



## **INTERNATIONAL DESIGN CHALLENGE**

*Supported by the Royal Academy of Engineering under the Frontiers Champions programme*

**RESILIENT HOUSING DESIGN IN FRAGILE SETTINGS – RES-HOUSE**



<b>PREMISE .....</b>	<b>3</b>
<b>DESIGN BRIEF .....</b>	<b>3</b>
<b>GENERAL SPECIFICATION OF THE HOUSE.....</b>	<b>3</b>
<b>TIMELINES.....</b>	<b>4</b>
<b>EOI SUBMISSION REQUIREMENTS.....</b>	<b>4</b>
<b>FINAL SUBMISSION REQUIREMENTS .....</b>	<b>5</b>
<b>SUBMISSION CRITERIA.....</b>	<b>5</b>
1. DESIGN OF HOUSE IN 3D FORMAT .....	5
2. DESIGN DETAILS AND SPECIFICATIONS INCLUDING .....	5
3. SUMMARY PAGE.....	5
4. TECHNIQUES AS PER ENERGY+ GUIDELINES AND REQUIREMENTS.....	6
<b>AWARDS + RECOGNITION .....</b>	<b>7</b>

## PREMISE

The frequency and intensity of natural disasters around the world has increased over the years. This is evident from the severe droughts, prolonged heatwaves and continent-wide wildfires experienced in Africa Americas, Australia, and Asia. The devastating floods in Pakistan in 2022 floods and 2023 earthquakes in Türkiye call for more inclusive and place-based building design and construction. The dynamic nature of geological and climatic situations demands a rethink of concepts, approaches, technologies, and techniques to include specific social, economic, and environmental components in addition to the historical cultural and geographical factors with a strong place-based and wellbeing focus.

The design of a house plays a vital role in the sustainability, affordability, and resilience besides improving the residents' quality of life. Climate responsive, adaptive, and passive design strategies coupled with innovative technological solutions are fundamental to energy efficient homes. The object of this challenge is to prepare emerging professionals especially the students and young graduates to envision and design a climate adaptive, zero-energy, resilient, inclusive, and sustainable house that is affordable to own, operate and maintain by the standards of lower to middle-income level households in the Global South setting. The design of a resilient house therefore must enhance the quality of life and well-being of residents, as well as adapt to climate change and the projected relevant natural disasters (e.g., floods, droughts, or heat waves) in a selected area.

This competition is primarily for interdisciplinary teams of students and young professionals. For a team to enter and win this competition, they must:

- Design a house that is intended for four to six occupants spread over a plot of 120 sqm, out of which 80 sqm would be the constructed area (the house).
- Design a house up to a maximum construction cost of US\$220 per sqm (as a general convention for Global South). We will accept regional variations of costs if clearly justified.
- Includes a subsidiary function attached to it for household need, as per the context (subsidiary function could be a workplace/commercial area, food sourcing or animal husbandry)

## DESIGN BRIEF

The design of the house needs to be innovative, provide all needs of residents, efficient and minimise waste of materials and as per the respective energy-positive and resilience guidelines. Teams should use their local climate zone data based on the location of the house and should provide details of any assumptions regarding the location, orientation of the house, and the local construction standards and costs. The design (layout and exterior), materials and construction methods of the house need to emphasise:

- a) Energy+ – keeping the use of energy low through design inputs and offset the use of energy through alternative energy means;
- b) Affordability – the proposed house should be within the average construction costs prevailing in the regional context;
- c) Food sustainability – use of space for the food production, storage, and consumption; and
- d) Resilience to natural disasters.

In addition, other innovative solutions such as water conservation and recycling etc. would be considered as plus points. Material and construction methods choices need to be kept innovative but locally acceptable, available, and compliant within the local and international design and building standards. A consultation with integrated system experts should also be part of the final design.

## GENERAL SPECIFICATION OF THE HOUSE

- Total area of plot 120 sqm with allowable constructed area of 80 sqm on ground floor (footprint).

- 3 Bedrooms with closets
- 2 Toilets and Bathrooms
- 1 Kitchen with cabinets
- 1 living area
- G+1 and height should not exceed more than 8m.
- Integrated RE technologies
- Kitchen garden
- Subsidiary function
- Needful energy appliances with their approximate usage details as per local needs and culture.
- Evidence of climate adapted and resilient structure to natural disasters (earthquakes, flooding, heat island, etc.)

To achieve these targets whilst keeping optimum environmental sustainability, the proposal needs to maximise passive design, added features such as water and energy efficiencies, produce on-site food, and recycle on-site water would be considered added desirable features over and above the core requirement of energy-positive house. Thermal comfort must still be achieved whilst delivering a low energy building

## TIMELINES

- Expression of Interest (EOI): June 12, 2023
  - Lecture 1: June 15, 2023: Dr Saeed Ahmed and Madiha Salam, NED UET Karachi,
  - Lecture 2: June 21, 2023 – Vasilena Vassilev, P+ Studio London
  - Lecture 3: July 5, 2023 – Dr Salman Mobeen, NED UET Karachi
  - Lecture 4: July 12, 2023 – Dr Maryam Siddiq, UET Lahore
  - Lecture 5: July 19, 2023 – Dr Alireza Moghayedi, UWE Bristol
  - Lecture 6: July 26, 2023 – Narmeen Aamir (Fulbright Fellow, Illinois Tech)
- Registration Deadline: August 02, 2023
- Submission Date: August 23, 2023
- Announcement of winners: tba

Submissions and queries to be emailed at [info@suspret.org](mailto:info@suspret.org)

## EOI SUBMISSION REQUIREMENTS

Subject: EOI Affordable, Resilient Energy + House Competition

- Proposed team name
- Proposed design location
- Proposed project team members (name, profession, role, and affiliation)
- Project lead contact details (email and phone)
- Proposed concept note / design approach (maximum 750 words)

Make sure you have interdisciplinary team members in team (minimum team members are three and maximum five).

## FINAL SUBMISSION REQUIREMENTS

Subject: EOI Affordable, Resilient Energy+ House Competition

- Team Number\*
- Team name
- Project team members (name, profession, role, and affiliation)
- Project lead contact details (email and phone)
- Concept, Design approach, RE integrated details, in form of a report (maximum 4000 words)
- Design Boards on two A1 Size sheets.
- 3D models – Sketch up, 3D Max, Revit etc.
- Energy calculations using appropriate open-source software such as EDGE BUILDING<sup>1</sup>
- A Small 5-7 minute video explaining your work and details

\*team numbers will be assigned by the organizers after EOI submissions

## SUBMISSION CRITERIA

Submission criteria:

### 1. Design of house in 3D format

- Architectural Drawings: Architectural floor plan(s), sections (minimum of 2), elevations (minimum of 2)
- 3D/Axonometric drawing showing key architectural and systems concepts
- Structure layout\*
- Electrical layout\*
- Diagrams explaining:  
systems (electrical, plumbing, HVAC where appropriate)  
integration of landscape  
spatial organisation  
lighting principles

\* Participants should show understanding of the engineering systems and if connected with the energy+ concept, should provide details and calculation wherever necessary. (Interdisciplinary teams should be made to handle this situation)

### 2. Design details and specifications including

- Envelope
- Key connections and materials

### 3. Summary page

- Project assumption
- Project concept
- Design approach

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<sup>1</sup> <https://edgebuildings.com/software/>

#### 4. Techniques as per Energy+ Guidelines and Requirements

##### Assessment Criteria and Rubrics:

Successful responses should demonstrate design depicting an approach towards energy-positive house which is also sustainable, affordable, and resilient through a creative and innovative integration of design and construction strategies. The designs should also include the issues of the community and its context, ecology, natural habitat, bioclimatic design, water uses, climate responsive designs and the impact on health and well-being. Long life considerations, environmental quality upgradation, design flexibility should be part of the design approach.

Entries will also be assessed for the success and innovation that the project has met the following criteria out of a total of 200 points:

Rubric	Category	Description	Point
DC	Design Concept	<ul style="list-style-type: none"> <li>DC - Concept and approach</li> </ul>	10
CA	Context and Analysis	<ul style="list-style-type: none"> <li>CA - Relation to context and regional variations</li> </ul>	10
DA	Design Aesthetics	<ul style="list-style-type: none"> <li>DA1 - Drawings</li> <li>DA 2 - 3d models</li> </ul>	10
EC	Energy Calculations	<ul style="list-style-type: none"> <li>EC – Energy Calculations using Edge</li> </ul>	10
DI	Design for innovation	<ul style="list-style-type: none"> <li>DI 1 - Innovative design strategy</li> <li>DI 2 - New building materials</li> </ul>	10
DA1	Design for affordability	<ul style="list-style-type: none"> <li>DA11 - Affordable Construction cost</li> <li>DA12 - Operation cost lower than the conventional houses</li> <li>DA13 - Low maintenance cost</li> </ul>	15
DS	Design for Social Aspects	<ul style="list-style-type: none"> <li>DS1 - Functionality</li> <li>DS2 - Privacy</li> <li>DS3 - Safety</li> <li>DS4- Connection to nature</li> <li>DS5- Design for wellbeing of the residents</li> <li>DS6- Support the local economy and community</li> <li>D7 Support the local economy and community</li> <li>D8 Design for social inclusivity, equity, and community development.</li> </ul>	40
DC1	Design for construction (Added feature)	<ul style="list-style-type: none"> <li>DC11 - Resources and materials efficiency</li> <li>DC12 - Suitable for mass production</li> <li>DC13 - Require less water and energy</li> <li>DC14 - Reducing the duration of construction</li> </ul>	30

		<ul style="list-style-type: none"> <li>• DC15 - Minimising waste</li> <li>• DC16 - Using materials that are <ul style="list-style-type: none"> <li>○ nontoxic,</li> <li>○ durable,</li> <li>○ recycled and recyclable,</li> <li>○ low embodied energy</li> <li>○ locally available</li> </ul> </li> </ul>	
DE	Design for Energy + and Sustainability	<ul style="list-style-type: none"> <li>• DE1 – Optimization of natural lighting and ventilation</li> <li>• DES2 - Energy-efficient equipment and devices</li> <li>• DES3 - Thermal insulation</li> <li>• DES4 - Thermal comfort</li> <li>• DES5 - Energy modelling</li> <li>• DES6 - Eliminate dependence on fossil fuel</li> <li>• DES7 – 100% of energy consumption generation on-site (renewable energy) Energy + design</li> <li>• DES8 - Water conservation</li> <li>• DES9 - Food sustenance</li> </ul>	45
DES	Design for ecosystems	<ul style="list-style-type: none"> <li>• DE1 - Connect to the local ecosystem</li> <li>• DE2 - Support local habitat restoration</li> </ul>	10
DC2	Design for change	<ul style="list-style-type: none"> <li>• DC21 - Resilience</li> <li>• DC22 - Flexibility/ Adaptability</li> </ul>	10
Total			200

#### AWARDS + RECOGNITION

There are cash rewards for the winners and the runners up. Awards will be based at the discretion of the jury. All shortlisted projects will receive certificates of participation. Winners will be notified of the competition results directly<sup>2</sup>.

Winner will receive £ 500,

Runner up will receive £ 300.

#### COPYRIGHT:

Copyrights of the design will be owned by the authors. By submitting an entry, the entrants grant worldwide licenses to organizers for the following:

- The right to publish the entry online as part of the shortlist and (if so selected) in print in publications.
- The right to display and store the entries on the competition website.

<sup>2</sup> The recipients outside the UK will get an equivalent amount in local currency.