DEAP Public Consultation **11th September 2013**

Name of Organisation/Individual Providing Feedback:

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Background/Overview:

I am an architect who deals primarily with self-build natural building projects. Many of my clients want to use local, natural and/or culturally/historically relevant building materials, such as cob (monolithic earth and straw) and straw bale. Increasingly, it is becoming harder to comply with the regulations, in particular Part L, as this type of building can fall outside the narrow parameters set by the Building Regulations and DEAP. For this reason, a significant number of natural builders choose to eschew the regulatory system altogether. This situation does not promote good standards in design and construction. Neither does it further the cause of natural building.

For numerous reasons, many of which will be referred to in this document, natural building is a valid and indeed vital component within the field of sustainable building. Rather than forcing it underground and undermining its merit, the regulations should attempt to address and accommodate it.

1. **Document:** Dwelling Energy Assessment Procedure (DEAP) Version 3.3 draft

   Section/Table No: *General Principles*

   Accredited or Certified Data, p.7

   "Criteria for test certificates by accredited test laboratories".

   Type of Comment: general

Comment Detail (Justification for Change):

When working with cob, it is made on site from the sub-soil from that site. For example, the walls of many cob houses are built solely from the earth excavated to form the foundation trenches and level base below the ground floor slab. When discussing the issue of embodied energy (see No. 6, p.10 - 11 below), there are few (if any) building materials which can match cob's performance under life cycle assessment.

While there has been plenty written about appropriate field tests to determine the nature of the available sub-soil and what modifications may be required to produce a viable building material, no two sites will produce exactly the same end result. In fact, no two batches of cob will be identical. It would therefore be impossible to provide test certificates by accredited test laboratories.

Having visited plenty of historic cob buildings in Ireland through my work, some at least 300 years old and in remarkable condition, I can vouch that it is a rational, enduring method of construction. It is culturally and sustainably relevant as a modern building material and should not be sidelined because it cannot be certified in the same way as more conventional building materials.

Using straw bales as insulation or as structure can also throw up similar issues with test certificate compliance.

Proposed Change by the Reviewer:

A code of practice for rammed earth is available, "*Rammed Earth: Design and Construction Guidelines*" – Peter Walker, Rowland Keable, Joe Martin, Vasilios Maniatidis. There is information available on "the *Characterization of Earthen Materials*" – Hubert Guillaud in the "*Terra Literature Review*". There is also excellent guidance on different forms of earth construction in "Earth *Building: Methods and Materials, Repair and Conservation*" – Laurence Keefe, "*Earth Construction Handbook: The Building Material Earth in Modern Architecture*" – Gernot Minke, *"Earth Construction: A Comprehensive Guide"* – Hugo Houben, Hubert Guillaud and "*Building with Cob*" – Adam Weismann, Katy Bryce, to name but a few.

With regard to straw bale construction, there are numerous codes in Austria, Germany, Canada, certain American states and more.

Rather than having to provide accredited laboratory test results for materials, general compliance with best practice for methods of construction (e.g. acceptable cob mix, straw baled to adequate density) should be allowed.

It would be hoped that the modern trend of absolute reliance on certification would not result in a requirement to send samples (e.g. of each cob mix) to a laboratory for analysis, etc. This goes against the hands-on spirit of natural building and would be cost prohibitive. It is hoped that a commonsense, practical approach would be adopted.

2. **Document:** Dwelling Energy Assessment Procedure (DEAP) Version 3.3 draft

Section/Table No:

General Principles

U-Values – Walls, Floors, Roofs, p.7

"U-Values should be calculated on the basis of the actual construction for new and existing dwellings".

U-Values of Opaque Elements, p.23

"U-value calculations should only use certified data as described here".

"Software packages to perform U-value calculations for different building elements in accordance with the relevant standards above are readily available".

13.2 Building Regulations 2008 and 2011 TGD L Conformance Demonstration, p.47

- *…. The exposed elements of the dwelling fabric are required to meet the constraints detailed in Section 1.3 of Building Regulations 2008 and 2011 TGD L. An average u-value must be met for each type of element. DEAP also checks that no individual section of an element exceeds the maximum u-value for that type of element.*

Type of Comment: general

Comment Detail (Justification for Change):

In "*Natural Building: A Guide to Materials and Techniques*", Tom Woolley states, "*the experience of living in a cob building is that it will have a good level of thermal comfort and perform better than might be predicted from simply assessing the crude U-value*".

Regarding hempcrete (hemp and lime composite), another monolithic form of building, the same book quotes, "*it has been argued by Ralph Carpenter, of Modece Architects, and others, that the U-value is not a good way to assess the thermal performance of this type of material"*, i.e. monolithic construction.

With a relatively high thermal conductivity of approximately 0.393W/mK, cob does not score well with U-values. Yet as Tom Woolley alluded to, there is a prevailing perception that cob buildings are warm and dry to live in without insulating the walls. This is borne out by experience, such as Paul Barclay's house built in Totnes, Devon in 2008 and our own cob house in Co. Sligo, which we moved into in 2010.

Paul super-insulated everything but the cob, which he left completely uninsulated. They have never turned on their underfloor heating. We super-insulated some elements, insulated other elements and left our cob walls uninsulated except for a 30mm hemp-lime render. We do heat the house, but our fuel bills are very small.

When visiting a 150 year old stone cottage with cob end room in Co. Leitrim, the octogenarian owner told me that the cob room was where she slept as a child as it was known as the "warm room".

U-values are calculated under laboratory conditions. They assume a steady state for the temperature on either side of the wall (inside and outside). They also assume a steady, uniform state for the heat transfer through the material in question. The reality is that a steady state does not exist in the real world. Temperatures fluctuate through the day and U-values do not take these changes into account.

Capacitive insulation refers to the ability of thermal mass to slow down or delay the flow of heat. It has virtually no effect when the surrounding environment is in a steady state, i.e. in laboratory conditions. However, once temperatures start to fluctuate, the benefit of capacitive insulation becomes important. In monolithic, massive structures this becomes very important.

While DEAP recognises different grades of thermal mass, this is with a view to the "useful" thermal mass, i.e. that which can contribute heat back into the room. I agree that only the first 75 – 100mm of thermal mass is actually beneficial for this purpose.

However, not only is thermal mass important in affecting thermal performance, thermal inertia or diffusivity is also critical. Experiments by Lime Technology on Tradical Hemcrete show that materials with high thermal inertia are slow to change temperature and slow to reach a steady state of heat transfer. This slows heat transfer down. Concrete has high thermal mass but no thermal inertia and so does not perform as well as materials with high thermal inertia, such as hempcrete and cob.

Comparing hempcrete and mineral wool under a dynamic load, the heat flux through the hempcrete was lower than through the mineral wool, despite the mineral wool having a higher insulation value. In fact, the hempcrete transferred almost 3 times less heat than the steady state model would have estimated ("*Tradical Hemcrete: Thermal Performance Slideshow Presentation*" - Ian Pritchett). In a typical 600mm wide cob wall with a density of 1,450kg/m^3, it will take 8 to 9 hours for a unit of heat to travel through it.

In "*Historic Scotland's Technical Paper 10: U-values and traditional buildings - In situ measurements and their comparisons to calculated values*" Paul Baker studied a number of historic properties, including the 18th Century Logie Schoolhouse which has 600mm wide solid earth.mud walls. The actual U-value measurements were up to 50% better than the software U-values indicated, 0.4 W/m^{2}K on one wall instead of the software predicted 0.7 – 0.8 W/m^{2}K and 0.5 W/m^{2}K on another wall instead of the software predicted 0.8 – 1.0 W/m^{2}K.

So not only are the U-Values inadequate for measuring thermal performance in monolithic, thermally massive materials with high thermal inertia (i.e. the materials outperform the expectation) – the default accepted U-Values are not even correct to begin with.

There is another fundamental flaw when relying on U-values to define the thermal performance of building fabric. I accept that DEAP provides an asset rating and therefore a comparable level playing field for all. However, in reality, there are huge issues with the performance gap, i.e. the actual energy performance of buildings when measured against their calculated performance.

At the Better Building Conference 2013 a number of papers were presented on this issue. Dominic Miles-Shenton repeated the findings of *Hens et al, 2007* and *Doran, 2000*, that heat loss is highly dependent upon the design and installation of the insulation layers. For a semi-detached house at Stamford Brook the predicted total heat loss was 63.8 W/K; the actual total heat loss was 111.8 W/K, +75%. For a mid-terrace house the results were even worse; 75.2 W/K predicted versus 153.4 W/K actual.

Joseph Little quoted a study by Lecompte, 1990 which showed that if a continuous gap of 10mm exists behind insulation, a 3mm gap between insulation batts can result in a degradation of the U-value by 158%. For a 10mm gap, this increases to 193%. He also demonstrated the effect of a 9km/hour wind through 300mm attic insulation, reducing its thermal performance by 35%.

Monolithic materials, such as cob and hempcrete, are by their very nature inherently airtight. Thermal bridges are all but eliminated. There are no layers or junctions between materials to damage or detail incorrectly. Whereas most conventional building materials rarely achieve their claimed U-values in practice (the SERVE project 2010 in Co. Tipperary had an 80% call back rate in the first year), monolithic materials tend to exceed theirs.

It could be argued that a big lump of insulation should be stuck to cob walls to tick the box and achieve the required targets. However, with sustainability in mind, I do not favour using unnecessary (in my view) additional materials just because the limited computer calculation decrees it.

Also , in research done by Professor Jean-Claude Morel, "*A Better Understanding of the Hydrothermal Behaviour of the Rammed Earth to Avoid the Wrong Kind of Earth Conservation Practice in France*", the addition of insulation to the wall increased the moisture content of the wall by almost 300%, from 1.7% to 5% (earth walls will always contain a certain amount of water, this is what helps to bind the material together). So although the insulation was applied to improve the thermal performance of the wall, it also led to an increase in the moisture content of the wall itself, thus reducing the thermal performance of the wall. There may have been a net gain in thermal performance, although the professor did not have pre- and post- in-situ U-value data. However, I still contend that cob walls can be incorporated into an overall whole house approach and good levels of thermal comfort without the need to insulate them or insulate them excessively.

Proposed Change by the Reviewer:

U-values are fundamentally embedded in the system at present and it would be all but impossible to find a quick fix. However, there should be some recognition that they are a flawed way to measure the thermal comfort a material can provide and that some materials suffer more than others. It is frustrating to have to work with U-values that (a) are probably incorrect to begin with and (b) are inadequate for reflecting the actual thermal performance of the material.

Perhaps if calculations for thermal capacity and thermal inertia could also be included, this may help the situation slightly.

3. **Document:** Dwelling Energy Assessment Procedure (DEAP) Version 3.3 draft

   Section/Table No: *Ventilation Rate, p.17*

   "The ventilation rate depends on factors including permeability of materials and inadvertent gaps and openings in the structure".

Type of Comment: general

Comment Detail (Justification for Change):

One of the roles of ventilation is to remove excess moisture from a dwelling. Along with other measures, this helps to prevent condensation, mites, fungal growth, mould, etc. Another role of ventilation is to remove any build-up of toxins such as CO_2.

With regard to excess moisture, many natural building materials are hygroscopic and are excellent at absorbing it, holding on to it and releasing it. This is true of earth, wood, straw bales and hempcrete.

The clay component of earth construction is also hydrophilic; cob walls have a thirst for moisture. Dr. Paul Jaquin is currently carrying out research on earth's capacity for relative humidity buffering (evening out the peaks and troughs of relative humidity in an internal environment throughout the day by containing excess moisture within the material itself) and relative humidity balancing (where moistures transfers from an area high humidity all the way through the material to an area of low humidity). His research, "*Relative Humidity Balancing in Earth Buildings*" already proves that earth building materials can be used to regulate humidity within a building. The magnitudes of these processes, i.e. exactly how much earth is needed to affect change, is now under investigation.

There has been some research carried out into the ability of earth materials to absorb odours and, more significantly, to bind toxins, leading to a reduction in the levels of indoor pollution (source: "*Using Natural Finishes, p.143*" – Adam Weissman, Katy Bryce).

In our own cob house we have a fully breathable mud floor. There is no radon barrier below as it is constructed on the principles of a drained conservation floor. We added an extra network of radon pipes in the below the floor, just in case, and had our house tested. Sligo is considered a high radon county. Of the houses surveyed 21% had levels 200 - 799 Bq/m^3 (action is required over 200 Bq/m^3) 4% had levels over 800 Bq/m^3. The worst case was 5,600 Bq/m^3. We had our house tested and scored 81 Bq/m^3. This is below the national average. There is no way to know if we just happen to live on a low radon site, even though we are at the foot of the Ox Mountains and the rock is relatively close to the surface on the site, or if the fabric of the house itself is actively working for us in removing pollutants from the internal environment.

While research into the ability of natural materials in general, and earth in particular, to regulate humidity and bind toxins is still relatively recent, the potential in relation to ventilation is huge. While the need for ventilation cannot be omitted altogether, the requirements could be significantly reduced as the fabric of the building itself carries out a portion of the work.

Proposed Change by the Reviewer:

There is no change proposed. However, I feel it is important to highlight the future potential of earth as a building material so that it does not disappear as viable construction option due to inappropriate regulation.

4. **Document:** Dwelling Energy Assessment Procedure (DEAP) Version 3.3 draft

   Section/Table No: *7.1 Heating Schedule, p.34*

   "The required (set point) internal temperatures during heating periods are Living Area: 21ºC and Rest of Dwelling: 18ºC".

   Type of Comment: general

Comment Detail (Justification for Change):

For materials capable of regulating relative humidity in an indoor environment, such as cob and hempcrete, these values may not be appropriate. As Tom Woolley states in "*Natural Building: A Guide to Materials and Techniques*", "*The relative humidity of a room will be more important than its temperature and it is often humidity rather than temperature that will affect the occupants' feelings of comfort*". Cob and hempcrete can provide comparable experiences of thermal comfort at lower temperatures than some conventional building materials.

At the Mass Matters Conference in Edinburgh in 2012, Paul Tuohy commented on the inadequacy of relying on air temperatures to measure thermal comfort. He looked at a house where the wall surface as 16 - 18ºC, the window surface was 9.5ºC and the air temperature was 22ºC; the experience of thermal comfort was measured at 18.2ºC. He then looked at a house where the wall surface was 21.4ºC, the window surface was 19.2ºC and the air temperature was 22ºC, the experience of thermal comfort was measured at 21ºC.

Proposed Change by the Reviewer:

For certain materials or construction build-ups, could it be appropriate to design to a lower temperature?

5. **Document:** Dwelling Energy Assessment Procedure (DEAP) Version 3.3 draft

   Section/Table No: *7.3 Internal Heat Capacity, p.34*

   "The position of the insulation affects the internal heat capacity of a construction".

   Type of Comment: general

Comment Detail (Justification for Change):

It should also be noted that the density and capillarity of insulations have a profound effect on how well they work. Comparing EPS with wood fibre insulation, they both have identical thermal conductivity values (0.039 W/mK) and therefore identical U-values. However, the EPS has a density of 20 kg/m^3, while the wood fibre has a density of 55 kg/m^3. Thanks to its increased density and therefore its ability to delay heat transfer, the wood fibre insulation will outperform the EPS in a real life situation.

Comparing wood fibre to mineral wool insulation, the latter has low capillarity. Should it get wet, it is very slow to dry out. Wet insulation does not perform well. In an experiment where a perfectly sealed vapour barrier had a 1mm x 1m tear introduced and so water vapour could enter the structure, the U-value of the insulation deteriorated from 0.3 W/m^2K to 1.44 W/m^2K, almost five times worse (source – Ecological Building Systems). Wood fibre insulation can get wet too, but it is much quicker to dry out and return to its intended performance.

Proposed Change by the Reviewer:

Should there be credits for insulation materials with increased density and capillarity?

6. **Document:** Dwelling Energy Assessment Procedure (DEAP) Version 3.3 draft

Section/Table No: *10.2 Fuel Factors, p.42*

"The primary energy and CO_2 emission factors in Table 8 account for energy used and emissions released at the dwelling, and also take some account of energy used and emissions released in bringing the fuel or other energy carrier to the dwelling. For example, in the case of electricity they account for energy losses and emissions at power stations".

11 Energy, Emissions and Costs, p.46

Primary Energy, p.46

"in kWh/year: This includes delivered energy, plus an allowance for the energy "overhead" incurred in extracting, processing and transporting a fuel or other energy carrier to the dwelling. The generation efficiency of power stations is included".

Carbon Dioxide Emissions, p.46

"in kg CO_2 per year: Emissions are calculated on the basis of primary energy consumption, e.g. emissions at power stations associated with the dwelling's electricity use are included".

13.2 Building Regulations 2008 and 2011 TGD L Conformance Demonstration, p.47

"…..The new dwelling must use a minimum level of renewable technologies…."

Type of Comment: general

Comment Detail (Justification for Change):

The above excerpts indicate the recognition of the importance of factoring in the hidden energy in energy supply. Currently DEAP is only concerned with the operational energy of a dwelling.

DEAP is a direct response to the requirements of EPBD recast. The 20-20-20 EU Policy calls for a 20% reduction in greenhouse gas levels, a 20% reduction in energy consumption and a 20% increase in renewable energy. This is good and proper.

However, it makes no sense to try to achieve this without looking at the embodied energy hidden within the building materials themselves. There have been numerous studies done estimating the amount of embodied energy associated with different dwelling types. In "*Architecture Ireland, V.247, 2010, p.70 -71*" N. O' Loughlin estimated that the embodied carbon associated with an A2-rated semi-d house (floor area 105m²) over 60 years was equivalent to 35.2 years of the operational CO_2. For a 75m² A2-rated apartment over the same time scale, the embodied carbon was equivalent to 28 years of the operational CO_2. Armstrong and Goggins (2012) have measured embodied carbon accounting for 23 – 34% of the total carbon footprint depending on dwelling type.

What is becoming clear is that as the operational energy reduces, the embodied energy is becoming increasingly significant. In work done by Jim Carfrae and Pieter de Wilde on "*The Leechwell Garden House: A Passive Solar Dwelling Built from Renewable Materials*", the embodied energy as a percentage of the total energy attributed to a Passivhaus dwelling is 40%. In the study, he compared the Passivhaus dwelling with a similar straw bale house, with matching annual heat energy values. The embodied energy of the straw bale house was only 5% of the total.

In Life Cycle Assessment, each of these phases are important – raw material extraction, transportation, manufacture of building materials, transportation, construction, operation, maintenance/refurbishment and end of life disposal/recycling. DEAP only deals with the operational aspect, which is not adequate if truly sustainable solutions are to be found.

Many of the natural building materials have tiny embodied energy. In fact, many of them can sequester carbon such as straw bales, timber and hemp-lime. Dwellings may achieve an A1 rating, but be built with every remotely accessed, toxic, highly-processed, disposable (i.e. incapable of being refurbished or repaired) material available.

Getting back to cob, it is sourced on site; it does not get more local than that. It requires virtually no processing to turn it into a building material. We made all the cob for our 130m² house by digger mixing. We used 120 litres of diesel. There was no other processing involved. It is low maintenance in that if it needs to be repaired, the material is right there on site. It is eternally recyclable. We have successfully repaired historic cob walls using the original material. When it comes to final disposal, there is no issue. If unmaintained, particularly if the roof is badly compromised or missing altogether, after a few decades the cob walls will simply vanish back into the earth.

Proposed Change by the Reviewer:

Should there be credits for materials with low or negative embodied energy (sequestration)? *TGD Part L 1.4.2 Heating Appliance Efficiency* requires that the boiler seasonal efficiency should not be less than 90%. However, *1.4.2.2.* allows for a lower seasonal efficiency of only 77% in recognition of the sustainable credentials of a biomass independent boiler.

Should there be a requirement to build using a certain percentage of renewable materials, just as there is requirement to use a minimum amount of renewable technologies.

7. **Document:** Dwelling Energy Assessment Procedure (DEAP) Version 3.3 draft

   Section/Table No: *A3 Dwellings with inadequate heating systems - A3.1 New Dwellings, p.54*

   "The DEAP methodology assumes that a good standard of heating will be achieved throughout the dwelling. For dwellings in which the heating system is not capable of providing the standard, it should be assumed that the additional heating is provided by electric heaters, using the fraction given in Table 7".

   Type of Comment: general

Comment Detail (Justification for Change):

Because of factors such as humidity buffering, reduced ventilation requirements, thermal capacity and thermal inertia, and using dynamic modeling coupled with locally relevant weather data, it may be possible to design heating systems that seem to be inadequate, but in fact, are not.

Proposed Change by the Reviewer:

If data can be supplied to prove that the system has been adequately designed, then it should not be assumed that the additional heat will be provided by electric heaters.

DEAP even recognises itself that the assumptions are not always correct, as outlined below,

> *<u>"A3.3 Highly Insulated Inadequately Heated Small Dwellings, p.57</u>*
>
> *In the case of highly insulated small dwellings, item(2) in A3.2 may not be realistic, for example a 3kW gas fire could suffice to provide most of the heating needs. Accordingly, if the design heat loss is less than 3kW, the heating in the main room is the main system in this case".*

8. **<u>Document:</u>** Dwelling Energy Assessment Procedure (DEAP) Version 3.3 draft

<u>Section/Table No:</u> *<u>Appendix E: Gross Seasonal Efficiency for Gas, Oil or Solid Fuel Room Heaters, p.74</u>*

<u>E1 Efficiency Determination</u>

"Only test results obtained by …. the recognised methods given in …Table E3 may be used to establish a seasonal efficiency for DEAP calculations.

Table E3: Recognised Efficiency Test Method for Solid Room Fuel Heaters".

<u>E2 Declaring the Efficiency of Gas, Oil Room and Solid Fuel Room Heaters, p. 75</u>

"Manufacturers' declarations so calculated should be accompanied by the following form of words and the associated test certificates from an accredited laboratory.

"The gross seasonal efficiency of this appliance has been measured as specified in [insert appropriate entry from Table E1 or Table E2 or Table E3] and the result is [x]%. The gross calorific value of the fuel has been used for this calculation. The test data was certified by [insert name and/or identification of Notified Body]. The efficiency value may be used in the Irish Government's Dwelling Energy Assessment Procedure (DEAP) for energy rating of dwelling".

Table 4a: Heating System Seasonal Efficiency (space and water) - Heating System – Room Heaters - Solid Fuel Room Heaters p.138

"Closed Room Heater – Efficiency 60%, Responsiveness Category 3"

Type of Comment: general

Comment Detail (Justification for Change):

The problem with declaring the efficiency of certain types of heaters commonly incorporated into natural building projects, such as mass masonry stoves (kachelofen) and rocket stoves, is similar to that of providing test certificates for certain common natural building materials.. While some kachelofens are built by specialists, many are built by the self-builder. In almost all cases rocket stoves are built by the self-builder.

The closest thing to a Kachelofen is the closed room heater described above. German companies claim up to 85% efficiency for their stoves.

Proposed Change by the Reviewer:

If it can be demonstrated that the construction of the heating appliance followed best practice methodologies, then it is deemed acceptable. Data for efficiencies of these types of heaters should be added to HARP.

9. **Document:** Dwelling Energy Assessment Procedure (DEAP) Version 3.3 draft

   Section/Table No: *10.9 Renewable and Energy Saving Technologies, p.45*

   "The "energy produced or saved" section allows for the benefits of newer energy-saving technologies that are not yet included in the published DEAP software (including photovoltaics, wind energy, solar space heating amongst others)".

Appendix Q: Special Features and Specific Data, p.104

"This section provides a method to allow the benefits of new energy-saving technologies that are not included in the DEAP software.

This method may only be used for technologies whose characteristics have been recognised as part of DEAP and described on the web page http://www.seai.ie/ber *(or a web page linked to it). In general, a technology may use one form of energy to achieve savings in another form of energy".*

Type of Comment: general

Comment Detail (Justification for Change):

Could this be the mechanism for giving credits to materials with low embodied energy or carbon sequestration properties?

Could this be the mechanism for giving credits for monolithic materials which are proven to outperform their calculated U-values?

Could this the mechanism for giving credits to materials which can buffer and/or balance indoor humidity levels?

Could this be the mechanism for giving credits to materials which can absorb toxins from the indoor environment?

Proposed Change by the Reviewer:

See above.

10. **Document:** Dwelling Energy Assessment Procedure (DEAP) Version 3.3 draft

Section/Table No: *S6.1 U-Values of Walls – Table S3: Exposed U-Values, p. 109*

Type of Comment: editorial

Comment Detail (Justification for Change):

There is no entry for cob. As outlined above, using a U-value for cob is fundamentally flawed. However, it is a common historic building material in Ireland with many more mud-walled buildings coming to light in recent times. There are 1000s all over the country.

Proposed Change by the Reviewer:

U-value for cob, with qualifications, should be supplied.

11. **Document:** Dwelling Energy Assessment Procedure (DEAP) Version 3.3 draft

Section/Table No: *Table S10: Thermal Mass Category Defaults, p.122*

Type of Comment: general

Comment Detail (Justification for Change):

How does one deal with the situation if an upper storey is built of different thermal mass then a lower storey, partitions on the upper floor are lightweight and on the ground floor are heavy, an single- or two-storey extension is built differently to the main house?

Proposed Change by the Reviewer:

Guidance should be supplied.

12. **Document:** Dwelling Energy Assessment Procedure (DEAP) Version 3.3 draft

Section/Table No: *Table 1a: Mean External Temperature [ºC], p.130*

One mean for whole country.

Type of Comment: general

Comment Detail (Justification for Change):

While I accept that DEAP is an asset rating, the reality is that local weather conditions have a big effect on fabric heat loss and design of the heating system. People looking to buy in Cork will only want to compare energy ratings with other properties in Cork. A national mean does not mean that the "level playing field" would be compromised.

Proposed Change by the Reviewer:

Regional mean temperatures should be supplied.

13. **Document:** Dwelling Energy Assessment Procedure (DEAP) Version 3.3 draft

Section/Table No: *Table 12a: Thermal Conductivity of Some Common Building Materials,p. 161*

Type of Comment: editorial

Comment Detail (Justification for Change):

There is no reference to hempcrete or cob. As stated at the outset, natural building is an important and integral part of the sustainable construction sector. If it is to be accepted into the mainstream, natural building materials need to be publicly visible.

Proposed Change by the Reviewer:

Thermal conductivity values, with qualifications to their shortcomings, should be supplied for cob and hempcrete.

14. **Document:** Dwelling Energy Assessment Procedure (DEAP) Version 3.3 draft

    Section/Table No: *Table 12b: Thermal Conductivity of Some Common Insulation Materials, p.162*

    Type of Comment: editorial

Comment Detail (Justification for Change):

There is no reference to hemp-lime, natural insulations such a sheep's wool, hemp or wood fibre. With their low-embodied energy, complex fibres, high capillarity and increased density compared with many manmade insulations, they should be represented in DEAP's data.

Proposed Change by the Reviewer:

Thermal conductivity values, with qualifications to their shortcomings, should be supplied.

15. **Document:** Dwelling Energy Assessment Procedure (DEAP) Version 3.3 draft

    Section/Table No: *p.15 Diagrams of rooms in roof*

    Type of Comment: editorial

Comment Detail (Justification for Change):

It would be helpful to include guidance on rooms not fully within the roof here.

<u>Proposed Change by the Reviewer:</u>

The paragraph below could be copied into p.15.

> *<u>"Rooms Not Fully Within the Roof, p.113</u>*
>
> *Where the upper storey included in the total floor area had walls (other than gable walls) which are exposed, this would not be a room in a roof and would not use the room in a roof approximation. The walls and roofs of this upper storey are entered separately in DEAP. An example of such a scenario would be a "storey and a half" dwelling."*

<u>Conclusion</u>

In his book "*Earth Building*", Laurence Keefe states,

> "*Does ... this, ... with the increasingly onerous thermal performance requirements enshrined in the Building Regulations, signal the imminent demise of centuries-old traditional building methods such as cob, mudwall and clay lump? The answer must be an emphatic 'no'; both new and traditional methods of earth construction must continue to co-exist, for the following reasons:*
>
> - *For the self-builder of for community projects based on the use of volunteer labour, the wet, piled or clay lump methods have much to commend them.*
> - *Also, for someone seeking to build an 'organic' hand-crafted, uniquely individual house, cob or mudwall construction is probably the only answer.*
> - *Finally, and perhaps most importantly, traditional craft skills such as cob and mudwall building need to be kept alive in order to repair and maintain the rich and diverse heritage of surviving earth buildings in Britain."*

The same is true in Ireland. Perhaps one answer is to go the way of New Zealand. They recognised that many natural building materials simply do not work the same way as conventional building materials and that trying to squeeze them into regulations that do not fit was not appropriate. So they devised a new set of building codes specifically for natural buildings. Should we be looking at this too?