**In my previous life I designed and managed the implementation of new retail store spaces, which gave me just the tiniest taste of how rewarding it must be for an architect to see their creation move from a concept on paper or screen all the way through to a fully built end-product. You do get a tangible result that brings a huge sense of achievement. I guess that’s why so many architects prefer to create brand new structures from scratch, and as we saw in our recent video about Passivhaus standards, new builds also offer the opportunity to include the kind of energy efficiencies that will be crucial to a more sustainable future.**

**But there’s another stream of architectural work that’s much less glamorous and arguably far more important from an environmental point of view. And that’s the enormously difficult task of retrofitting existing buildings.**

**According to the website Architecture 2030, existing buildings generate nearly 40% of annual greenhouse gas emissions and about two thirds of the buildings that are standing today will still be there in 2050.**

**So this week I’m having a think about how the architectural and building industry is responding to these big challenges and what the average homeowner can do to create energy savings in their existing property to get themselves moving towards that all important Passive House standard.**

**Hello and welcome to Just Have a Think.**

**I’m sure quite a lot of folks watching this program will, like me, have dreamt of creating their perfect living space at some point in their lives, but not many of us will ever get the opportunity to build our own home from scratch.**

**And of course, there are others who love the home and neighbourhood they’re already living in, and wouldn’t want to move, but who have houses that don’t meet any of the energy certification requirements, and that are costing them a fortune in fuel bills each year.**

**And then there’s the rapidly growing number of people living in rented accommodation and social housing as a result of the societal move towards greater urbanisation and the relentless rise in property prices.**

**The vast majority of those buildings will need to be radically overhauled as part of the global drive towards greater sustainability over the coming decades.**

**So, retrofitting looks set to become a crucial activity, not just for private owner occupiers, but also for landlords and municipal authorities.**

**Retrofitting isn’t just about bolting some add-ons like solar panels to your roof to reduce your electricity bills, although that is an extremely good idea in its own right.**

**No, it’s really predominantly aimed at greatly reducing energy consumption in the first place by significantly improving the fabric of the building itself to increase it’s thermal performance and comfort.**

**The challenge is knowing how far to go and how much comfort and performance any retrofit measures will genuinely deliver.**

**The industry bods have two levels of improvement that they generally refer to. The first is called a shallow retrofit, which is fairly superficial and may only mean bumping up the insulation in your loft and fitting a more efficient boiler.**

**The second level is, unsurprisingly, called a deep retrofit, and it’s a whole different ball game altogether.**

**So how do you know which category your works fall into and what standards are in place to assess them?**

**Well, we already know about the Passivhaus standard, but it’s almost always physically impossible to reach that lofty goal in an already existing building that wasn’t designed that way in the first place, so some allowances have to be made, and those are reflected in a globally recognised refurbishment standard called EnerPHit, and a couple of European spin offs called outPHit and EuroPHit.**

**You see what they did with the PH there? Genius!**

**On existing buildings architects are limited by geometry, orientation and structure. There may also be thermal bridges that are difficult to completely eliminate and that provide a path for heat to escape through gaps in existing insulation.**

**The EnerPHit standard takes all of that into account and sets a lower performance level than Passivhaus, which can be summarised like this**

**The building has to achieve a space heating and cooling demand of twenty-five kilowatt hours per square metre per year, compared to the fifteen kilowatt hours per square metre per year required for Passivhaus certification.**

**It also has to reach an air tightness of one air change per hour instead of zero point six under the Passivhaus standard.**

**And by the way, just to give you a bit of context and perspective on just how shockingly lax the normal building regulations are, at least here in the UK anyway, according to the Chartered Institution of Building Services Engineers, the requirement for a new build home is an air tightness of between five and fifteen air changes per hour!**

**So, deep retrofitting is not easy, and while EnerPHit is not as strict as Passivhaus, it’s still a pretty tough standard to achieve.**

**The first thing to aim for is a high level of internal or external insulation, not just in the walls but also below the ground floor and in the roof spaces. Retrofitters have to calculate very carefully where to install insulation to achieve the best results without causing other consequential problems. That’s trickier than it sounds. For example, if you just stick a bunch of insulation on the interior side of a wall, you might make the room warmer, but you’ll also inevitably make the external wall colder. If that wall is made of a porous material like breezeblocks or some types of brick, then you could be blocking off it’s ability to get rid of moisture, which can result in damp and mould, which you don’t want! So, if an external wall is very exposed to the elements, then internal insulation may not be your best bet, and you’ll have to consider adding a layer of insulation onto the outside surface, which will then typically require a rendered finish.**

**You’ll also need to install high performance triple glazing windows and external doors, and the designers will usually need to consider how they can make significant improvements to the insulation and taping around window and door frames and cavities as part of any new installation.**

**Once you’ve achieved these improvements in the sealing of the building envelope, then just like with Passivhaus design, a mechanical ventilation and heat recovery or MVHR system will need to be installed.**

**You may also be well advised to replace your existing heating system with a ground or air source heat pump, which is something we’ve looked at a couple of times on this channel, and I’ll leave links to those videos in the description box below here.**

**If you are going to take the plunge though, and go through the pain of gutting your home to make these major investments in future proofing, then there’s probably not much point in skimping. The benefit of using the EnerPhit certification as your benchmark is that you’ll be forced to comply with the rigour and quality assurance that the standard demands. That means you’ll likely need to employ an experienced team of designers and builders who know how to carry out the works to ensure that the airtightness performance is achieved and that there are no hidden shortcuts taken at any stage in the process.**

**The EnerPHit certification process is exactly the same as Passivhaus certification. To meet the requirements, the project must be designed using something called the Passive House Planning Package, or PHPP, which is a software-based calculation tool used by architects and planners to assess a buildings heating, cooling and primary energy demands and recommend appropriate levels of remedial works.**

**And the finished project has to be certified by an accredited Passivhaus certifier.**

**The cost of an EnerPHit retrofit will obviously vary greatly from building to building and from country to country, so if you’re thinking of embarking upon a project then you should seek the advice of your local Passivhaus organisation. Fortunately, Passivhaus is now pretty much a global standard so you should have no difficulty getting guidance for your own project, and again I’ll leave links to some of those websites in the description box below.**

**As a very rough rule of thumb though, according to UK Homebuilding and Renovation website, a deep EnerPHit standard retrofit budget will likely be somewhere between eight hundred and a thousand pounds per square metre, with an MVHR unit installation for an average-sized house coming in at about ten thousand pounds, and triple glazed windows and doors costing around four hundred to six hundred pounds per square metre. The bulk of rest of the cost comes from the labour-intensive work to install all the insulations, membranes and intricate tapings around protrusions and junctions that ensure the airtightness measures required to get certification. That work is very time consuming and it has to be done with great care, because much of it is covered up after it’s completed, and you really don’t want remedial works at the end of a project like this.**

**There’s no question it’s a big financial commitment but depending on where you live there may well be grants and incentives available from state or national government. Over in Ireland, for example homeowners can get as much as fifty percent of their retrofit costs subsidised by that country’s Sustainable Energy Authority, and that level of central funding is really something that needs to form part of the green recovery plans in every developed nation in the world.**

**A deep retrofit project can take a building from an Energy Performance Certificate rating as low as F or G, which is basically a damp, leaky shell that’s impossible to keep warm in cold weather, all the way up to an A rated home that comes close to the energy efficiency of a purpose built Passivhaus construction, potentially reducing energy demand by eighty percent and carbon dioxide emissions by ninety percent.**

**People who have gone through the process talk about the transformation in their comfort and health, with a constant year-round ambient temperature within the home and a lovely crisp clean air supply from the ventilation system. All achieved with negligible heating and cooling bills.**

**And once you’ve got your official certification, you will of course have significantly improved the value and marketability of your home.**

**In truth, the world is miles behind where it should be in applying these energy saving measures to domestic and public buildings, but awareness is growing and the EnerPHit standard is gaining traction in many parts of the world.**

**Examples of successful retrofits are easy to find online at websites like Passive House Accelerator, who have an entire section specifically dedicated to case studies from all over North America and the wider world. I’d highly recommend this interview with James Traynor from the Royal Institute of British Architects, who has written a book all about the EnerPHit standard. And of course, there are numerous YouTube videos showcasing successful retrofit projects from the United States, Canada, the UK, Europe and Australia to name just a few.**

**And many local authorities are now also beginning to understand their obligations as part of the Climate Emergency to invest heavily in major improvements to their social housing stock, much of which hasn’t been touched for decades. Some of those buildings have become so badly insulated and leaky that the residents simply can’t afford to pay the huge costs of heating their apartments properly. The consequence of that is a level of persistent cold and damp that in many cases is causing chronic respiratory illnesses in long term tenants.**

**We talk about some pretty amazing technological breakthroughs on this channel, which will no doubt be very important for reaching net zero carbon emissions by 2050. But many of the best solutions don’t rely on fancy new machines or ambitious and unproven geoengineering concepts. They’re right in front of us, hidden in plain sight, as they say. Investing rapidly, efficiently and effectively in our existing buildings and national infrastructures will not only massively drive down greenhouse gas emissions but it’ll also create hundreds of thousands of well paid jobs for at least a generation to come.**

**Now, if you’ve been through a deep retrofit yourself and you have top tips that others could benefit from, or if you have direct experience of working in the Passivhaus and deep retrofit industry, then dive down to the comments section below and leave your thoughts there.**

**That’s it for this week though.**

**This channel would be impossible to maintain without the amazing folks over at the Just Have a Think Patreon page. They enable me to keep the channel completely independent and keep these videos one hundred percent ad-free, and I’m immensely grateful for the support they provide.**

**And I must just give a quick shout out the folks who’ve joined since last time with pledges of ten dollars or more a month.**

**They are**

**Glen Little**

**Ty Haller**

**Shahaf Benita**

**LJ Nissen**

**Andrew Tech**

**Mike Howe**

**Byron Wolfe**

**Rashid Mostafa**

**Stephen Leeb**

**Robert Doxtator**

**Lawrence Kearns**

**Mike Hopkins**

**Mark Fermor**

**Matty C.**

**Andrew Rufener**

**Oliver Reinhard**

**Robert Uttard**

**And Joanne Gailius**

**And of course, a big thank you to everyone else who’s joined since last time too.**

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**As always, thanks very much for watching, have a great week, and remember to Just Have a Think.
See you next week**