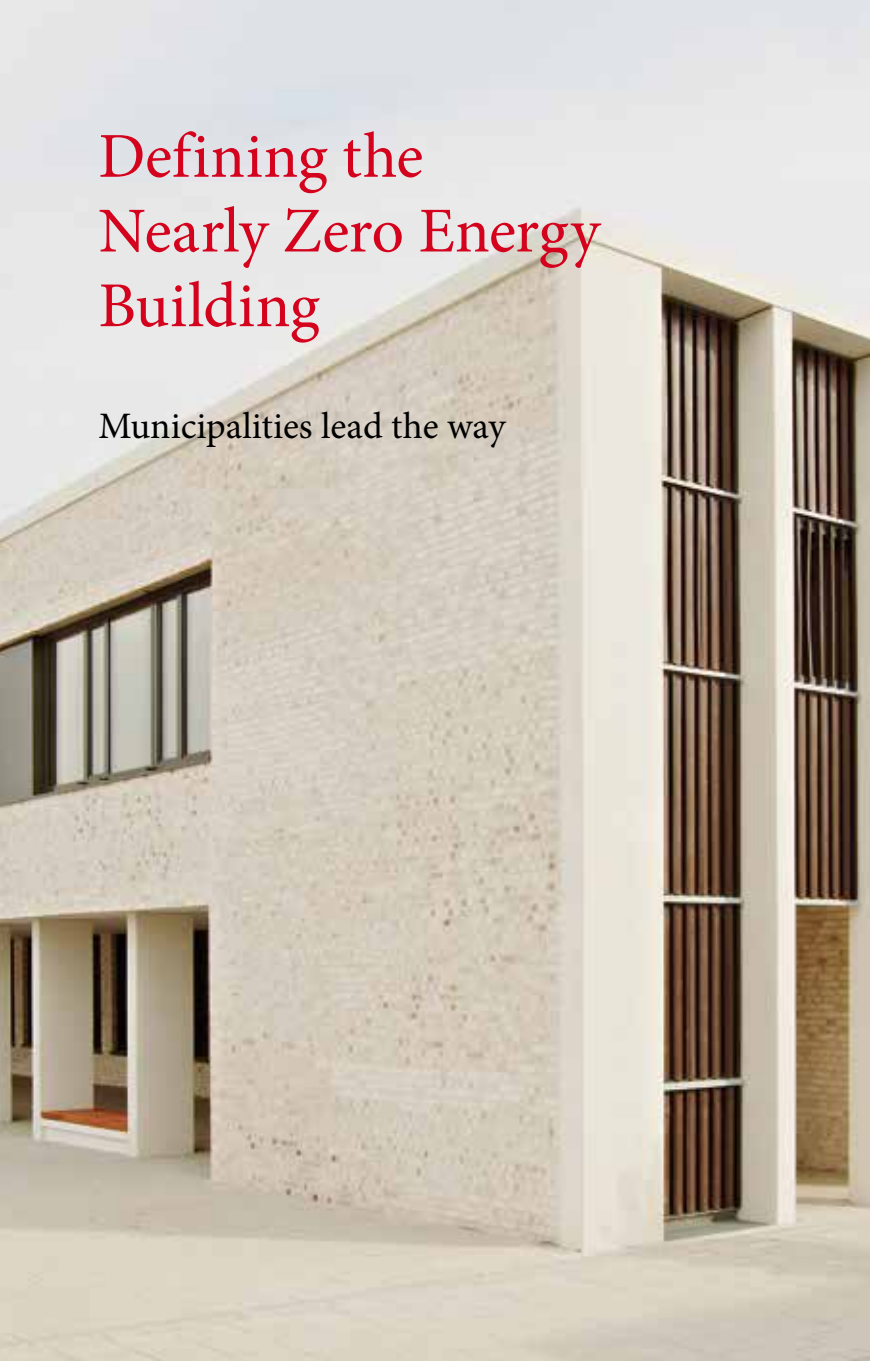
Defining the Nearly Zero Energy Building

Municipalities lead the way



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Foreword

The UK has made significant strides to reducing the energy demand of our new and existing buildings, but the really hard work begins now. Having realised the quick wins such as highly efficient heating systems and improved insulation, reaching the EU's Nearly Zero Energy Building (NZEB) target by 2020 will require new thinking.

The Passive House concept is not new to the UK, but is still a relatively niche approach to building. It has been demonstrated in other EU regions that adopting Passive House principles in combination with appropriate renewable energy sources can deliver comfortable, attractive, low running cost, low carbon buildings of any kind, in line with future NZEB requirements. We need to learn lessons from these regions to fast-track our own success. A key area for improvement in the UK will be raising the standard of workmanship and attention to detail during construction, particularly relating to the installation and commissioning of mechanical ventilation systems, which will inevitably become more commonplace as we strive to reduce heat leakage from our buildings.

We need to build the appetite and momentum for this to become our preferred approach to meeting our NZEB targets, supporting supply chains to reach critical mass for affordability, increasing the skills on site to achieve improved quality. We need to act now so we are prepared for the targets of 2020.

Colin King, Director, BRE Wales

The PassREg project is accelerating the future of construction in Europe. With the Passive House Standard as a basis complemented by renewables, participating regions are delivering a blueprint for Nearly Zero-Energy Buildings. As of 2020, this will become the standard throughout the EU – a step that will drastically reduce energy consumption in the building sector.

The pioneering regions in the PassREg project are already able to draw on valuable experience and offer guidance for other communities. The step towards Nearly Zero-Energy Buildings is long overdue, as over a third of the total energy consumption in Europe results from building operation. Up to 90% of this energy can be saved with Passive House.

Local authority officials are especially important in this regard. They can create a framework for energy efficient construction with their innovative ideas, whether by means of financial incentives, pilot projects, or land-use planning. This brochure provides guidance and highlights innovative examples.

Professor Dr. Wolfgang Feist

The Nearly Zero Energy Building NZEB

[1]

Defining the NZEB

The building sector has a key role to play in implementing the EU energy efficiency objectives: around 40% of the energy consumption and a third of CO_2 emissions are attributable to buildings. With the adoption of Nearly Zero Energy Buildings throughout the EU from 2020 onwards, these figures will be reduced in a perceptible and sustainable way.

Most buildings across Europe have not yet been modernised to improve their energy efficiency, therefore a considerable potential for savings exists. This will be addressed by the provisions of the European Energy Performance of Buildings Directive. The Nearly Zero-Energy Building, as defined in the Directive, is to consume very little energy. The small residual demand will be largely met by renewable energy generated onsite or nearby.

This definition prioritises energy efficiency for good reason. Energy from renewable sources is not unlimited and is not available to the same extent in every locale. The available area for wind or solar powered systems is usually very limited, especially in cities. Energy from biomass is also only a reasonable and sustainable solution in some cases – if too many buildings use wood pellets for heating, the raw material required will not be able to re-grow fast enough. If you reduce building energy demand by 90%, though, the situation will begin to look very different.

The Energy Performance of Buildings Directive aims to improve the overall efficiency of buildings, taking into consideration local conditions, indoor climate and cost effectiveness. In various studies carried out by the Passive House Institute, it has been shown that an optimum is achieved when it is possible to heat a building solely via the hygienically necessary supply air from a heat recovery ventilation system. For typical floor areas, this is the case with a heating load of 10 W/m² or an annual heating demand of around 15 kWh/(m²a). These values also happen to be critical for compliance with the Passive House Standard. A concept that has been proven successful for more than 20 years, Passive House is an ideal basis for the definition of the Nearly Zero Energy Building.

There are already numerous examples of buildings throughout Europe that, through a combination of Passive House Standard with renewable energy sources, can be regarded as Nearly Zero Energy Buildings. Some of these were built between 2012 and 2015 in the "Beacon Regions" of the PassREg project; others were awarded with the 2014 Passive House Award – information is available at www.passivehouse-award.org.

These buildings demonstrate that architecturally ambitious designs can be combined with the Passive House Standard with outstanding results. An overview of these Nearly Zero Energy Buildings, along with numerous pictures, technical details, project descriptions and other material, can be found at www.passreg.eu.

Passive House – the perfect NZEB

Since the ratification of the Energy Performance of Buildings Directive, the 28 member states have been working to develop their own definitions of Nearly Zero Energy Buildings, which will be required as of 2020. The Passive House Standard already offers a highly efficient and economically viable solution that can be effectively combined with renewable energy.

In the current debate about the introduction of so-called Nearly Zero Energy Buildings, reference is made to a range of energy efficient construction concepts: *Passive Houses*, *green buildings*, *solar houses* or *sustainable buildings*, to name just a few. All these concepts are fundamentally convincing in their own way, as proven by the large number of exemplary projects around the world. With its clearly defined standard and general applicability, Passive House stands out from other concepts.

Based on consistent compliance with several performance related criteria, the Passive House Standard has proved itself in practice in building types ranging from houses to schools, supermarkets, offices and apartment buildings. In addition to its high efficiency requirements, this standard is also impressive with regard to its excellent cost-benefit ratios when taking into account the lower overall energy costs. The potential use of renewable energy further reduces the already low CO_2

Villa Lucia | Passiefhuis Bergenbos | Netherlands |

Villa Pernstich | Michael Tribus Architecture | Italy

emissions. Passive House thus fulfils the requirements of the EU Energy Performance of Buildings Directive in every possible respect, thereby forming the ideal basis for Nearly Zero Energy Buildings.

An overall energy performance standard, the Passive House Standard is not limited to any specific construction design or building type. Any experienced architect can design a Passive House building in line with his or her own creativity. What matters is the quality of the details. As a result, the building owner will have an energy efficient building that is both cost-effective and comfortable.

Heat that is not lost in the first place does not have to be actively supplied. This is the key principle of the Passive House Standard and is mainly achieved by means of a well-insulated building envelope. "Passive" sources such as the sun shining through the windows, as well as internal heat sources such as heat from people and appliances, suffice to heat the indoor space. Added to this is a ventilation system in which heat is recovered from the extracted air.

In this way, a Passive House consumes about 90% less heating energy than a conventional building and more than 75% in comparison to an average European new build. This standard thus makes a significant contribution to the energy revolution and to climate protection. A Passive House is also an attractive investment for building owners: extra costs incurred in the construction phase are amortised after a few years due to saved energy costs. Even after this time, heating and cooling bills will be a tenth of what they are in "normal" buildings.

Passive House occupants are thus less dependent on future energy price developments.

The first Passive House was built in 1990 in Darmstadt (Germany). Systematic measurement of this pilot building's consumption data provided evidence that the previously calculated energy savings were achieved in practice. Different types of buildings based on the Passive House principle where then built in the framework of further research projects, ranging from schools and offices to swimming pools and supermarkets, all built to the Passive House Standard. The following years also showed that this standard is not only applicable and successful in Central Europe, but also in all other climate zones throughout the world.

The general applicability of the Passive House Standard has led to a huge increase in its dissemination internationally in recent years. Of course, the exact implementation details depend

greatly on the respective project and location. The technical challenges that must be mastered in the case of a supermarket with energy-intensive refrigeration systems are completely different to those of a conference building that is only used occasionally, but that is full when in use. A home in Northern Scandinavia must be planned differently to a home in the Mediterranean. The fundamental principles of the standard, however, remain the same regardless of whether these are applied to new builds or energy efficient retrofits in accordance with the so-called EnerPHit Standard.

Casa EntreEncinas | Duqueyzamora_ Arquitectos | Villanueva de Pría | Spain © Duqueyzamora Arquitectos

First Estonian Passive House | Architekturbüro Reinberg ZT GmbH | Estonia © Architekturbüro Reinberg ZT GmbH

The five key factors for consideration in all cases are:

1) An optimal level of thermal insulation. This provides for excellent thermal protection of the building envelope and is essential to achieve high levels of energy efficiency, as most of the heat in conventional buildings is lost through the exterior walls, roof and floor. This principle is reversed in the summer and in warmer climatic zones: alongside external shading elements and energy efficient household appliances, thermal insulation ensures that heat remains outside, keeping the inside pleasantly cool.

2) Thermally insulated window frames with high quality glazing. Such windows, typically with triple-glazing, "trap" the sun's heat during the cold winter months. South-facing windows in particular direct more solar energy into the house than the heat they release towards the outside. During the warmer months, the sun is positioned higher in the sky so that less heat is trapped. Still, external shading is important to prevent any overheating.

3) Thermal bridge free construction. Heat will travel from a heated space towards the cooler outside, following the path of least resistance. Thermal bridges are weak points in a structure that allow more energy to pass through than might be expected. Avoiding thermal bridges in building design is thus a great way to avoid unnecessary heat loss. Careful planning, especially for connections between building components, intermediate ceilings, and foundations, is essential.

4) An airtight building envelope. An airtight envelope that encloses the whole interior space prevents energy loss, moisture-related structural damage, and draughts. To achieve this, Passive Houses are designed with an uninterrupted and continuous airtight layer; special attention must be paid to junctions and connection details.

Office building | Stadtwerke Lemgo | h.s.d. architekten | Germany © Christian Eblenkamp

5) Ventilation with heat recovery. Heat recovery ventilation ensures a plentiful and consistent supply of fresh, clean, dust and pollen free air while reducing energy losses. Up to 90% of the heat from the extracted air can be recovered via heat exchange. These systems are usually very quiet and easy to operate.

Passive House is not just an energy-saving standard; a central component of the concept is the high level of thermal comfort. Throughout the building, indoor temperatures remain constant and comfortable year-round, even without floor heating or radiators near the windows.

While the concept behind the Passive House Standard may be straightforward, great care must be taken during design and construction to achieve the desired results. Each Passive House project should be guided by an experienced expert right from the design phase. The Passive House Planning Package (PHPP), long internationally established as the premier design tool for Passive Houses and other energy efficient buildings, enables experts to accurately predict the effects of design changes on annual heating demand and other important characteristic values.

Passive House certification further ensures both high quality and that the designed energy performance is delivered in practice. Certification is either carried out by the Passive House Institute itself, or by an internationally accredited Building Certifier. Through certification you can be sure that the delivered energy performance and quality is as promised.

Some regions and municipalities are promoting the use of Passive House low energy principles and renewables and achieving these standards on a wide scale thanks to targeted policies, legislation, incentives, and support. Despite their very different social and political contexts, Frankfurt, Hanover, Brussels and Tyrol provide excellent examples.

Highlights

[2]

> The City of Hanover

Hanover's success story began as early as 1998 with the completion of a row of terraced Passive Houses in Hanover's new Kronsberg district, built for the EXPO 2000. At around the same time, the regional climate protection fund, proKlima, was established via the municipal energy supplier, enercity Stadtwerke Hannover AG, and the Hanover City Council. The fund channels over € 3 million annually in direct subsidies, consulting, and quality assurance for Passive House new builds and retrofits with the provision of renewable energies. This innovative funding mechanism is fed by Hanover and select neighbouring cities, a 0.05 cent per kilowatt-hour tax levied on consumer gas bills, and enercity Stadtwerke, which transfers a portion of its profits to the fund. The effect of this fund on the local economy has been remarkable: for every euro spent in subsidies, an estimated € 12.70 flows back into the region.

Zero e:park Hanover | Supermarket | Spengler & Wiescholek Architektur und Stadtplanung | Germany © Olaf Mahlstedt, enercity-Fonds proKlima

The zero e:park, the development of which was supported by the fund, stands as a particular highlight. This almost carbon-neutral district in Hanover-Wettbergen comprises 300 Passive House residential units, complemented by the use of solar-thermal energy. The use of hydro power is also planned. A wildly successful concept, future home owners may buy land in this area on the condition that they build to the Passive House Standard.

Kronsberg district | Hanover | Germany
© Passive House Institute

Multi family dwelling |
Eco-district Haren | A2M |
Brussels | Belgium

Multi family dwelling |
Eco-district Haren | A2M |
Brussels | Belgium

> The Brussels Capital Region

In contrast to Hanover's long-running history with energy efficiency and Passive House, the Brussels Capital Region underwent rapid change, going from zero to front-runner in less than ten years. As of 2014, over one million square meters of passive buildings had been built or retrofitted in Belgium, particularly in Brussels Capital Region, including single-family homes, apartment buildings, offices, kindergartens and schools. Thousands of building professionals, occupants and users throughout Belgium have now been directly influenced by Passive House.

In Brussels, the Exemplary Building Programme, known as BATEX, popularised the Passive House Standard as the preferred low energy building solution. The programme granted subsidies through a series Passive House design competitions for residential buildings and a wide variety of both public and commercial buildings. BATEX, which ran from 2007 to 2014, was complemented via additional training, support and widespread stakeholder engagement, all of which quickly brought Passive House into the mainstream. In January 2015, Passive House became part of the official construction regulation, making it the reference standard for all new builds and deep retrofits. The adoption of Passive House by the Brussels Capital Region has already inspired many other regions and municipalities throughout Europe and the Americas.

Bahnstadt Heidelberg | Germany © City of Heidelberg | Photo Steffen Diemer

Bahnstadt Heidelberg | Germany © City of Heidelberg | Photo Kay Sommer

> Heidelberg's Bahnstadt

Another striking example of forward-thinking planning is Heidelberg Germany's new city district, the Bahnstadt. The Bahnstadt is rapidly becoming a highly respected model for the implementation of high sustainability standards in urban development and was honoured with the 2014 Passive House Award in the "Passive House Regions" category. Established on the site of a former freight yard, the area will eventually provide housing for 5,500 people as well as office space for 7,000.

The City of Heidelberg made the Passive House Standard mandatory for the entire Bahnstadt development, making it one of the largest Passive House sites in the world. The 116 hectare district includes a student campus, offices, industry, retail, leisure, housing and associated services, demonstrating the flexibility with which the standard can be applied. It is supplied by a district heating network based on woodchip-fed combined heat and power. As such, the area is net zero in terms of annual carbon emissions – all heating and electricity needs are supplied entirely via renewable sources.

The development has been so well received, the second phase of construction was accelerated by two years. Public and private investment through 2022 has been estimated at € 2 billion. The City of Heidelberg also offers subsidies to aid the ultra-low energy development of the region, for example, by providing € 50 per square metre for residential Passive House buildings – up to a maximum of € 5,000 per unit.

> The City of Frankfurt am Main, Germany

The City of Frankfurt has shown its commitment to climate protection through its integration of the Passive House Standard and renewables in its planning activities. It is currently developing a master plan to reduce greenhouse gas emissions by 95 percent by the year 2050, leading the way to climate neutrality. The plan includes the use of the Passive House Standard in the building sector and stipulates that the city be fully supplied by renewable energy sources by 2050.

Initiated as early as 1991, current building policy consists of two main pillars: the Climate Protection Concept and the Passive House Act.

The Climate Protection Concept covers a wide range of proposed measures for reducing CO_2 emissions, including an integral communication concept relating to climate protection, a quality standard for energy-efficient renovations, capacity building campaigns, and financial support through 'Frankfurt's Passive House Loan'.

The second pillar is the Passive House Act. In 2007, the City Council of Frankfurt decided that all municipal buildings, as well as all buildings belonging to the city's own housing associations must be built to the Passive House Standard. It also stipulates the use of renewables. As of 2014, more than 100,000 m^2 of Passive House floor area have been built in Frankfurt. The municipal housing association, AGB Holding Frankfurt, proudly calls themselves "The Passive House builders" – a tagline that stands as a testament to the city's dedication.

Photos: Riedberg Secondary School | Frankfurt am Am Main | Architects Ackermann+Raff | Germany © Thomas Herrmann

> The Region of Tyrol Austria

The country of Austria has the highest density of Passive House buildings per square kilometre in the world, more so than even Germany and Switzerland. The region of Tyrol in particular has emerged as a frontrunner in recent years: In 1999, the Austrian Federal Ministry of Transport, Innovation and Technology (BMVIT) launched a research and technology programme called "Nachhaltig Wirtschaften" and a sub-programme "Haus der Zukunft". By combining the low-energy solar building approach and the Passive House Standard, promising design concepts have been developed and implemented both for new builds and retrofits.

Nursing home | retreat home | Tyrol | Artec Architekten | Passive House Consultant Herz&Lang GmbH | Austria © Herz&Lang GmbH

The Lodenareal in Innsbruck | architekturwerkstatt din a4, team k2 architekten | Austria © Passive House Institute

The "Tyrolean Energy Strategy 2020" acts as a basis for the region's energy policy. Tyrol cemented the Passive House concept and renewable energies into their strategy for climate protection by means of attractive housing subsidies. In order to achieve Tyrol's ambitious target of energy autonomy within a generation, the policy not only strengthens energy efficiency in buildings but also hydropower, solar energy and energy from biomass.

Large-scale Passive House projects are also playing a particular important role. Neue Heimat Tirol, the region's biggest social housing company, has been instrumental by implementing exemplary Passive House projects that provide quality housing for low-income citizens. The Lodenareal in Innsbruck, for example, comprises 354 flats built to the Passive House Standard and is complemented by renewables in the form of solar collectors and wood pellet boilers.

A Passive House region in the making

[3]

A Passive House region in the making

Carmarthenshire County Council is looking to lead their region to become a sustainable, low carbon community. Hence they want to explore the real world challenges of delivering the future nearly zero energy targets for construction, the impact on supply chains and the potential to create new industries and jobs.

Carmarthenshire in south west Wales is the third largest unitary authority in Wales by area and the fourth by population. There are 3 relatively large towns – Llanelli, Ammanford and Carmarthen (populations 49,500, 23,700 and 15,800 respectively). However, the region is largely rural with much smaller towns and villages. Part of the county also borders the coast and the main industries are agriculture, forestry, fishing and tourism.

Sustainability is a core principle of everything the Welsh Government and subsequently its Local Authorities implement, hence Carmarthenshire Council are keen to deliver high environmental standards across all construction activities in the region. Since 2009, the majority of developments have been required to achieve BREEAM certification to demonstrate their environmental credentials. However, the Council now wish to strive for very low energy in public buildings to set an example for the region and to ensure their own ongoing running costs are manageable now and into the future.

Swiss Valley Reservoir, Llanelli | Wales | © Carmarthenshire County Council

They are therefore looking to the Passive House Standard as a means of achieving this, supported by renewable energy sources wherever feasible. However, at present there are no national or regional financial incentives for developers to strive for such standards in construction. Projects therefore need to demonstrate financial viability without subsidy, generally relying on anticipated running cost savings to justify any additional capital expense required.

Buildings that demonstrate innovation and future-proof performance show what can be practically achieved and offer encouragement to others aspiring to equivalent standards. By combining Passive House principles with renewable energy sources, these projects provide lessons learned and guidance to stimulate wider regional implementation.

[4]

Shining examples

"The pupils, staff and governors are absolutely delighted at the improvements being made to our school and at the prospect of being part of the first Passive House School in Wales."

Alison Williams |
Head Teacher, Burry Port CP School | Carmarthenshire County Council Wales

> Beacon: Wales

Carmarthenshire Council justified piloting the Passivhaus Standard on a new school project in the small coastal village of Burry Port by considering capital investment and lifecycle costs to determine the overall 'cost optimal' solution. This first Passivhaus school in Wales provides manageable and predictable running costs for the Local Authority.

The project demonstrates the feasibility of building to this Standard in a rural setting, thus proving the viability of Passivhaus in almost any location. In more urban situations, wider supply chains offer increased value for money. The school serves as a very important example to assess the benefits of and barriers to energy efficient construction.

The development unites the town's infant and junior schools, accommodating 210 pupils and a nursery class holding up to 30 children. In addition to low running costs, the aim was for the classrooms to offer a comfortable, healthy, well-day-lit environment to enhance the learning experience of the students.

Llanelli Town Centre | Wales

Architype | Burry Port CP School | Wales © Architype

"The new Burry Port CP School design hinges on a 'fabric-first' approach to energy efficiency, meaning the building does the work, rather than relying on bolt-on energy devices."

Andrew Tidy | Architect & Projects Team Leader, Property Services | Carmarthenshire County Council Wales

Burry Port | Wales
© Jez Hewitt Photography

The school takes a 'fabric first' approach to energy efficiency via the Passive House Standard, with quality assurance built in to guarantee performance. The design will maximise 'free' energy from the sun during winter months but also offer shade and nighttime cooling to avoid any need for air conditioning in summer. Although the building will be constructed to eliminate leakage and prevent heat from escaping, there is no risk of the classrooms becoming 'stuffy', since fresh air will be provided throughout the building by a heat-recovering ventilation system. The project will use Welsh timber throughout the structure and cladding, thus supporting local supply chains.

Usable floor area (TFA): 675m^2
Heating Demand: 15 kWh/m^{2}a
Heating Load: 12 W/m^2
Cooling demand: 0 kWh/m^{2}a
Cooling load: 0 W/m^2
Primary Energy Demand: TBC
Airtightness: 0.6 ach (design)
Architect: Architype
Architect's website: www.architype.co.uk
Costs: £ 3.8 million (approx.)

Carmarthenshire County Council want to embrace the Passive House principles on all future Local Authority projects and help develop a local skill base and supply chain for low energy buildings. Leading by example, they hope to gradually improve construction standards and quality across the region.

[5]

Challenges and Opportunities

Carmarthenshire Council

Although the Burry Port school project was still under construction at the time of this publication, a number of lessons learned could already be identified, which will be useful for the region as it aspires to the widespread adoption of nearly zero energy buildings.

Early engagement with designers and consultants was valuable to determine the viability of the project and to give realistic visions of the building layout and costs prior to the scheme being tendered. This involved testing outline designs using the

Tywi River approaching Carmarthen Town | Wales |

Passive House Planning Package design tool and discussions with supplier networks about potential construction options. This helped Carmarthenshire Council make the financial case for the build under their 'Modernising Education Programme' and allowed them to include specific details in their tender documentation relating to the energy standards they required.

The contractor has experienced some difficulties in obtaining a number of competitive quotes when tendering for sub-contract packages. Some companies did not want to take on the anticipated additional risk or simply did not have the necessary skills for the project. Hence some aspects may not truly represent best value and reflect the lack of expertise currently present in the local market. Alternative contracting arrangements based on value, quality and shared risk rather than simply lowest price may help to give more confidence to suppliers to take on such projects, without exaggerated pricing for risk.

The challenges faced by Carmarthenshire Council when developing their low energy school will be relevant UK-wide. A particular issue in the short term is the ability to cost effectively source appropriate Passive House components. While the Council endeavour to support the local economy and manufacturers, product availability is currently limited locally and it is likely they will need to use imported or uncertified products. This will influence competition, value and cost in the short term. However, if large clients become confident enough to regularly set such low energy standards on future developments this should prompt the local market to supply appropriate products, which will have benefit in the long term.

Burry Port Marina | Wales | © Carmarthenshire County Council

Ensuring quality is maintained long term from project to project will be critical to the success of low energy buildings everywhere. Poorly executed examples that are not subject to rigorous quality checks during construction may not perform as expected and can risk the reputation of genuine, successful low energy buildings. Training and awareness raising for all members of the construction team will be necessary to express the importance of quality workmanship on site. However, As Built Certification (whether Passive House Certification or an equivalent national standard if developed in due course) via independent third parties will be vital to ensure design performance is delivered in practice and to act as a quality assurance mark for clients and building owners.

While the Welsh and UK Governments refine and consult on their definition of the EU Nearly Zero Energy Building requirements and its implementation, it is expected that different approaches may be followed. They will inevitably involve a varying mix of building fabric efficiency measures, on site renewable energy sources and potentially off site 'allowable solutions' to offset the development's CO_2 emissions. Although a minimum Fabric Energy Efficiency Standard will be required, it is unlikely to stretch as far as Passive House standard fabric energy performance. However, the Passive House approach with modest renewable energy supplies should always be a viable way of meeting the overall performance target. A balanced approach of fabric efficiency measures and renewables will offer opportunities for product manufacturers to develop new and enhanced products to supply growing local markets. This will help to sustain new and existing jobs in the 'green' economy.

Taking a wider view, there is evidence to suggest that the real estate market (at least in the housing sector) is starting to value low energy buildings. Hence it will be a favourable proposition for developers to build to ultra low energy standards. If lenders can be assured of the energy performance and can therefore consider reduced outgoings in repayment calculations, buyers may be able to secure additional borrowing, thus helping to offset increased build costs that may be passed on to them in the short term.

[6]

The power of cities – how to proceed

The power of cities

Climate protection begins at the local level and reducing energy use in buildings is one of the most important tasks. Many local authorities have therefore taken the initiative in recent years to promote the use of highly efficient Passive House technology.

The introduction of Nearly Zero Energy Buildings in European cities is one of the most important objectives of the PassREg project. Information exchange has taken place between partners from different countries in Europe to fast track learning and knowledge transfer. The aim has been to reduce greenhouse gas emissions and also help local authorities make significant savings, relieving the burden on municipal budgets.

When formulating local efficiency and climate protection objectives, local authorities should not just limit themselves to the fulfilment of national requirements. They can often draft their own, more ambitious, plans. Cities and communities have, in fact, played a leading role with regard to energy efficiency in recent years. Many regions such as Hanover, Heidelberg, and Frankfurt, are already realising Nearly Zero Energy Buildings on a large scale by adopting the Passive House Standard in combination with renewable energy.

In practice, the ten measures described below have proven extremely helpful for improving energy efficiency in the building sector. Even though local framework conditions will obviously influence each individual case, these measures can provide

Case Finali Social Housing | Cesena | Italy © Archefice Associati

guidance for municipalities that wish to reduce their energy consumption sustainably. Cities and communities can therefore not only make a valuable contribution to climate protection, they can also reduce their operating costs and protect themselves from future energy price increases at the same time.

10 measures for effective climate protection in the building sector

1) In order to reduce energy consumption in a sustainable manner, cities and communities can stipulate that new public buildings belonging to the city or local authority will only be built to the Passive House Standard. The additional use of renewable energy may also be required. This can be reinforced by carrying out retrofits with Passive House suitable components.

2) As part of their climate protection efforts, municipalities can decide that land belonging to the local authority will only be sold on the condition that construction will take place according to the Passive House Standard with the integration of renewable energy, or that refurbishment will be carried out using Passive House components. Suitable verification such as preliminary planning with the Passive House Planning Package (PHPP) is highly recommended.

3) For climate-adapted urban master-planning by local authorities, the topographic situation, orientation with relation to the sun, the prevailing wind direction, compactness and shading should be taken into consideration. These points can be supplemented with an appropriate provision of building services and energy supplies.

4) Social Housing companies can make a contribution towards better energy efficiency by constructing new buildings in accordance with the Passive House Standard and modernising their existing building stock using Passive House components, while moving towards the use of renewable energy.

5) Municipalities can encourage citizens to participate in climate protection efforts by initiating financial incentive programmes for energy efficient investments. In this way, private home owners will be motivated to build houses to the Passive House Standard or to retrofit with Passive House components. Incentives for the use of renewable energy should also be encouraged.

6) To ensure that the required standard is actually achieved, cities and local authorities can introduce quality assurance by means of milestone checks. These will ideally consist of approval planning,

implementation planning, a first on-site meeting at the end of the shell construction phase, a second on-site meeting after completion of the airtight building envelope, an inspection upon completion and commissioning, and finally, independent Passive House certification.

7) To promote commitment to energy efficiency at a wider regional level, local authorities can develop, sponsor and implement climate-neutral urban districts as pilot projects based on the Passive House Standard with renewable energy.

8) Municipalities can help instigate wider support activities for stakeholders, including contractors, architects, manufacturers, local authority planning departments, building owners and occupants, etc. These may be in the form of informational events

Student housing | Ergli | Ervins Krauklis | Latvia © Ansis Starks

and training activities to help the industry acquire the necessary knowledge and skills to design, construct, build and use Passive House buildings. The city or municipality may additionally facilitate complementary advisory services for investors before issuing building approvals.

9) Cities and municipalities can reduce their energy consumption even further by developing information campaigns and/or financial incentives to encourage households to upgrade energy intensive equipment with modern, energy efficient appliances and building systems.

10) In order to increase the impact of all these efficiency measures in a targeted manner, it is also beneficial to include information about Passive House buildings and the use of renewable energy in municipal PR concepts. Case studies of buildings in which energy use has been monitored and published can be very motivating.

The PassREg project supported the implementation of such measures and, at the same time, offered participating partners a platform for the exchange of information. The main objective was to raise awareness of the growing significance of energy efficiency measures at the local level with key decision makers in local authorities and municipalities. It is hoped that the push provided by the PassREg project will make a lasting contribution to the reduction of energy consumption across the whole of the European building sector that will continue long beyond the project's end.

Imprint

Coordinator:

Passive House Institute

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www.passivehouse-international.org

www.igpassivhaus-tirol.at

www.passiefhuisplatform.be

www.lvif.gov.lv

www.maisonpassive.be

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Further information

www.passivehouse-international.org

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