on the windows to the void flat.

The inspection and tests revealed that there are a number of inherent weaknesses in the design and installation of the windows, which present risks of wind and water penetration. These relate both to the windows themselves and also their interface with the concrete construction.

The original construction had included a number of elements of detailing to prevent wind and water penetration in the panel system and the windows. These levels of protection are not designed into the current construction, which has several vulnerabilities. These risks are exacerbated by the exposure of flats at higher levels within the dwelling, where 37% of flats in the top 5 storeys are affected by wind and water penetration.

Problems included:

- Deterioration of original seals in panel construction which have not been replaced
- Deterioration of elements of the original construction; concrete finishes, removal of weather bars, blocked drainage channels
- Poor fit of windows into the openings, relying on packers fitted on site to provide an overall fit
- Reliance on mastic seal for weatherproofing
- Leaks occurring through the horizontal stiffener
- Possible leaks in joints between packers to the head and jambs
- Lack of weatherproof detailing at the cill, head and jamb
- Water ingress through joints between the lintol panel and wall panels
- Vulnerable construction at the lintol panel joint
- Cold bridging at openings

The study concluded that the windows as currently installed are standard sizes that have been adapted to, rather than designed for, these openings. The requirement to make up frame arrangements on site leads to difficulties in installation. This, combined with the deterioration of the construction over time, has led to the widespread nature of the current problems. These have been compounded, rather than reduced, by the re-installation of the windows.

Improvements in the window performance may be possible in conjunction with a new external cladding screen; however, some risks will remain. Complete window replacement in conjunction with a new external render system is likely to provide the best solution. The information revealed in the study is now being used by the over-cladding contractor to determine whether remedial measure or window replacement will provide the most effective solution.



Figure 10: Block 2 East

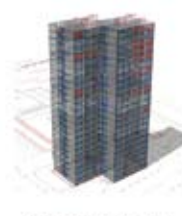


Figure 12: Block 6 East

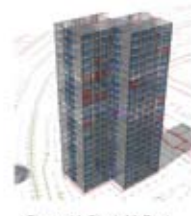


Figure 14: Block 22 East



Figure 11: Block 2 West



Figure 1: Block 2 West

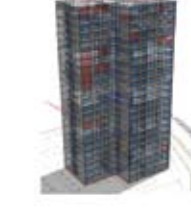


Figure 15: Block 22 West

# CONSULTANCY CASE STUDIES

## NEW TOWER BLOCK IN GLASGOW GETS PLANNING APPROVAL WITH ASSISTANCE VIA CBE AND EXPERTISE PROVIDED BY GLASGOW CALEDONIAN UNIVERSITY

A report was commissioned by Peter Richardson of ZM Architecture, Glasgow on behalf of their client: Credential Holdings, Glasgow to investigate the pedestrian - level wind speeds at the site of their proposed new commercial development on the corner of Bath Street (South side) and Newton Street (East side.)

It is a multi-storey block with a tower approximately 53 metres high by 20 metres long by 15 metres wide. The Northwest façade of the tower is curved to follow the corner of the junction. The report was to be prepared for inclusion in the planning application to assess how it would affect the microclimate of the area, e.g. to demonstrate that there would be no additional discomfort or danger to pedestrians during high winds in the area.

Professor John Crowther of the School of the Built and Natural Environment, Glasgow Caledonian University, was the consultant for the project. Dr Crowther measured wind speeds from various directions on different days at the site. The mean wind speed was measured with sensitive cup anemometers. An analysis was then carried out of 10 years of wind speed and direction data obtained from the Meteorological Office for the Abbotsinch Hourly Weather Station, to estimate the probability of extreme wind speeds in the location.

A 1:200 scale physical model of the building and some adjacent buildings were provided by ZM Architecture and wind speed tests were carried out on the model in a wind tunnel to assess its impact on the environment at the proposed site. The results of the wind tunnel measurements were then compared to the field study results and found to be almost identical.

The conclusions of the study are that a new building in the location will not increase the wind speeds significantly above those at present experienced in the street canyon between the existing Contact4 building and Tay House. Planning consent was subsequently granted for the new development which will be called the Quantum Building.



**(1) Peter Kennedy, Dean of the School of the Built and Natural Environment**

Having advised governments in New Zealand, Malaysia and State of Victoria, Australia on methods of dispute resolution and established the Adjudication Reporting Centre, Peter is very well qualified and experienced in this field. He has an LLM in Construction Law, is past Chairman of the Scottish Branch of the CIOB and has served on its National Council.



**(2) Professor Bimal Kumar**

Bimal Kumar is Professor of Information Technology in Design and Construction in the School of the Built and Natural Environment.

**(3) Professor James Sommerville**

James has extensive experience working both in the UK and the Middle East. As a Chair of a number of boards of the CIOB and a Member of the Council of the RICS in Scotland, he has direct interaction with many of the prime housebuilders. As a Chartered Surveyor and Builder he is acutely aware of the issues surrounding customer care.

**(4) Professor John Kelly**

John is the holder of the AWG Chair in Construction Innovation, Glasgow Caledonian University, is a Chartered Surveyor with industrial and academic experience. His research into value management began in 1983 and within the past three years, John has attracted over £1/4 million in research grants.





**(5) Tony Kilpatrick, Head of the Division of Environment Design and Construction.**

Expertise: Tony is a civil engineer with expertise in fire protection engineering. He was involved in the development of fire standards for the new Building (Scotland) Act and the review of the fire code for NHS Scotland. Research interests: His early research involved investigating the potential recycling of bituminous materials.

**(6) Dr Iain Sanderson**

Expertise: Fire safety including inspections and appraisal of fire engineering construction proposals.

Research Interests: Predictive models for smoke production in fire engineering contexts in the built environment.

**(7) Dr Paul Baker, the Centre for Research on Indoor Climate and Health**

Expertise: Building Science research, including air infiltration measurement and ventilation issues, passive solar energy use and moisture related problems in buildings. His current research activities include:

- The development of sensors for the measurement of conditions in micro-environments to improve our understanding of the life-cycle of biocontaminants such as dust mites in carpets.
- The Engineering Historic Futures Project, funded by the EPSRC as part of their climate-change research initiative “Building Knowledge for a Changing Climate”, which examines the issues arising from water damage to historic buildings, and focuses on developing appropriate methodologies for drying.

**(8) Colin Hunter the Centre for Research on Indoor Climate and Health**

Expertise: Building-related biological issues. Microbiological aspects of air quality. The prevention of biodeterioration of buildings and building materials.

Research: The deterioration of carved historical stones for Historic Scotland; The hygienic status of HVAC ductwork; The occurrence of Legionella in domestic water systems; Biological factors affecting the health of children.

**(9) Chris Sanders, Director the Centre for Research on Indoor Climate Health**

Chris worked for the Building Research Establishment (BRE) in Scotland for 29 years, initially on the risk of condensation and mould in houses and roofs and the assessment of the effects of moulds and mites on health. He carried out the analysis of condensation, mould and energy data in the last four English House Condition Surveys, and was a member of the DETR working group that produced the EHCS Energy report.



**(10) Dr Ole Pahl**

Expertise: Identification and management of biological waste.



**(11) Dr Gholam Jamnejad**

Expertise: The treatment of completed landfill sites.



**(12) Dr Caroline Gallagher**

Caroline has strong interests in the field of health, safety and environmental issues and the problems encountered in striving for the goal of sustainability, especially sustainable development in relation to urban regeneration. She is an expert in the application and uses of GIS systems.



**(13) Douglas Hillhouse**

Expertise: Building and architectural design, space planning, fire safety design and performance codes.



**(14) Mark Phillipson the Centre for Research on Indoor Climate and Health (GCU)**

Expertise: The thermal performance of buildings and the effects of climate change on buildings and their occupants. He is a building physicist by training.

Research: The implications of thermal and moisture transport in buildings, sustainable construction and climate change on UK construction.



**(15) Dr Mike Hepher**

Mike Hepher is an analytical chemist specialising in environmental pollution investigations and is the chair of Air Quality Scotland.

Expertise: His expertise covers waste management problems, environmental health issues and instrument development.



**(16) Harry Madden**

Harry is Chartered Building Surveyor who has gained considerable experience through his work in professional practice. The breadth of his experience and knowledge has led to their being consulted as Expert Witnesses in a wide variety of complex building problems and disputes.



**(17) Halbert Mills**

Halbert is Chartered Building Surveyor who has gained considerable experience through his work in professional practice. The breadth of his experience and knowledge has led to their being consulted as Expert Witnesses in a wide variety of complex building problems and disputes.



**(18) Ian Trushell**

Ian holds fellowships in RICS, CIArb and CIOB and is Chairman of the Scottish Branch of the Chartered Institute of Arbitrators (CIArb). He is past Chairman of CIArb.



**(19) Martin Cullen**

Martin is a Civil Engineer whose areas of expertise are lock gate structures, maritime, geospatial and structural engineering. He gained extensive industry experience before starting an academic career. He is a member of the Institution of Civil Engineers (ICE) and a fellow of the Institution of Civil Engineering Surveyors.

Martin chaired the Geospatial Engineering Board of the ICE for two years and acts as consultant for a number of projects.



**(20) Dr Nicholas Hytiris**

Nick is a Civil Engineer whose areas of expertise are in Geotechnics and Environmental Geotechnology. A Senior Lecturer in Geotechnics and Environmental Geotechnology, he has conducted research into new ground improvement techniques and currently has projects for clients in Greece, Holland, South Africa, Turkey and China.



**(21) Dr Agnieszka Klemm**

Agnieszka is a visiting professor at the Technical University of Lodz and the Polish Academy of Sciences.

Expertise: The performance and durability of concrete and other construction materials.



### **(22) Tim Whitworth**

A Fellow of RICS, Tim has an MSc in Construction management and is a fellow of the Chartered Institute of Arbiters.

Expertise: Developing a systems management approach to construction risk; The building contract.

Consultancy offered: Dispute resolution (arbitration, adjudication and mediation).

### **(23) Dr John Lowe**

Expertise: Risk management; Economic structure of the construction sector and its impact on construction costs. Specifically technological change and innovation in construction; Economic forecasting, construction productivity and financial management.

### **(24) Dr Iain Cameron, Head of the Division of Construction Management and Economics & Academic Co-Director of the Centre for the Built Environment**

Expertise: Iain is a chartered builder and registered safety practitioner, having worked in industry for several years before joining the University. His expertise is in Health and Safety in construction including advising clients on safety management systems, policies and procedures.

Research: Working at height for the HSE and Worker Engagement also for HSE and Superior Safety Performance for IOSH.

### **(25) Dr Billy Hare**

Expertise: Health & Safety in construction. Worker engagement including migrant workers. CDM Regulations including designer. Billy has carried out research for HSE on Worker Engagement and Factors Influencing Scottish Construction Accidents also for HSE and Superior Safety Performance for IOSH.

### **(26) Dr Stas Burek**

Stas Burek lectures in environmental technology. He is a committee member of the UK branch of the International Solar Society and Treasurer of the Scottish Solar Energy Group. He has chaired the Glasgow and West of Scotland Energy and Environmental Forum, a network of industrialists, academics and other stakeholders. His expertise is in this area of environmental technology including wind and solar power.



**(1) Dr Michael Grant, Head of Department, Department of Architecture, Strathclyde University**

Dr Michael Grant has been a member of the Department of Architecture since 1986 and currently holds the position of Head of Department. His research interests relate to the application of the Information Technologies to design problems in spaces, buildings and cities. His personal expertise relates to visual computing which translates to the development of generic 3D applications that have formed the basis of long standing research themes in urban modelling and virtual reality investigations into the performance of our built environment.

**(2) Professor Alan Pert, Director of NORD and Professor of Architecture at Strathclyde University**

The Northern Office for Research and Design [NORD], are architects, educators and researchers. NORD was founded by Alan Pert and Robin Lee in July 2002. The company is a multi-disciplinary practice, embracing every aspect of the designed environment, with particular focus on architecture. Education has always played a key role in NORD's work; Alan Pert was appointed visiting Professor at The Canterbury School of Architecture in August 2007 and in March 2007 Pert was appointed as Professor of Architecture and Urban Studies at Strathclyde University.

**(3) Professor Gordon Murray, Head of School and Professor in Architecture and Urban Design at University of Strathclyde**

Gordon Murray is a principal in gordon murray+alan dunlop-architects. They are recognised for both thoughtful and thought-provoking projects across Scotland and, more recently, Europe. In the ten years Gordon and Alan have been together, the practice has won over twenty-five national and international architecture awards. "Reduced to the maximum" is a personal mission statement. He has taught in Schools of Architecture in Glasgow, Edinburgh and Belfast where he is also External Examiner at the University of Ulster.

**(4) Dr Andrew Agapiou, Convener of Professional Practice and Management in the department and Academic Co-Director of the Centre for the Built Environment**

Expertise: Prior to entering academia, Andrew worked as a site engineer and construction manager for building and civil engineering contractors on major capital projects throughout the UK. He has organized and contributed to numerous knowledge transfer activities and in-house training courses for several large practices and contracting organizations. His expertise is in construction engineering and management.

**(5) Gerry Grams, Visiting Professor in Urban Design**

Gerry is the City Design Advisor to Glasgow City Council lecturing in architecture and urbanism.



### **(6) Ian Gilzean, Visiting Professor Strathclyde University**

As the Government's Chief Architect Ian develops and implements architecture policy and advises Ministers on architecture issues. Having been involved in architecture education for 17 years Ian is visiting Professor at the University of Strathclyde as well as External Examiner for Canterbury School of Architecture and the Architects Registration Board (ARB).

### **(7) Christopher Platt**

Christopher Platt is founding partner with Roderick Kemsley of studio KAP architects. Their award-winning work has been published internationally in architectural and academic journals as well as in books of international exemplars, mainstream press, TV, radio and international websites. Their diverse research-based practice has recently explored issues of detail, rural sustainability, urban design and the domestic room with residential and community clients. Christopher Platt is external examiner at Cardiff and Edinburgh universities and visiting professor at the Bauhaus University in Weimar.

### **(8) Stirling Howieson, Director of the Centre for Environmental Design and Research (CEDAR)**

Expertise: Building related biological issues.

The main thrust of the Unit's research effort has been a series of interventionist trials to assess and quantify the role indoor air quality, in particular high humidity (driving the colonisation and proliferation of the house dust mite) plays in the aetiology of the disease and periodic symptomatic exacerbations. The research cuts across a variety of specialisms: building physics and material science, entomology, immunology, toxicology, bio-statistics and pulmonary medicine.

### **(9) Dr Ombretta Romice**

Expertise: Sustainable urban design, environmental psychology and user participation in design. She holds a PhD in architecture and psychology and a PostDoc in housing and regeneration.

### **(10) Dr David Grierson, Director of the Postgraduate Training Programme in Sustainable Engineering, and Director of the David Livingstone Centre for Sustainability**

Research and Expertise: Sustainable architecture and urban design. David is particularly active in the promotion of knowledge exchange and CPD through increased engagement with business, industry, the professions, and other institutions. He represents the University as a member of the Glasgow Urban Design Panel which advises Glasgow City Council's Planning Committee on planning decisions.



**(1) Professor David Porter, Head of the Mackintosh School of Architecture**

Project leader for the Living Cities Feasibility study researching place making. Background in practice-based research into high density low-rise housing and urban design in Holland and the UK as a partner in Neave Brown David Porter architects.

**(2) Alexander Page, Depute Head of the Mackintosh School of Architecture**

Research interests: provision of housing for an ageing population. Design issues regarding the provision of environments for dementia sufferers as “just another disability” and inclusive design from a dementia sufferers’ point of view.

**(3) Dr Tim Sharpe, Head of Architectural Technology and Co-Director of the Mackintosh Environmental Research Unit (MEARU) Mackintosh School of Architecture, Academic Co-Director of the Centre for the Built Environment**

Expertise: Environmental and low energy design and sustainability. Energy related technical issues. Sustainable building design. Building materials technology.

**(4) Professor Colin Porteous, Professor of Architectural Science**

Research Interests: Environmental architecture – focus on solar energy housing applications and carbon neutral design with special interest in solar pre-heated ventilation air.

**(5) Douglas Pritchard, Head of Visualisation, Glasgow School of Art**

Expertise: His primary area of interest is in the development of large-scale urban visualisation projects for design development, public consultation and urban planning. Over the past year he has been the Project Director of Virtual City of Glasgow, a ground-breaking project for the Glasgow City Council. According to the Council, this 3D representation of Glasgow is likely the most accurate and detailed urban model of its kind in the Europe.

**(6) Joanna Crotch**

Expertise: Joanna’s specialism is in the field of reviews.

Following five years in the field of private practice, working primarily in the field of social and private housing, Joanna began to teach part-time at the Mackintosh School. In 2002 she became a full-time member of staff. She lectures in Structures within the stage 1 programme.



**(7) Julie Annan**

Expertise: Social and economic implications of the built environment, social housing, housing associations, urban studies.



**(8) Dr Raid Hannah**

Expertise: Environmental control and computer aided design.

Research: Examining the efficiency of hot air solar collectors in Glasgow and Aberdeen. Design studies to investigate the relationship between the design process and the design product under different conditions of human computer interaction.



**(9) Sally Stewart, Head of Undergraduate Studies**

Expertise: Social and environmental sustainability.



**(10) Robert Mantho**

Research: Collaborative design and the exploration of spatial definition. Art and architecture, creative practice, public realm, design and build.



**(11) Minty Donald**

Research: Site responsive art as a means of engaging with and critiquing the built environment.



**(12) Dr Masa Noguchi**

Masa is a lecturer-researcher in architectural technology including building materials and systems, and energy and environmental aspects in architecture.

Research: Mass customisation in sustainable, affordable housing, zero/low carbon construction technologies, solar architecture, building integrated photovoltaics and value analysis in design and construction.

**Gordon Gibb, Director of Professional Services**

Expertise: Building contracts. Dispute and claim resolution. Professional negligence and liability. Building and land law. Expert witness service provided. Presentation and negotiation skills training. Gordon also has his own practice, Gibb Architects.

# AREAS OF EXPERTISE AVAILABLE THROUGH CBE

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- Community engagement
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- Building materials and technologies
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- Project management
- Strategic management in Construction and property enterprises
- Construction Procurement & Economics
- Construction dispute resolution
- Construction markets and procurement
- Construction and development risk
- Property Management and Valuation
- Health & Safety
  - Information Technology
  - Facilities management
- Building performance

## SUSTAINABLE BUILT ENVIRONMENT

### **Sustainable building design and construction**

In the construction industry, clients, designers and builders alike are all concerned to ensure that their buildings are sustainable over the long term and respect the environment. Our consultants work with developers, designers, builders, utility companies, local planners and others providing advice on sustainable development based on sound ecological principles.

Clients are also assisted in assessing the effects of specific developments on the environment, for example, the impact of wind farming on the land and townscape. Other areas of interest include the quality of freshwater for drinking suitability, urban ecology, environmental quality, and the use of Geographic Information Systems (GIS) in environmental decision-making.

### **Carbon management**

The effects of climate change and the need to reduce carbon emissions is a critical issue for us all. Businesses and local authorities need to be aware of their environmental impact and seek to reduce their 'carbon footprint'.

Our expertise includes: Climate Change, Carbon Footprinting, Policy Support, Model Development, Renewable Technologies, Energy Management

### **Waste management**

We advise local authorities, consultancies and contractors on the engineering aspects of waste management, and environmental geotechnics: landfill engineering, contaminated land, site investigation and environment technology, particularly research studies that require in-depth and/or long-term monitoring and analysis.

Our consultants also include specialists on waste, in particular agricultural waste. They advise clients on the implementation of environmental regulations, and the treatment and re-use of waste materials, particularly biological waste.

### **Indoor climate health**

The centre combines work on long term research projects funded by bodies such as the Engineering and Physical Science Research Council (EPSRC), the European Union, and other national funding agencies, with individual consultancy projects directly related to the needs of industry. It is also establishing close links with the local community to develop comprehensive solutions for the problems associated with poor housing in Scotland.

# AREAS OF EXPERTISE AVAILABLE THROUGH CBE

The Centre has an active interest in delivering bespoke consultancy to a range of industry clients. Particular areas of interest include:

## **Condensation risk assessments**

To help owners, occupiers, and designers identify inherent condensation risks within buildings and identify viable and effective solutions.

## **Thermal Bridge Modelling**

To help designers and clients achieve compliance with Building Regulation requirements for thermal performance.

## **Small Scale Air-Tightness Testing**

To demonstrate compliance with best practice in construction and reduce unnecessary heat loss.

## **Environmental Modelling**

To evaluate internal comfort conditions and evaluate the benefits of building refurbishment.

## **Climate Change**

To evaluate the impacts of climate change on buildings and the construction industry.

## **Integration of Renewable Energy Systems**

The team have various interests in a range of building integrated renewable energy sources. Assessment services can be offered to clients to evaluate the long term performance and identify the benefits actually realised.

## **Allergen monitoring**

To provide an evaluation of biological (e.g. house-dust mites, fungi and cockroaches) causes of air quality and health-related problems.)

## **Surface colonisation**

The Centre has interests in understanding the development of biological growths on constructional materials and building surfaces leading to the development of effective preventive and remedial strategies.

## **Sustainable Communities**

Community engagement is about involving communities in the planning, development and management of their environment. With the introduction of community planning and other community led initiatives it has become even more important for both the public and private sectors to develop strategies for community engagement.

We offer expertise on: Community Engagement, Sustainability Agenda, Environmental Justice, Community Ownership/Assets, and Capacity Building.

## CONSTRUCTION MANAGEMENT

### Building Surveying

Our consultants in this area work with public and private property owners, housing associations, local authorities, architects and construction companies offering the full range of building surveying services as described by the Royal Institution of Chartered Surveyors, some of which are listed below.

The use of diagnostic equipment, including infra-red thermography apparatus, allows us to offer a comprehensive service in the identification and analysis of building defects and their causes.

### Consultancy offered:

- Defect investigation and maintenance advice
- Insurance assessment and claims
- Property legislation
- Dilapidations
- Advising on the approval of plans submitted by lessees and inspection of the building works.
- Advising on building or proposed plans and work on site to ensure compliance with the Building Act and Building Regulations
- Advising property owners on the requirements of the Disability Discrimination Act
- Providing advice on energy efficiency

## CIVIL ENGINEERING

This broad area encompasses a wide variety of skills and expertise which is available from our team of talented and professional individuals. The consultancy areas available are summarized under the following categories.

### Geotechnics and environmental geotechnology

Our consultants in this area work with building and road contractors, advising on site investigation, stabilisation of marginal soils and difficult foundations, soil reinforcement, and uses of marginal land, waste and other materials for these purposes.

Our consultants have developed new techniques to recycle sludge and waste, including the use of sewer sludge materials in road engineering and olive oil sludge in the production of bricks. We can also assist on issues such as ground improvement and land remediation techniques as well as river erosion protection through the use of geosynthetics.

### Harbours and canals

This work involves advising contractors, consulting engineers, legal professionals, insurance companies, steel contractors, and port and canal operators on the design of harbour, dock and canal installations such as link spans and gates. A specialist area is lock gate structures. We can also assist and advise in matters concerning maritime, geospatial and structural engineering. Our consultants act as expert witnesses in contractual claim and court cases connected to this field.

# AREAS OF EXPERTISE AVAILABLE THROUGH CBE

## **Structural steelwork**

The safe and effective erection of steel structures depends on the competent design of beams and columns and the connection between these, whether bolted or welded, and use of appropriate erection methods. They must, of course, also comply with all current health and safety requirements. We offer design and consultancy services to a range of clients, including contractors entering into design and build contracts. This may also benefit either party to a contract where there may be some dispute about the suitability of the structure.

## **Structural Eurocodes**

Following the introduction of the new Structural Eurocodes, we now offer consultancy and training, both in seminars and through bespoke in-house programmes, on the meaning and application of these.

## **Buried services**

New legislation is now bringing this fraught area under control and those who own buried services, maintain or install them and those who have to deal with the various groups who have buried services need to understand the legal responsibilities resulting from the new Acts. Our experts can interpret these for you and advise on how best to meet your obligations.

## **Materials**

Our consultants work with construction companies and the producers of construction materials. They advise their clients on the performance and durability of these materials. This includes development of new technologies and products. One of our specialist areas is the crystallisation process in capillary porous materials and its destructive effects. Other research interests are the durability and performance of building partitions, prediction of degradation with time, laser cleaning of building surfaces, multi-criterion optimisation in a design process of cement composites, and non-destructive methods of monitoring condensation processes.

## **FIRE RISK ENGINEERING**

Our consultants work with architects, project managers, property developing companies, local authorities and health services, providing advice on regulatory compliance for buildings and workplaces, and the application of fire risk engineering in respect of relaxation of regulations. We can assist you in assessing fire risks and the management of these risks in all aspects of building design, with particular expertise in the application to major public buildings (hospitals and similar).

## **CONSTRUCTION PROCUREMENT AND ECONOMICS**

### **PPP/PFI**

Two fundamental requirements for the success of PFI schemes are that the public sector secures value for money and that the private sector assumes responsibility for risk. That is where we can help you. One of our major interests in this area is the economic formation, modelling and prediction of construction activity. We are internationally recognised for our work in construction risk management, procurement and inventory management.

## **Risk Management**

Risk management describes a process, involving identifying, analysing and responding to risks, inherent or potential. The various types of risks fall under the main headings of:

- Economic
- Political
- Technical
- Methodologies for analysing these risks generally fall into the two main designations of either Quantitative or Qualitative.

## **Diagnostic method available**

We have devised a diagnostic method which allows these factors to be identified and measured. This method may be provided as a service and we can also provide in-company training in its use. Underlying and informing our approach is the recognition of the strong link between risk management and value management. Clients who may benefit from this include architects, building contractors and developers. Companies involved in consortia bidding for, or actively involved in, PFI/PPP projects may feel a particular need to be able to manage the larger potential for risks involved in such long term commitments.

## **CONTRACT DISPUTE RESOLUTION**

Consultancy offered: We provide advice on contract law to both sides of the contract, explaining what their responsibilities and requirements are and helping them to ensure that their interests are protected. In the event that, even after all precautions have been taken to ensure that a good, sound agreement has been made, a dispute arises, we can further advise on the various options available for remedy, including arbitration, adjudication and mediation.

The School runs the UK's only Adjudication Reporting Centre which monitors the use of adjudication by the industry and also the effectiveness of legislation in supporting the adjudication provisions.

## **PROCUREMENT**

### **Value Management**

Value Management (VM) is more than just finding the most cost-effective way of carrying out a construction project: it offers a way of involving the people who will design, build, use or be affected by the project in the entire process, taking into account their needs and constraints and thereby creating an end product of real value to users, clients and funders. It puts into practice the true spirit of partnering.

By looking in a systematic way at the way a building will be used in short and longer terms, a more informed VM approach may be applied to the design, materials and processes, while still bearing in mind budgetary restraints. Generally, this results in better decision making, cost savings and a better building.

Applying the VM approach to the whole life use of a building provides reliable cost information which can be used in PFI/PPP cost projections and by anyone who is responsible for long term maintenance planning.

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Services offered by the School include:

- Value management research and development programmes
- Value management training (accredited under Value for Europe programme)
- Workshop facilitation in value management and partnering
- Whole life costing
- Application of value management to Best Value

## **Framework for whole life costing now available.**

A strategic partnership between the Society of Construction and Quantity Surveyors (SCQS) and The School of the Built and Natural Environment has resulted in the production of an IT tool and handbook, which is expected to transform the way Local Authorities approach strategic property investment. "A Framework for Whole Life Costing" aims to explain the basic concepts of whole life costing and provide an IT tool in the form of a software programme to assist with the compilation of financial projections.

The programme introduces consistency of approach and indicates areas where particular aspects of the analysis should be recorded so that the information can be presented in a way that allows all projects or option appraisals to be assessed on a "like for like" basis. The concept allows project and option appraisal benchmarking and information sharing across the Public Sector and wider industry for similar project types and forms of construction.

## **HEALTH AND SAFETY**

Health and safety is a major issue in construction. It is crucial, therefore, that this is properly managed within a company. Our consultants have long-standing and widely respected experience in this field. They work with construction companies, contractors, local and national authorities, carrying out site inspections and advising clients on safety management systems, policies and procedures. A specialist service involves undertaking asbestos audits, for example, for developers, builders and/or their removal contractors.

We can advise you on the practical usefulness of current fall prevention and protection methods when working at heights; investigate health and safety management on construction sites to develop best practice models; integrate health and safety management with site management; risk assessment; and planning, control and supervisory procedures.

## **INFORMATION TECHNOLOGY**

The use of Information Technology does not in itself solve the challenges that may be posed by the processes and practices encompassed in the modern world of construction: thought must be given to the creation of new ways of using this technology in order to apply it to an ever-changing and developing environment. The Intelligent Buildings Lab at GCU is a vision for an integrated infrastructure facility for research and the development of technologies and new design concepts for intelligent building systems and their components.

The lab carries out built environment research with concepts and expertise from CAD/CAM, Artificial Intelligence, Communications, Technology, Electronics and Material Sciences. This innovative research is then propelled into advanced physical systems, with embedded intelligence, capable of sensing its environment, processing knowledge and dynamically adapting this to its user or environment. The lab has only recently been established and already has made significant advances in the intelligent application of IT. We are keen to find further challenges through which to broaden its scope.

Our consultants advise clients and provide consultancy services on their specific IT requirements. Clients can instantly benefit from these services as the key providers in this area are academics who develop systems and advanced IT tools to facilitate the integration of design and construction processes, intelligent building, modelling building regulations and representation and processing of codes. More generally, it is believed that architects and other SMEs are under-achieving due to their failure to adopt even basic IT tools such as spreadsheets and similar applications. Professor Kumar has developed a cost modelling system, "IFCEL", in collaboration with leading IT consultants, AEC3. IFCEL can interface with most CAD systems and automatically generate take-off quantities from building models and then output the cost models. It does not require any new technologies as it works with Microsoft Excel.

## FACILITIES MANAGEMENT

As a discipline, the study of Facilities Management (FM) is not just about changing lightbulbs and building maintenance. It has developed into a key strategic element of the planning and implementation of sophisticated construction developments, including those procured via PFI or PPP, as well as being concerned with the ongoing experience of living in, working in and visiting buildings. We are pleased to be able to offer consultancy, research and training at the very cutting edge of strategic facilities management: at every stage of the development process and lifecycle of the property.

### Consultancy

We offer advice and consultancy in developing strategic FM practices in all sorts of organisations. Specific areas include:

- Carrying out an innovation "MOT" (audit) on your company
- Creating and installing 360 degree review mechanisms to ensure FM practices are cost-effective and suited to strategic objectives
- Providing hands-on support to investigate and trouble-shoot FM challenges

### Practical research

- Performance management
- Innovative management
- Outsourcing areas of vulnerability

# SOURCES OF FUNDING

## Knowledge and Technology Transfer in the Built Environment (KTTBE) Awards Scheme

An excellent opportunity to advance an idea for a new product or process that will help to develop your business.

Aimed at building relationships between small to medium enterprises (SME's) and Higher Education Institutes (HEI's), these grants of up to £5000 are to be awarded to the HEI to evaluate the feasibility of an interdisciplinary or cross sectorial approach to a market led programme. This should be of relevance to a Scottish SME who should be a contributing partner to the study.

Applications are requested from any Scottish SME requiring technology transfer from an HEI active in construction, architecture, urban planning and related technologies and disciplines.

Download an application form from [www.cbe.org.uk](http://www.cbe.org.uk)

Further information available from CBE:  
tel: 0141 273 1411 or email: [cbeinfo@gcal.ac.uk](mailto:cbeinfo@gcal.ac.uk)

Examples of successful applications and application forms are also available for download on the CBE website.



There are a number of other potential sources of funding support available to assist businesses to undertake research and business development projects. The Scottish Executive is aiming to develop a culture of innovation and competitiveness in Scotland, by providing direct financial help through a range of programmes geared towards helping small and medium enterprises (SMEs). In addition, the SCoRe, SEEKIT and Knowledge Transfer Partnerships (KTPs) programmes encourage collaboration and cooperation between Universities, and other higher education establishments, and SMEs.

**Knowledge Transfer Partnerships (KTPs)**

[www.ktponline.org.uk](http://www.ktponline.org.uk)

**SMART Scotland**

[www.scotland.gov.uk/about/ELLD/BGI/00016879/innovationgrants.aspx](http://www.scotland.gov.uk/about/ELLD/BGI/00016879/innovationgrants.aspx)

**SPUR**

[www.scotland.gov.uk/about/ELLD/BGI/00016879/innovationpolicy.aspx](http://www.scotland.gov.uk/about/ELLD/BGI/00016879/innovationpolicy.aspx)

**SPUR Plus**

[www.scotland.gov.uk/about/ELLD/BGI/00016879/page1536083307.aspx](http://www.scotland.gov.uk/about/ELLD/BGI/00016879/page1536083307.aspx)

**SCoRe**

[www.scotland.gov.uk/about/ELLD/BGI/00016879/page6302611.aspx](http://www.scotland.gov.uk/about/ELLD/BGI/00016879/page6302611.aspx)

**SEEKIT**

[www.scotland.gov.uk/about/ELLD/BGI/00016879/page173849141.aspx](http://www.scotland.gov.uk/about/ELLD/BGI/00016879/page173849141.aspx)

**Glasgow City Council**

Companies based in Glasgow and meeting certain criteria may be eligible for Training Grants from an EU programme managed by the Council.

[www.glasgow.gov.uk/en/Business/Businesssupport/TrainingGrants/](http://www.glasgow.gov.uk/en/Business/Businesssupport/TrainingGrants/)

# MEET THE PEOPLE

THE CENTRE FOR THE BUILT ENVIRONMENT



**(1) Dr Branka Dimitrijevic, Director**

T: 0141 273 1408

E: Branka.Dimitrijevic@gcal.ac.uk

**(2) Anne Blacklock, Business Development Manager**

T: 0141 273 1409

E: Anne.Blacklock@gcal.ac.uk

**(3) David O'Neill, Project Administrator**

T: 0141 273 1411

E: David.Oneill@gcal.ac.uk

**(4) Michael Sibanda, IT Administrator**

T: 0141 273 1406

E: Michael.Sibanda@gcal.ac.uk

## Academic Co-Directors

**(5) Dr Andrew Agapiou, University of Strathclyde**

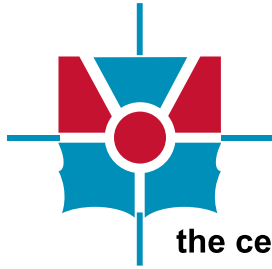
E: andrew.agapiou@strath.ac.uk

**(6) Dr Tim Sharpe, Mackintosh School of Architecture**

E: tim.sharpe@msc.ac.uk

**(7) Dr Iain Cameron, Glasgow Caledonian University**

E: i.cameron@gcal.ac.uk



the centre for the **BUILT ENVIRONMENT**

To find out more about how CBE can assist your business please contact the Business Development Manager at CBE on 0141 273 1411 or [cbeinfo@gcal.ac.uk](mailto:cbeinfo@gcal.ac.uk) who will arrange to meet you to discuss your requirements.



Centre for the Built Environment  
70 Cowcaddens Road, Glasgow, G40 8BA

tel: 0141 273 1411  
fax: 0141 273 1418

email: [cbeinfo@gcal.ac.uk](mailto:cbeinfo@gcal.ac.uk)  
<http://www.cbe.org.uk>