Good Sustainable Design requires understanding combined with vision; it is attainable through architect-led design.

Green, Sustainable Design is not Magic

It requires integrated, professional consideration of the relevant issues to produce an environmentally and economically balanced solution to the building brief and site location. Architects are uniquely placed to lead on sustainable design. It is not a notional or overly ambitious aim, but mainstream good design, and this is what we do.

Sustainability

KAVANAGH TUITE ARCHITECTS
A truly energy conserving (and thus minimum carbon emitting) building requires an integrated design process, involving the whole design team, from conceptual stage.

Conceptual design takes building size, form, orientation and exposure into account to create a building concept that from the very beginning will generate the minimum heating, cooling and lighting loads. To this concept, ‘passive’ design measures are added to further reduce energy loads and increase comfort levels.

Efficient construction standards, with balanced insulation, thermal mass and air-tightness strategies are then integrated, with minimalised engineering services, using the most cost-effective and appropriate technology.

This also involves integrating heat-recovery ventilation, and maximum use of daylight for day-time lighting requirements. In large projects this total building design and systems integration can be complex, and requires building physics analyses, performance simulation and modelling to achieve a balanced, optimised design.

The residual building energy demand should then, to the greatest extent possible, be from renewable sources.

Monitoring completed projects, to validate building performance against the design criteria, is a key part of the look-back review which we carry out on every project.
Project design should take into account the particular location, natural features, existing structures and ecosystem of the site and through a process of development should improve the site ecology and environmental diversity. This applies regardless of the site being located in an urban or rural context.

New buildings should enhance the ecosystem particular to their location. Site specific concerns include:

- orientation
- settlement patterns
- existing structures
- topography
- flora and fauna
- transport links

Observing these concerns in designing particular building solutions is the first step towards designing for sustainability.
‘Healthy’ building design

In providing for healthy, sustainably designed buildings we must design for:

• visual contact with the external environment.
• materials that in their manufacture and use are non-hazardous, recyclable and have long life.
• internal and external spaces that, by active and passive means, provide a high quality environment with the lowest overall carbon footprints.
• the elimination of visual and acoustic stress.

Besides physiological health, we need to consider psychological health aspects as well, designing for eye-contact with the natural external environment, and for a good acoustic environment, in living, learning and work locations.

Our philosophy is to design buildings of excellence which exceed our clients’ expectations. We seek to use the most appropriate and sustainable construction methods, technologies and materials to achieve this policy.

Our buildings will always give enjoyment to their users, but be economic in their design with an awareness of the wider responsibilities to society.
Project design should allow for natural rainwater retention, with on-site absorption and/or harvesting.
Harvested rainwater and treated grey-water should be used for non-potable on-site consumption (wc flushing etc.) where feasible.
Building fittings should aim for mains water conservation, with low-flow fittings and water-efficient appliances.
Landscape design should minimise the need for irrigation in all but extreme conditions and allow for capture and reuse of water to the greatest extent.
Water management is one of the more direct and visibly positive measures that can be included in sustainable building design. In Ireland, water was considered to be a free and limitless resource. The realisation that this is far from reality is now accepted.
Planned water ecology should include conservation, reuse and attenuated disposal.
Appropriate Materials

Material selection is a key issue in sustainable design. Materials selection should be guided by:

- the use of natural materials from renewable sources.
- the specification of manufactured material with low embedded energy and carbon rates.
- the avoidance of harmful components or processes in the manufacture or harvesting of materials.
- sourcing materials within the shortest geographical range.
- avoiding excessive waste during construction.

Building materials should be selected for low environmental impact in their sourcing, manufacture, delivery and use. Materials that generate greenhouse gases in their manufacture should be avoided, as should large-scale use of materials and building elements requiring long-distance transport. Materials must be specified that are from renewable sources.

We should also design for reduced embodied energy in construction materials, and avoid use of non-recyclable high-energy materials where possible.

Materials with recycled content should be incorporated where possible, and we should use materials and building elements that are recyclable at the end of their life-cycle.
Waste Management

Waste and its management is one of the major issues of sustainability, and should be considered throughout the design process.

Construction waste should be a point of concern to all. Good design management should allow for:
- construction waste to be minimised
- demolition material to be recycled within the site where practicable
- materials to be carefully stored on site to avoid damage or breakage
- off-site fabrication where practicable

The maxim “measure twice, cut once” remains ever true.

Buildings should be designed for convenient end-user recycling of operational waste, and also for minimum construction waste creation on-site, through modular design, off-site fabrication, and elimination of on-site cutting where possible.

Where a limited life building is designed, its design should include for its de-construction and re-use, either in whole or in components.

Buildings should be designed for ease of adaptation and creative re-use. Traditional building lives should be not less than sixty years and their design should take into account end-of-life recyclability.
Rabuck Castle, near Mount Merrion. 2 3/4 M from Dublin.
Unitised Panel - Head + Sill
Unitised Panel - Jamb Interface
AIRTIGHT BUILDING

This is an airtight building, all penetrations to the external envelope must be identified to the Site Engineer.
Rain-screen Cladding Fixing over Insulated Concrete Walls
Cold Bridge Detailing

1. Point-fixing of unitised panels

2. Thermal break pad fixings to Eurofox system on concrete walls

3. Thermal isolation pad fixings of roof plant room steel to concrete slab

4. Insulation of fall-arrest system supports to roof slab

5. Attention to detail of insulation continuity – as parapet detail
Post-Occupancy Monitoring

Post-completion monitoring of systems and comfort are essential to continue to learn and develop yet higher skills going forward.

SEAI (through UCD ERG) has commenced a two year programme of monitoring and post occupancy evaluation of the building.

Monitoring equipment will log environmental data in 16 student rooms - temperature, humidity and CO\textsuperscript{2} levels, electricity use and lighting loads.

It will also record overall energy demand for space heating, hot water, heat flows from MHRV and solar collectors.

The data will be provide the verification of the design and will also feed back into research in the design of following projects.
Certificate

MosArt Ltd hereby certifies the following building prototype as a

Quality Approved Passive House

Roebuck Student Residences, Roebuck Castle, UCD Campus, Dublin

Client: University College Dublin
Roebuck Castle, UCD Campus, Dublin

Architect: Kavanagh Tuite Architects,
Terminus Mills, Clonskeagh Road, Dublin 6

Building Services: Delap & Waller Associates

This building was designed to meet Passive House criteria as defined by the Passive House Institute. With appropriate on-site implementation, this building will have the following characteristics:

- Excellent thermal insulation and optimised connection details with respect to building physics. High thermal comfort during the summer has been considered and the heating demand or heating load will be limited to
  - 15 kWh per m² of living area and year or 10 W/m², respectively
- A highly airtight building envelope, which eliminates draughts and reduces the heating energy demand:
  The air change rate through the envelope at a 50 Pascal pressure difference, as verified in accordance with ISO 9972, has to be less than
  0.6 air changes per hour with respect to the building’s volume
- A controlled ventilation system with high quality filters, highly efficient heat recovery and low electricity consumption, ensuring excellent indoor air quality with low energy consumption
- A total primary energy demand for heating, domestic hot water, ventilation and all other electric appliances during normal use has to be less than
  120 kWh per m² of living area and year

This certificate is to be used only in combination with the associated certification documents, which describe the exact characteristics of the building.

Passive Houses offer high comfort throughout the year and can be heated with little effort, for example, by heating the supply air. The building envelope of a Passive House is evenly warm on the inside and the internal surface temperatures hardly differ from indoor air temperatures. Due to the highly airtight envelope, draughts are eliminated during normal use. The ventilation system constantly provides fresh air of excellent quality. Heating costs in a Passive House are very low. Thanks to their low energy consumption, Passive Houses offer security against energy scarcity and future rises in energy prices. Moreover, the climate impact of Passive Houses is low as they reduce energy use, thereby resulting in the emission of comparatively low levels of carbon dioxide (CO₂) and other pollutants.

issued:
MosArt Offices 31/08/2011

Tomás O’Leary
MosArt Ltd

Certificate-ID: 2839_MosArt_PH_20110831_APR
Conclusions

**Increased building performance** – represents a challenge and an opportunity

PWFC requires **fully documented design** – this puts building design **centre-stage**

High **quality building design** does deliver **exemplary performance** - BREEAM  LEED  Passivhaus.

Cannot be an afterthought – starts with **“first lines-on-paper”**.

Traditional design will yield to **lightweight envelope design**.

Verification involves rigorous **on-site quality controls** and pre-testing before acceptance and handover.

**In-life costs** are the true measure of low-carbon design.
Wood + Acetic Anhydride → Acetylated Wood + Acetic Acid
100% modification

From Surface to Core