

Research Associate - Advanced building façade design for optimal delivery of end use energy demand

Job Ref: REQ220679

As part of the University's ongoing commitment to redeployment, please note that this vacancy may be withdrawn at any stage of the recruitment process if a suitable redeployee is identified.

School/Department summary

Loughborough University (CREST) in collaboration with University partners from Nottingham University and Exeter University have been awarded funding from the EPSRC to undertake a program of fundamental and applied research to develop advanced façades technologies to achieve significant reduction in building energy demands. Low cost optical components will be designed and integrated into conventional double glazing, which will significantly increase the thermal resistance of the window, provide control of the solar heat gain, and enable windows to perform better than walls on a yearly basis in terms of their net energy balance. Building energy loads will be reduced significantly while providing comfortable levels of daylight. The target is that when integrated in a typical commercial building the novel glazing façade system will provide comfortable annual daylight levels achieving over a 20% reduction in annual artificial lighting energy consumption, reduce space heating demand by over 30% in the heating season and cooling load by 20% in Summer. The integration in a façade system of active solar energy technologies with better performing windows may potentially lead commercial buildings to be a negative energy load on an annual basis.

The three main areas of research to be performed at CREST relate to i) transient optical and thermal modelling of the façade systems being developed and prediction of building energy loads, ii) development and characterisation of switchable vacuum glazing, iii) the design, development and assessment of the performance of transpired inverted absorber CPCs and thermochemical inter seasonal heat storage.

The major activities of the post primarily relate to modelling, developing and experimental testing of new building façade components and modelling system and building energy performance and include:

- Modelling and development of low heat loss glazing systems,
- Development and testing of novel building façade integrated solar thermal air heating collectors,
- Façade system component model development, validation and parametric analysis,
- Building energy performance simulation.

Laboratory work as part of a team will be required in some of the following areas:

- Design of experimental test equipment and procedures,
- Switchable vacuum glazing development and characterisation,
- Development and performance assessment of transpired inverted absorber CPCs,
- Thermochemical material property measurement,
- Design and characterisation of small-scale thermochemical energy storage systems.

Job Description

Job Grade: Specialist and Supporting Academic Grade 6

Job Purpose

The Research Associate will primarily be involved in the following with most time spent on the areas in italics (primarily items v,vi, viii and ix)) i) performing a literature review of advanced façade technologies for low energy buildings, ii) developing and validating models for advanced façade components, iii) performing a parametric analysis to identify optimum designs, iv) performing simulations to predict improvements in building energy performance that can be realised with the advanced façade components being developed, v) *design of experimental test equipment and procedures*, vi) *new edge seal materials and fabrication techniques for vacuum glazing*, vii) *integration of vacuum glazing prototypes with switchable elements and their experimental characterisation*, viii) *development and performance assessment of transpired inverted absorber CPCs*, ix) thermochemical material property measurement, and design and characterisation of small-scale thermochemical energy storage systems.

Job Duties

To be responsible for undertaking the main research activities as follows:

- Develop and test new edge seal materials and fabrication techniques for vacuum glazing,
- Produce vacuum glazing prototypes, integrate with switchable elements and experimentally characterise their performance,
- Undertake experimental work, to build and characterise novel prototype façade components in particular transpired inverted absorber CPCs.
- Performing simulations to predict improvements in building energy performance that can be realised with the advanced façade components being developed.
- Performing a literature review of advanced façade technologies for low energy buildings.
- Developing and validating models for advanced façade components.
- Performing a parametric analysis to identify optimum component designs.
- To assist in the dissemination of results arising out of the project.
- To assist in organisation of project workshop meetings.
- To travel to collaborators' locations within the UK and report on the progress of the project.
- To provide feedback to the project team on progress and assist in preparing interim project reports.
- To work as a committed member of the project and university team.
- To make presentations to industry and academia.
- To publish the outcomes of research in international journals and conferences.
- To assist in tutorials and laboratory sessions for students if needed.

Points To Note

The purpose of this job description is to indicate the general level of duties and responsibility of the post. The detailed duties may vary from time to time without changing the general character or level of responsibility entailed.

Special Conditions

All staff have a statutory responsibility to take reasonable care of themselves, others and the environment, and to prevent harm by their acts or omissions. All staff are therefore required to adhere to the University's Health, Safety and Environmental Policy & Procedures.

All staff should hold a duty and commitment to observing the University's Equality & Diversity policy and procedures at all times. Duties must be carried out in accordance with relevant Equality & Diversity legislation and University policies/procedures.

Successful completion of probation will be dependent on attendance at the University's mandatory courses which include Respecting Diversity and, where appropriate, Recruitment and Selection.

Organisational Responsibility

Reports to Professor Philip Eames.

Person Specification

Your application will be reviewed against the essential and desirable criteria listed below. Applicants are strongly advised to explicitly state and evidence how they meet each of the essential (and desirable) criteria in their application. Stages of assessment are as follows:

- 1 – Application
- 2 – Test/Assessment Centre/Presentation
- 3 – Interview

Essential Criteria

Area	Criteria	Stage	
Experience	Background in Building/Mechanical/Chemical Engineering, or Science including heat transfer analysis.	1, 3	
	Experience of successfully designing and undertaking a complex program of experimental research work	1, 3	
	Experience of developing, validating and successfully using detailed simulation models	1, 3	
	Experience of developing simple simulation models	1, 3	
	Experience of having produced technical reports and / or guidance materials on engineering or science topics	1, 3	
	A journal and conference publication record commensurate with current career path and stage	1, 3	
Skills and abilities	Knowledge of heat transfer and fluid mechanics and associated modelling techniques	1, 3	
	Ability to develop, plan and undertake a detailed program of experimental laboratory work	1,3	
	Ability to use a wide range of appropriate computer software and develop complex and simple simulation models	1,3	
	Excellent written and oral communication, and IT skills	1, 3	
	Self-motivated with ability to meet deadlines	1, 3	
	Previous experience of model validation and performance of a parametric analysis	1, 3	
	Ability to work independently and as part of a team, interacting with different academic and industrial partners	1, 3	
	Excellent interpersonal, and organisational skills	1, 3	
	Training	Demonstrate evidence of having undertaken further training	1, 3
	Qualifications	A good honours degree in Engineering, Physics, Chemistry or Materials Science, or other suitable subject	1, 3
Relevant PhD awarded or nearing completion in a relevant Engineering/science discipline (or equivalent experience)		1,3	

Desirable Criteria

Area	Criteria	Stage
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Experience	Practical experience of working with or developing solar thermal systems, advanced glazing or thermochemical energy storage systems	1,3
	Practical experience of relevant experimental analysis techniques	1,3
	Current or recent relevant work experience at post-doctoral level in an academic or industrial environment	1, 3
	Experience of modelling buildings and building façade systems/components optical and thermal performance	1, 3
	Practical experience of working with advanced façade systems.	1, 3
	Practical experience of working with thermochemical energy storage materials and systems.	1, 3
	Practical experience of solar collector modelling and experimental performance characterization.	1,3
	Experience of authoring original work for academic journal papers, conference papers or technical reports for industry	1, 3
Skills and abilities	Ability to assist in teaching of undergraduate or postgraduate students	1, 3
	Working knowledge of a range of software packages and excellent ability in a programming language	1, 3
	Knowledge of experimental techniques associated with heat transfer studies	1, 3
	Ability to design and manage the construction of experimental rigs	1, 3
	Ability to successfully undertake an extensive laboratory test campaign	1, 3
	Previous experience of successfully undertaking a detailed experimental test campaign and data analysis	1, 3
	Previous experience of model validation and performance of a parametric analysis	1, 3
	Previous experience of producing reports	1, 3
Qualifications	Relevant PhD in an Engineering discipline preferably related to façade engineering/building energy performance with significant modelling and experimental work (or equivalent experience)	1, 3

Conditions of Service

The position is **full time** and **initially until 31**

December 2023. Salary will be on Specialist and Supporting Academic Grade 6, £31,406 to £40,927 per annum, at a starting salary to be confirmed on offer of appointment.

The appointment will be subject to the University's Terms and Conditions of Employment for STAFF GRADE 6 AND ABOVE, details of which can be found [here](#).

The University is committed to enabling staff to maintain a healthy work-home balance and has a number of family-friendly policies which are available at <http://www.lboro.ac.uk/services/hr/a-z/family-leave-policy-and-procedure---page.html>.

The University offers a wide range of employee benefits which can be found [here](#).

In addition, the University is supportive, wherever possible, of flexible working arrangements.

We also strive to create a culture that supports equality and celebrates diversity throughout the campus. The University holds a Bronze Athena SWAN award which recognises the importance of support for women at all stages of their academic career. For further information on Athena SWAN see <http://www.lboro.ac.uk/services/hr/athena-swan/>

