The GREAT FIBREGLASS FIB

Fibreglass Fatigue is Costing You Money in Wasted Warmth!

Everything home owners need to know about insulation,

Where HM Government went wrong and what they could

FORCE YOU TO DO

all in one place – HERE!

August 2010

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SUMMARY

On the face of it, the subject of this pioneering e-book might appear abysmally dull.

Scratch the surface and you'll find a fascinating never- been- told- before story of intrigue, incompetence, and ignorance. It offers something that doesn't exist anywhere else.

It is primarily intended for public consumption and for their benefit. Its intention is to provoke a reaction. Politicians and the Media can't afford to ignore it.

The object of this work has been to convey as plainly as possible a very complex chain of events and their consequences. It is based on well researched, published facts and balanced conclusions. Nowhere else will you find all of that information, brought together from many different relevant and authoritative sources, in one place – stated simply!

Nowhere is there a layman's guide. Nothing, whereby the man in the street can easily and quickly understand the process by which politicians pronouncements have credibility and reasoning in the measures which they impose on you and your home.

In weaving together the many strands, a conscious effort was made to try to turn it into an easy and perhaps an enjoyable read without too much effort. For those who wish to delve further into this subject, or cross check these contents, a bibliography is provided at the end.

There is a well established, long held myth that fibreglass insulation keeps homes warm.

There is widespread ignorance at just how ineffective fibreglass insulation can be, has or will become. It's inevitable deterioration is due to the unique microclimate of the loft in which it is placed.

In theory, warm air rising, reaching your loft from inside your home is captured in a tangled mass of expanding voids within a fibrous quilt. The fibres are made from "stretched and springy" molten recycled glass and silica [sand] or mineral wool.

The "open cell" voids temporarily trap air. They are supposed to drastically slow down the rate at which warmth escapes. It may slow it down, but it doesn't stop costly heat escaping.

The same theory applies to a woolly jumper or thermal underwear. It is scientifically proven that still air is the insulator – not the fibreglass.

Fibreglass of itself does ***NOT*** insulate –***FACT!!!*** To say it does is a ***FIB***!!!

Just because it is there, and is visible, does not mean that fibreglass insulation is still doing the job that it was meant to do. If it ever did.

Fibreglass as a material may have a long life. Its effective life is relatively short. In practice, over time, fibreglass fatigue sets in.

Particularly in older dwellings, fibreglass voids progressively collapse. Sooner or later they lose their ability to hold that warm, still air in position. Fibreglass is *NOT* effective if its voids can't do their job. It is only a temporary solution. Just a bit better than a quick fix.

This e-book is for you, Joe Public. It is particularly important to **every home owner of an older dwelling.** Especially if it was built more than 30 years ago and you think your token fibreglass insulation is adequate. In England alone, the UK Government says there are about 15 million of you.

If you think you don't need to do anything - think again!

Think what the UK Government can, and may, be forced to make you do. Whether you like it or not, you *WILL* be affected. **The purpose of this e-book is to save you money by stopping you wasting it**.

It will also enable you to more easily understand your own situation and what HM Government intentions will mean for you, and perhaps, what you *MUST* do in the future.

For that reason this e-book is not punctuated with cross references. Wherever possible, it studiously avoids jargon, global concepts and comparisons, ratios, or references to historical data. They are incomprehensible to the average home owner who is only interested in how those matters affect him or her.

This independently produced work doesn't favour any particular political point of view. It is not pressure group propaganda.

The UK, with 27 million households, has the greatest proportion of older dwellings of any other EU member state. Three quarters of the UK housing stock was built before 1976. One third of all UK CO_2 emissions come from housing. One third of that is through the roof.

Energy efficiency varies widely across the UK housing stock. For 40 years, successive UK governments haven't given it much thought. They have taken for granted that the token gesture of cheap, flimsy, fibreglass laid across the floor of a loft was adequate enough to make sufficient a difference to reduce the country's energy requirements.

It was always thought of as a power generation and imported fuel, balance of payments thing. The questions of global warming, climate change and CO_2 exhaust emissions never entered into it – until now!

10% of all CO_2 emissions are dependent on the condition of domestic loft or roof insulation.

From the ***Kyoto Protocol (1997)*** to the latest ***EU Directive (2010)***, UK environment and energy policy was in the hands of the recently deposed Labour Government. Ministers seemed compelled to be dynamic, excited and enthusiastic to prove that they were doing something purposeful. That they were ahead of the game. That they were amongst the leaders in the EU.

In those 13 years there were prolific progress pronouncements at break neck speed. There was a staggering amount of strategic and policy initiatives and targets. Bureaucracy burgeoned. There was no-one to say "Hang on a minute, let's think this through..."

Perhaps there was too much statistical information for them and their advisors to see clearly what was really going on. Perhaps they just didn't understand it. So much said by Ed Miliband, Secretary of State for Energy and Climate Change, quivered on the cusp of credibility.

Nowhere, did they define what they meant by "insulation". Wrongly, they saw it all as one thing. By default their "insulation" seemed deemed to be fibreglass. It was as if they knew of nothing else. Perhaps they didn't.

They based their policies on figures which were dubious and contradictory. Two reports, ***The Review of the Sustainability of Existing Buildings (2006****) and* ***The UK Low Carbon Transition Plan (2009)*** both relied on data from the ***English Housing Condition Survey 2004 (EHCS).***

Both reports referred to:-

"... 6.5 million homes, *(**one third** of the nation's housing stock with a loft)* lacked <u>adequate</u> insulation..." Inconsistently, ***The Review*** defined that as less than 4" (100mm) and in ***The Plan*** as less than 6"(150mm).”

The subsequent ***English Housing Survey 2008 (EHS)*** - successor to ***EHCS*** - gave a comparable statistic of:-

"... 14.8 million homes *(**two thirds** of the English housing stock)* lacking an <u>adequate</u> thickness of loft insulation..." this time defined as 6"(150mm).

That contrasts with ***Building Regulations (2008*****)** whereby anything less than 10" (270mm) is deemed <u>inadequate</u>. That is where brand new fibreglass insulation should perform far better in NEW homes than that deteriorating in EXISTING older homes.

The two Surveys can't both be right. More likely that they are both wrong. It comes down to the inconsistencies and inadequacies of how loft insulation has been surveyed or assessed.

The ***English Housing Survey (2008)*** procedure specifically required sub-contracted surveyors *NOT* to enter the loft. They were to conduct an incomplete and impractical "head and shoulders" inspection, peeping in from off a step ladder *(Not a joke. Fact!)*. That is both dangerous as well as inadequate. It produced an unreliable answer. They needed to look down on it from above. The view from a submarine periscope sees far less than one from a hovering helicopter.

A similar situation occurs with ***Domestic Energy Assessors (DEAs).*** They are the ones who produce ***Energy Performance Certificates (EPCs).*** They too are instructed *NOT* to enter the loft. Consequently their results are also a matter of guesswork which compound the inaccuracies of their flawed ***RdSAP*** system *(More about that later! Page 43)* which is demonstrably not fit for purpose. Surprisingly, that treats EXISTING older properties as if they were brand NEW. There can be little confidence in the results that they come up with.

To do it correctly, as now required by the new ***EU Directive (2010),*** it requires the assessor/surveyor to enter the roof to make his observations on the actual conditions. Not casual guesswork as at present.

Inevitably ***Energy Performance Certificates*** are, and will continue to be misleading. That is worrying because someone is obliged by Law to pay for that service. The answer is likely to be wrong. The paying customer thinks they are getting the benefit of the experience of a qualified person, when they are not.

The ***DEA*** *(for whom there is no national qualification standard)* is not allowed, by the straitjacket of a system, to use any experience or judgement that he or she may have. They are simply a box ticker, with very limited discretion and little if any choice.

Instead, the customer is given what amounts to a ticket, an ***Energy Performance Certificate***, regurgitated by something akin to a horoscope from a machine in an amusement arcade.

When it becomes common knowledge as to what customers are really paying for, there may eventually be legal repercussions and/or a media outcry.

To comply with ***EU Directive (2002),*** Labour's objectives were:-

"... by 2015, all *(EXISTING)* lofts ... in Great Britain will be insulated where practical."

" ... Even if all NEW housing does become zero carbon by 2016, the energy efficiency of the remainder of the housing stock will still need to be addressed."

"... by 2050 emissions from *(ALL)* homes will need to be zero."

The way, in which they went about it, lacked credibility. Seemingly, with little or no technical knowledge of a subject on which they had kidded themselves that they understood, they hoped that they had kidded everyone else.

Once and improbably, if ever, that over idealistic 2050 scenario is reached, what then? Nobody seems to have addressed that question.

With ongoing misplaced trust in such a short-term solution i.e. fibreglass, and its never ending, wholly impractical topping up, a reliable solution will never be found.

Perhaps no one will ever notice, or care.

The Coalition Government's early knowledge will come from the defective data in the ***English Housing Survey (2008).*** It is based on inconsistent guesswork in an *"(un)representative"* survey sample. **1 in 1,375** completed questionnaires out of **22 million households.**

EHS surveyors were not being paid to pass an opinion, they were simply being asked to tick or put numbers in boxes – and then get paid. That is all the ***RdSAP*** system requires in order to provide the degree of accuracy and reliability promised by Labour's ***Department for Energy and Climate Change (DECC)***.

The "quality" of the ***EHS*** surveyors' answers in respect of the questions relating to an interviewee's loft, has to be seriously questioned. Not because the surveyors are professionally inadequate, but because the questions are.

RDSAP calculations made as a result of the ***EHS*** Questionnaire, cannot produce a conclusion which can be relied upon.

Fundamentally important to any answer about insulation, is a question about what supports or protects it. That has the greatest impact on the microclimate of the loft in which insulation is installed and its subsequent performance. The ***EHS Survey*** has no such question.

The ***EHS*** questionnaire does not ask whether the roof is covered with slates or tiles (plain clay or concrete interlocking). Nor does it ask if the house has been re-roofed recently, or it remains as it was originally constructed. It asks no maintenance questions.

By asking the right questions about the condition of roof covering, felt or other under lining it is possible to better predict the rate of decline of the nation's housing stock. They are always the first to go.

There are no questions about dormers or chalet roofs or other ***Hard to Treat*** styles. Yet disproportionately, there is more to be gained nationally by insulating that troublesome large minority than there is in fractional improvements of the majority. The problem is, it can't be done with fibreglass. The inadequate ***RdSAP*** software knows of nothing else. It cannot provide the right answer.

It is in the national interest to devise a scheme whereby those attractive older dwellings can be brought up to an optimum level of insulation rather than give up on them merely because fibreglass can't do the job.

Surprisingly, the home owner is not asked if he or his predecessors have ever added to the loft insulation (if any) since they moved in. Arguably, that is one of the most important things the ***EHS*** Questionnaire ought to need to know.

The ***RdSAP*** system automatically assumes the default thickness of loft insulation. It refers to the age of the property irrespective of whether or not insulation still exists, or its condition or disposition. That is critical in accurately and reliably determining a dwelling's heat loss.

It is not the age of the house so much as the EFFECTIVENESS of its insulation that matters. Little else does. The failure of the ***EHS*** Survey to properly consider the condition of insulation and its conversion into terms of CO_2 emissions is of enormous strategic significance to any government needing to know where it is on the environmental ladder.

It is not credible. It is laughable!

Using the present ***RdSAP*** software *(RdSAP - working the numbers out Page 43),* the calculated performance of the insulation of EXISTING homes will be grossly over optimistic. It will mirror the Labour Government's figures. They were claimed to be wholly "accurate" and "reliable".

If the Coalition Government and their successors continue to accept distorted figures, they will be deluding themselves that things are better than they really are. Because there is no proper method of knowing or checking what the right answer is, there can be no responsibility or accountability for the end result.

Current practice in recording and calculating the energy efficiency of loft or roof insulation is flawed. It cannot be described as "correct" or "actual". It needs to be changed if it is now to meet the new EU standards ***(EU Directive 2010)***.

What if, in the future, the government of the day suddenly realises *(or a leak to the media, spilling the beans!)* that they have been relying on inaccurate data, which leaves them with a CO_2 deficit rather like the current £ debt deficit?

Owners of allegedly energy INEFFICIENT homes could eventually be penalised via the Council Tax if they don't bring homes up to scratch. Rural areas without natural gas, where homes are reliant on more expensive LPG or oil, could be worst hit.

Pressure could be exerted by power suppliers having their arms twisted by Central Government. Who would bet against a Gas Tax?

Home owners, particularly those with ***Hard to Treat*** *(a bureaucrats term meaning you can't do it with fibreglass!)* cases, could be forced to employ expensive measures such as photovoltaic panels or erect a wind turbine. They would need to generate electricity in order to balance any CO_2 emissions "quota" that might be set. They could be caught in a trap that they can't get out of.

The new ***EU Directive (2010)*** marks the end of fibreglass dominance of the UK domestic insulation market. It sets new criteria by which insulation performance will need to be measured on the troublesome majority of older homes.

If the incoming Coalition Government is to honour the UKs current commitments, then the more stringent methods that they will have to adopt will expose the failings of current practices. It will expose the unwise dependence on fibreglass meeting domestic CO_2 emission targets.

Already on NEW homes, ***Building Regulations*** now require rigorous testing for air tightness. That is the only way in which zero carbon targets will be met on EXISTING homes. As far as they are concerned, only insulation foam can make them as good as NEW. Nothing else can!

NEW dwellings will not replace the existing housing stock quickly enough to meet the outgoing Labour Government's over optimistic zero carbon target for ALL dwellings by 2050.

Where official comparisons have been made, insulation foam is proven to be far superior to fibreglass in every respect. It has successfully been used to insulate and renovate roofs in the UK for 40 years. It is regrettable that it not recognised by the ***RdSAP*** software system.

Arguably, it is the one solution ideally suited to enable the government of the day to progressively meet its CO_2 emissions targets via the cumulative ***EPCs*** collated on the ***DCLG Central Register***. It would also provide correct and actual evidence to support its reporting to the EU authorities in accordance with ***EU Directive 2010***.

This e-book is divided into 5 Chapters. It has been designed so that it can be followed beginning to end as if it were a traditional book, or, depending on your particular interest, it can be read in any order that suits you, .

It is produced as a PDF for you to download at no cost to you. If that is inconvenient, bound paper copies are available for £18.50 by post by calling **0800 9545650**.

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FOREWORD

The NEW

DIRECTIVE 2010/31/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

of 19 May 2010

on the energy performance of buildings

(recast)

(22) " The prospective buyer and tenant of a building or building unit should, in the energy performance certificate, be given **correct** information about the energy performance of the building and practical **advice** on improving such performance. Information campaigns may serve to further encourage owners and tenants to improve the energy performance of their building or building unit. The energy performance certificate should also provide information about the **actual** impact of heating and cooling on the energy needs of the building, on its primary energy consumption and on its carbon dioxide emissions."

AUTHOR NOTE:

The new more highly detailed Directive is 3 times as long as its predecessor in 2002.

The important words here are "correct" and "advice".

Annex 1 of the new EU Directive – common general framework for the calculation of energy performance of buildings – paragraph 3 says:-

"The methodology shall be laid down taking into consideration at least the following aspects;

(a) The following **actual** thermal characteristics of the building.....
(ii) insulation

The important word here is "actual"

Current UK Government methodology fails on each of those three words.....
read on to find out why!

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PREFACE

This white paper is produced as an e-book so that it may be downloaded at no cost or effort. In trying to assist in the flow of reading, certain presentational decisions were made. These are described below.

Some HM Government documentation only concerns itself with England. Some with England and Wales. Where it describes England and English regions, by definition it does not cover Wales, Scotland and Northern Island. Where UK policies are concerned, all countries are included. The different approaches are therefore not directly comparable. As far as possible, an effort has been made to minimise or eliminate confusion.

The term "fibreglass" is used (which is the everyday term most people understand). It is taken to mean glass fibre products however spelled. It includes mineral wool and any associated trade names, any of the other rolled out blanket like materials used as insulation, as well as blown-in or loose fill materials used for that same purpose on a loft floor.

The term "loft" is mostly used throughout simply because it is shorter than attic or roof space and more commonly used, but it refers equally to those words.

The term "home" or "house" is used to cover every type of dwelling, whatever its age, style, tenure or location.

The scientific term "CO_2" is used to mean carbon dioxide and carbon emissions.

In order to assist readability and to avoid the over use of abbreviations *(as some readers may forget what they are)* some text is in bold and some in italics.

Some terms such as NEW and EXISTING are given in capitals to emphasise the differing legal requirements of each.

At the risk of repetition, frequently referred to documents and organisations have often been given their titles in full. Those devices have been used deliberately and consistently as appropriate.

To assist in understanding the chronology, year dates are given in brackets.

In order to emphasise the essential difference between NEW and EXISTING dwellings or construction, those words have been deliberately capitalised for ease of comprehension.

Where the Author has specifically commented on quoted text of others, he has made it clear which are his contributions and not those of the originators.

Where thicknesses or depths of insulation are given, or indeed any other measurement, they are shown thus: - 6" (150mm) - as it is believed that a greater percentage of likely readers will think in those terms, smaller numbers being easier to compare and relate to.

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AUTHOR

Graham Spiers is Managing Director of The Carbon Footprint Insulation Company Limited.

He has spent virtually all of his life in the construction and allied industries. At the age of seven he first assisted his architect father, holding one end of the tape on a house survey. Twenty three years later he designed and built his own house.

His wide experience takes in many facets. He was brought up restoring stonework in stately homes and churches in the West Country, and prestigious new office buildings in the City of London. The next thirty years were spent on large commercial and public authority projects of almost every description. He was the project manager on many of them, from hospitals to houses and schools to skyscrapers.

In the 1970s and 1980s, he pioneered what were in those days, modern management techniques in the construction industry. He was a commissioned contributor to Building magazine in its heyday, as well as Building, Technology & Management. During that time he twice won an award in the annual Ian Murray Leslie Awards scheme for technical journalism in the building industry.

As well as giving occasional talks and presentations to national and other outside bodies on behalf of the Chartered Institute of Building, he wrote and contributed to several works of reference and guides to good practice.

He was presented to HM The Queen and Prince Phillip at St. James Palace in 1984. He was elected a Fellow of the CIOB in 1987.

He has spent the last decade in various aspects of environmental improvement and energy efficiency.

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CHAPTER ONE

INTRODUCTION

Why the Great Fibreglass Fib?

The world is in crisis – so we're told. Governments across the world have been persuaded that the planet has a problem which affects us all. Global warming is causing climate change. Consequences could be catastrophic.

Governments solve problems by passing laws to ensure that their citizens comply with their chosen course of action.

In our case, as is the case with every member state of the European Union, HM Government has to comply with ***EU Directives*** by making UK laws which achieve their objective.

There are two ***EU Directives*** which govern what we do. The first in 2002 represented an initial recognition of the problem. It gave out general instructions. The second, three times as long with more specific wording, came out just three months ago in May 2010. It prompted this piece to be written.

Current UK methodology is flawed. It needs to be changed if it is now to meet new EU standards.

Nowhere, in any of the deposed Labour Government's documentation, did they define what they meant by "insulation". It was all the same to them, when it wasn't. Their credibility has to be in question – which is worrying, because they were the ones leading our response to the threat of climate change.

Their civil servants and cosy quangos will be the same ones advising the incoming Coalition Government. Will anything change?

By default their "insulation" is deemed to be fibreglass as if they know of nothing else. Perhaps they don't.

For 40 years, successive UK governments haven't given it much thought. They have taken it for granted that the token gesture of cheap, flimsy, fibreglass laid across the floor of a loft was adequate enough to make sufficient a difference to reduce the country's energy requirements.

It was always thought of as a power generation and imported fuel balance of payments thing. The questions of global warming, climate change and CO_2 exhaust emissions never entered into it – until now.

The last time anything happened like this was The Clean Air Act 50 years ago.

On all styles, types and age of dwellings 25% - 40% of all heat loss is through the roof.

All fibreglass does, is to temporarily trap warm air, slowing down the rate at which heat is lost. It is the still air that is the good insulator. Moving air, far less so.

Older roofs with excessive ventilation, allow in gusts of wind which suck warm air out through the fibreglass voids. Physicists know this as the Venturi Principle. Even a modest breeze will do it, cancelling out the perceived insulating properties of open cell fibreglass quilt.

Once fibreglass fatigue sets in, it quickly loses its peak performance, in the ever changing micro-climate of the loft of an older house, its ability to maintain those essential voids is diminished. Unless fibreglass quilt is encapsulated and protected, which very little is, its ability to insulate is lost.

80% of domestic central heating systems are fuelled by gas. The real cost of gas has doubled over the last 20 years to 2010. It is expected to keep going up.

This paper does not concern itself with opposing arguments on contentious issues such as the validity of "Global Warming" or nuclear power. Neither does it concern itself with "big picture" calculations, targets and budgets. Nor does it seek to justify nebulous numbers from a spin doctor's prescription pad or claimed or quoted in government or other publications.

Those debates have been driven by political expediency. A response to outside international pressures not to be left out or left behind. In particular, the UK Government under Tony Blair wished to be seen to be amongst the world leaders, if not in the lead, in devising a regime as a model for others to aspire to. Perhaps they were too hasty for their own good.

During its 3 terms in office over 13 years, Blair's government vigorously mobilised the governmental machine to establish the leadership role in saving the planet. It wanted to be the first to have an operational procedure, to enable the UK to be the first, or amongst the first, to achieve the distant targets set by the United Nations for 2050.

There is nothing necessarily wrong with that – but this e-book explains what that means for you. It looks at how we got here. What has been done. What's wrong with it. What we must do differently in the future, if the UK target in respect of domestic heat loss is to be honestly achieved without dodgy dossier deviousness.

The Labour Manifesto for the General Election in 1997 was published earlier in the same year as the ***Kyoto Protocol***, the world's attempt at saving itself from Climate Change.

Labour's bandwagon was overtaken by the first ***European Union Directive in 2002 on the energy performance of buildings***. 40% of all EU energy consumption is down to its buildings.

The fast moving events of recent years caused the EU to rewrite that Directive. They re-published it, as I began writing this, in May 2010. Parts of Paragraph 22 are given as a Foreword to this e-book. It concerns you.

In particular the word "correct" in relation to "..... information about the energy performance of the building and practical advice on improving such performance." That is the starting point for what follows here.

Current UK practice in respect of recording and calculating the energy efficiency of loft or roof insulation is flawed. It cannot be described as "correct" or "actual". Nor can it be described as wholly accurate or reliable as the Labour Government said it was.

"Practical advice" shall be given. To date the UK system has preferred the previous EU term "recommendations". Perhaps this will start a debate about liability. Advice might be associated with telling people what they "should" do. Recommendations might suggest what people "could" do. The whiff of a bewigged barrister beckons.

Annex 1 says –

"... the calculation methodology should take into consideration the "actual" thermal characteristics of the building's insulation."

The UK has the greatest proportion of older dwellings to new than any other EU member state. Current UK practice in respect of loft or roof insulation treats every dwelling, however old it is, as if it were brand new. That is *NOT* "actual"!

It is clear that the present position regarding your home is the brainchild of academics and administrators - them, and others of an institutional mindset, and what turns them on.

In the UK's race against time, so far it seems, there has been little or no considered input from anyone of a first-hand practical background in the narrow, but important, forgotten field of loft insulation. Otherwise there would have been no need for this piece to be written.

To those of us who spend our lives scrambling around other people's lofts or attics, it is no surprise that most home owners don't know what is up there, other than a box of Christmas tree decorations, one or two empty suitcases and things that they haven't seen for years.

Colleagues reckon that no more than 5% go up there more than twice a year. Many have never been up there. Some are even frightened to do so. Some suffer from vertigo at the merest suggestion of a loft ladder or a set of steps.

Probably well over 90% rightly or wrongly believe that they have fibreglass up there. Almost all of them believe that fibreglass ***IS*** insulation. That nothing else ***IS***! Almost all of them haven't a clue as to the state and extent of the alleged fibreglass insulation – even those who actually know it is there.

When asked about the cost of the heating element of their energy bills, many simply don't know, although they grumble. Most just simple accept the status quo, and do nothing.

Structurally, "the roof over your head" is the weakest part of a dwelling. Yet it is the most neglected. The roof itself is often out of sight, unused, taken for granted, until there is a panic. It has many small components – tiles and/or slates, all of which on their own are vulnerable. They occur at the highest point of the house where they feel the full force of the elements.

They are supposed to protect any roofing felt and fibreglass insulation, the least durable components of any dwelling. They are neither rigid nor solid. They are flimsy, flexible and/or fabric. They are an essential part of a delicate micro-climate which makes every loft different.

The incorporation of insulation into buildings is a relatively modern innovation. Evolution is a story of constant change. There is no law that governs when the next phase or development will be. It can be rapid such as electronics and media or as slow as the design and manufacture of domestic doors and ironmongery.

There can be no argument that says that fibreglass is the ultimate solution, or that it will effectively last forever, when another material can be shown to be superior.

Although they don't realise it, Government thinking is at this tipping point. Fibreglass insulation is a Phase One (1965 – 2005) material. It has seen better days.

Due to climate change and the rising cost of energy, future more stringent requirements in Phase Two (2005-2050) will require a much more superior material, one that supports and seals a roof. A vertical rather than a horizontal solution. More versatile, more energy efficient, more durable, insulation foam will have to become much more in evidence.

This paper started out as something that could be written within a few days - at most! In fact it took over 3 months of continuous, painstaking forensic research.

Bamboozled by gobbledygook in a mountain of high handed technical, academic and official jargon, written for the benefit of those who know better than we do, this writer has forensically dissected a subject that was thought to be too clever for the rest of us to understand.

As the writer, hopefully, I have neither misunderstood nor made a mistake, but it is possible that I have. If that is the case, I ask for your tolerance and understanding. If you would like to suggest a correction, or a better way of putting it, then I will be delighted to hear from you so that this e-book can be revised and updated for the greater benefit of others.

As it was researched and written, this e-book has evolved. The end result is a long way from its first draft. It often appears forensically critical. That was not the original intention. Anything taken as criticism is meant to be constructive, born out of frustration.

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WHAT HM GOVERNMENT COULD FORCE YOU TO DO

The concept of cumulative CO_2 emissions is difficult for most people to grasp. They like things they can see or imagine.

The Labour Government flagship ***The UK Low Carbon Transition Plan*** relied on data from the ***English Housing Condition Survey (2004).*** Its findings were significantly different to those of its successor the ***English Housing Survey (2008***). Because of their methodologies, neither of them is totally believable.

For policy making, the ***EHS Survey (2008)*** will be the Coalition Government's latest source of information on the condition and energy efficiency of housing in England. ***EHS*** data is collated at the ***Department for Communities and Local Government (DCLG) Central Register***. It is supposed to build up a statistically accurate and reliable representative "picture" of all types of housing and their ownership.

As far as loft insulation goes, the ***English Housing Survey*** or whoever interprets their information, will have made the mistake of applying rough ***RdSAP*** values *(RdSAP - working the numbers out Page 43)* of NEW fibreglass insulation to EXISTING homes. Mature fibre-glass insulation will not match its performance when new. Insulation performance of EXISTING homes will be grossly overstated. Government figures hopelessly over optimistic.

They are more likely to depict the best case scenario rather than the actual facts. Remember they relate to England alone. For simplicity, because this is a very complex subject, what the comparable figures are for Scotland, Northern Ireland and Wales is not considered here *(with respectful apologies)*. Government figures show that they add up to 5 million households.

The ***EHS Survey*** physical inspections which produce those figures are based in part on inconsistent guesswork in an *"(un)representative"* survey sample of **1 in 1,375** completed questionnaires out of **22 million households**.

No-one has suggested what the margin of error might be, as they would for example in an opinion poll. It might be embarrassing. The figures put forward by the Labour Government, where error compounded error, are hopelessly hypothetical.

Inevitably assumptions and approximations will have been made. Homes of a certain age will be assumed to have similar insulation characteristics. Real experience indicates that that is far from the case.

It is one thing to claim that such methodology, impressive as it is, will produce "statistical" accuracy and reliability. It is quite another thing to know that it achieves actual accuracy and reliability as required by the latest ***EU Directive (2010).***

Nowhere in this research is there any indication of how the global community will "police" each country's carbon emission (CO_2) performance against "target". Are we in for another uranium enrichment fiasco like Iraq and Iran? How is carbon trading going to work? Or is it all a big game? Or is there some ulterior motive?

Over the next 40 years, the Government machine believes statistically, on average, that every home will be sold once every 12 years. By law an ***Energy Performance Certificate (EPC)*** has to be lodged with the Government's ***DCLG Central Register*** for every house on the market, whether it sells or not. The Land Registry will monitor sales that take place.

By then they should have an ***EPC*** on file for almost all of the nation's housing stock. In theory, if it was done properly, *(not like it is now)* they will be able to model any improvements in insulation. That would then provide them with the credibility their claims currently lack.

As the ***Central Register*** file gradually grows, periodically they would be able to analyse trends with greater confidence than now, to see if other measures are needed.

Local authorities are known to have "snooped" on residents for other purposes. To have employed heat seeking camera vans to detect excessive heat loss from homes. There is nothing to prevent the Orwellian state from finding out what it wants to know. There is nothing to stop them making you conform.

If the Coalition Government and their successors continue to accept distorted figures, then we will be deluding ourselves that things are better than they really are. That is fine, as long as no-one finds out. If they do, there could be urgent pressures on home owners to catch up.

Initially, invasive inspectors going into every home is unlikely. Questions could be asked on Council Tax returns. If answers are not forthcoming and/or wrongly given, because they can be checked against the ***Central Register***, sanctions could be applied.

Owners of allegedly energy INEFFICIENT homes could be penalised via the Council Tax if they don't bring homes up to scratch. Rural areas without natural gas, where homes are reliant on more expensive LPG or oil, could be worst hit.

Pressure could be exerted by power suppliers having their arms twisted by Central Government. Who would bet against a Gas Tax? Home owners, particularly those with ***Hard to Treat*** *(a bureaucrats term meaning you can't do it with fibreglass!)* cases, could be forced to employ photovoltaic panels or wind turbines to generate electricity to compensate for CO_2 emission "quotas" that might be set.

For all that, it is difficult to see how legislation could be enforced on such an ill defined subject unless local authority officials were given entry and search powers and very specific guidelines. Thanks to Government's over reliance on fibreglass, lawyers might do well!
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HOW DOES FIBREGLASS INSULATE – or does it?

Fibreglass Fatigue is Costing You Money in Wasted Warmth!

Fibreglass of itself does ***NOT*** insulate –***FACT!!!*** To say it does is a ***FIB***!!!

There is a well established, long held myth that fibreglass insulation keeps homes warm.

In theory, rising warm air reaching your loft from inside your home is captured in a tangled mass of voids by its quilt of expanding fibres. They are made from "stretched and springy" molten recycled glass and silica [sand] or mineral wool.

The "open cell" voids temporarily trap air. They are supposed to drastically slow down the rate at which warmth escapes. It may slow it down, but it does *NOT* stop costly heat escaping.

The same theory applies to a woolly jumper or thermal underwear. It is scientifically proven that still air is the insulator – *NOT* the fibreglass.

Still air, when captive, is a good insulator. That ***IS*** a scientific fact! So the more still air that can be trapped ***permanently***, the better the insulation effect will be. Insulation is not a "thing", it is a consequence – a result or effect.

Fibreglass is only a good material for insulating so long as it maintains its voids in peak condition in a controlled environment. That is where the fibres are expanded to their full potential, and air is not "encouraged" to unevenly flow through or around it.

That optimum condition is what is created in a laboratory. Carefully controlled scientific tests establish insulation properties called U-values to compare them with other alternatives.

Whether it is the roof of a new dwelling, or one from the reign of Queen Victoria or before, none of them can replicate the environment of a testing laboratory.

The choice of insulation methodology based on comparative laboratory results, is not the same as comparing like with like in terms of the environment where the material will be used.

Whether by design, such as the influence of ***Building Regulations*** on new dwellings, or by default – because you can't prevent it – roof spaces are ventilated deliberately. The UK is a windy island. Gusts and eddies around all buildings are everyday occurrences. Hills and valleys and the pattern and proximity of nearby buildings intensify the effect.

The beneficial wind that is allowed into a roof to prevent condensation has the adverse effect of sucking warm air out from the fibreglass quilt. Physicists know this as the Venturi Principle. Even a modest breeze will do it, cancelling out all perceived insulating properties. History has failed to recognise this.

The draught can be felt. Even well fitted modern synthetic roof under lining membranes in brand new houses cannot prevent the inevitable windblown dust and fine debris finding its way into the atmosphere of a roof space. It varies in severity from place to place and depends on aspect and elevation. That is why modern roof trusses on NEW homes are designed by computer to suit the wind load of the postcode where they are to be fitted.

Exposed new brick and blockwork gradually dries out. It sheds particles over time. Bit by bit, speck by speck, a grey haze crust clings and settles over the top of uncovered fibreglass. It weighs down the uppermost fine filamentous fibres like frozen snow on the branches of a tree. Unlike snow, the ever gathering dust does not melt. It thickens and clogs, choking the voids from re-opening to their full potential.

In practice, over time, fibreglass fatigue sets in. Voids progressively collapse. Sooner or later they lose their ability to hold that air in position. Fibreglass is *NOT* effective if its voids can't do their job. The lightweight self weight of fibreglass quilt gradually causes further irreversible sagging with age. Air voids inevitably depress. Costly heat is wasted.

Roof spaces are penetrated by pipework, electric cables and light fittings and the access hatch as well as intended ventilation points. With time, here and there, ill fitting overlaps in roofing felt under linings and gaps emerge.

Rising warm air from within, below, and moist cold air from outside, pervades the roof space atmosphere. It potentially causes sweating and condensation on the underside of the roof lining, suffering from the wind chill factor on its outer face.

Moisture drops onto the uncovered, greying, tired fibreglass quilt below. It adds to the superimposed load like a damp towel. As the process repeats continuously, the fibres find it difficult to recover to the point that fatigue eventually overcomes them. They turn into a mat.

It is ironical that the more efficient the fibreglass blanket is, in retaining heat, the colder becomes the under surface of the roof above it. The risk of condensation is greater as warm moist air still circulates within the roof space. The deterioration of the fibreglass blanket becomes accelerated. The efficiency of the insulation is increasingly impaired.

Older roofs built with an under roof lining, between 1930 and 1980 will by now be experiencing marked deterioration, if not significant failure of the lining fabric, or roofing felt as it is generically described. Of all structural building components, roofing felt is the only one that is neither rigid nor solid. It is the "weakest link".

A historic and unnecessary obsession with over-ventilating roof timbers causes the roofing felt fabric to oscillate as the wind sucks and blows it like a sail. It strains at the nails which hold it in position. It suffers extremes of temperature, from near boiling to bitter cold. Eventually it becomes exhausted and fragile. Once a small tear appears in the increasingly brittle material, the wind will make it bigger, to the point where it will dangle down, like a stalactite, over the fibreglass below.

Fibreglass insulation (which is said to have been invented in the USA in 1938) was not required on new dwellings in the UK until the late 1960s, early 1970s when a 2" (50mm) layer soon became typical above bedroom ceilings.

Earlier homes had no such requirement, in which case their fibreglass quilt will have been introduced later. Any rain seepage will have dripped onto the saturated grey crusted unprotected fibreglass, which by then will have lost virtually all of its insulating properties.

By that time energy bills will have been spent heating the sky.

Victorian and Edwardian dwellings can roughly be categorised as 1830 – 1930. The early years of this period saw the beginnings of formalisation of consistent design detailing. That was assisted by further and more frequent travel by architects using the early railway network.

A greater awareness arose of the problems associated with buildings and the methods to be adopted to avoid them. Roofing felt and fibreglass insulation were not to exist for another 100 years. Many of those buildings, and those much older, still survive in excellent condition, where it is not uncommon for many modern buildings to be demolished or re-developed after a few decades.

One reason for this is the "better safe than sorry" approach to specification, design and workmanship. Then, tradesmen were craftsmen with a pride in their work. Things were "built to last". Labour and materials were plentiful and cheap.

Roof timbers were very sturdy with an "overkill" philosophy in their sizing. In those days, they didn't know much about processes for treating timber or computerised design of roof trusses. Heavy slate (mostly from North Wales) was the roofing material of choice, except where in particular locations they had their own traditional supplies of natural stone or fired clay.

Transportation by ship and/or canal was often the influencing factor which was steadily replaced by rail.

Slate and clay tile roof coverings were well lapped and firmly fixed. They were backed by "torching", a generous stiff mortar fillet along each batten to seal out any wind or rain that managed to beat the first line of defence. It is only in recent years, since the advent of central heating, making the air drier, that that mortar has finally lost its "life" and crumbled onto any fibreglass laid down since the 1970s.

As with many things, the benefits of hindsight put original actions and intentions into perspective. Our forefathers used materials and components that time had taught them were durable. If only our generation had have realised 50 years ago that fibreglass, whilst durable as a material, was relatively short lived in effectiveness, then we would have been better placed to counter the newly perceived threat of climate change.

In terms of evolution, fibreglass as a material has had its day. It has got to the end of a phase. Phase One ended at 2005.

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LEARN WHAT EVERYONE NEEDS TO KNOW

ABOUT FIBREGLASS INSULATION

There's far more to it than what you might think!

Fibreglass quilt can best be described as a Phase One insulating material. Phase One may be said to cover the period 1965 – 2005 between fundamental revisions of ***Building Regulations***.

40 years ago, long before "climate change" had been heard of, a relatively novel material, fibreglass insulation, first came in under ***Building Regulations 1965.*** It only applied to proposed NEW buildings. It did *NOT* apply to EXISTING buildings.

By then, all NEW buildings were constructed with a felt lining under roofing tiles and slates. This offered some protection to the fibreglass quilt below, spread between bedroom ceiling joists across the floor of the roof space.

The 1970s required 2"(50mm) depth of fibreglass quilt in NEW homes. Whilst slowing down the rate at which heat was lost from below, it still allowed the warm air to get to the roofing felt preventing it from becoming a cold surface. Condensation forming on the underside of the roofing felt was thus discouraged by the inefficiency of fibreglass.

Its use in EXISTING homes probably would not have caught on for many years but for the ever escalating cost of heating fuel.

There never was a great enthusiasm for the idea in the first place. It just drifted into the nations psyche in an haphazard sort of way as an optional extra, "something we ought to do..." on the basis that someone else had done it. Neighbour copied neighbour.

The idea grew through word of mouth, advertisements, the media, but especially with the growth of large DIY superstores. It became a sort of wet Bank Holiday job as B&Q had an Offer on. It was cheap and easily available. Husbands got brownie points.

In stuffy, sweaty, dark, windowless attics of EXISTING homes, with a bit of care, suffering the discomfort of itchy skin, nose and ear bunging fibres, home owners could do it themselves. It was perceived as cost effective. But because it was a rotten job to have to do, there was no apparent incentive to make a good job of it. It was just sufficient to say that you had done it. No-one knew how bad a job had been made of it. They still don't!!!

In those days, in EXISTING older homes, there was neither compulsion nor government incentive. When it was first introduced, there seems to have been no recognition that it wouldn't last. There still isn't.

No-one seems to have had the courage or care to question its long term cost effectiveness. Successive governments have become locked into a habit that no-one seems to know how to break.

In those days, after 50 and more years of wars, economic depression and rationing, there was no concept of built-in obsolescence. Things were made to last and expected to last. Every component of a new building was expected to be durable.

It might have been reasonable to expect that it would not have gained Building Control Approval if it wasn't. It was a sort of quality assessment.

Today, largely due to the initiatives of the Labour Government, there are conditional government grants and financial inducements from power providers. In their anxiety to be seen to be doing something to satisfy their social conscience, fibreglass was dispensed like free prescriptions. It would not have occurred to them to consider the consequences of creating condensation problems later on.

No-one, then or since, has ever publicised in a form suitable for the lay general public to absorb, the implications of using fibreglass quilt in unsuitable conditions. This is probably the first.

Until ***Building Regulations*** required it to be more than 4" (100mm) thick in NEW homes, its use in all lofts was perfectly sensible, providing it could be protected from dust, debris and damp, and wasn't disturbed or used as a cushion for suitcases, boxes of this and that and other things long forgotten.

If fitted properly, and maintained in a clean dry condition without disturbance, protected between the 4" (100mm) nom. joists above the bedroom ceiling below, and protected from above by a taught unperforated roof underlining, such as might be found in a newly built house, then fibreglass quilt gives good value for money in its early years.

It is cheap, but its benefits are temporary. It deteriorates. Even its most ardent supporters will accept that it needs a periodic "top up". Just the sort of putting-it-off job that no-one ever gets round to doing. It can never permanently maintain the function that it was once meant to perform.

There is widespread ignorance at how ineffective fibreglass insulation can be, or has become, due to its inevitable deterioration over time.

"Having insulation" is something that house sellers needed to say they had. It became socially respectable. Providing a house buyer's surveyor could see pink or orange stuff in the roof space, that was all that was necessary. Even when the fibreglass was sagging and sad, covered in a grey crust, it was taken for granted that the house still had "some" insulation, even if it wasn't doing any good at all.

Modern construction design and practice owes its historical preferences and prejudices to the Victorian era of massive expansion and innovation. Architectural, engineering, surveying and building professions all originated from about 1820.

In the days when the disease malaria got its name from the French words for "bad air", rather than mosquito bites, the Victorians were obsessed with "fashionable" fresh air and its perceived health benefits.

Soap and detergent tycoon Lord Leverhulme *(Unilever founder)* regularly slept on the roof of his coastal home in Port Sunlight on the Wirral, exposed to howling gales and blizzards from the nearby Atlantic. Whatever he died of, it wasn't pneumonia!

Queen Victoria and Prince Albert bought Balmoral in Scotland, "...for the purity if its air". It is reputedly one of the coldest spots in the UK. It reminded Albert of his native Germany.

Historically, Bye-laws and Building ***Regulations*** required lofts to be ventilated. The evolution of preventative timber treatments over the last century and their compulsory use in structural timbers makes roof space ventilation now questionable to the degree that it is still taken.

The Victorians were not over bothered about insulation because they didn't know what it was. They were more concerned that structural timber was allowed to "breathe". Hence the over abundance of air bricks, whose use spread like a plague "... so the air could get at it."

It was a long held view by traditionalists that external brick walls had to have air bricks so that the wind could whistle in and around the dividing cavity so reaching the ends of timber joists so that they did not rot. To them, fibreglass insulation would have been an alien concept.

Unlike localised Victorian Bye-laws, modern ***Building Regulations*** is a national standard, "one size fits all". It tends to work on a worst case scenario plus a safety factor – snow loading being but one example. Colchester on the dry east coast is treated the same as Carlisle on the wet and windy west coast. Nippy Northumberland is treated the same as the tepid Thames Valley.

It is perhaps surprising in this computer age, that when software copes with this by designing roof trusses by the postcode of where they will be fitted, that a greater subtlety is not used in the field of insulation and heat loss calculations.

Older properties from Victorian and Edwardian times up until the late 1930s did not have roofing felt under lining. Nor did they tend to have cavity walls. Roof coverings were predominantly natural slate and otherwise plain clay tiles. Interlocking concrete tiles came later.

To safeguard against wind-blown water ingress, and to reduce the wind effects through gaps and butt joints, mortar fillets known as "torching" were applied along every batten all across the roof. This had a strengthening effect and resisted the tendency of slates and plain tiles to wriggle and rattle. The intended air circulation was provided by open eaves.

The Victorians weren't stupid. Far from it. But they were incredibly blinkered in their belief in the invincibility of the Empire. It would never have occurred to them that following the carnage of two World Wars, that the cheap, conscientious labour necessary to one day renew the torching would either not be available, or that it would be at a prohibitive cost.

By the time cheap fibreglass had caught the public imagination in the 1970s, torching in older roofs had become stale in various stages of crumbling. Early roofing felt was showing signs of fatigue, ripping and coming away and hanging down, exposing the backs of tiles and slates.

With increasing openings to blow through, the influence of the wind whipping up dust and grit presented a problem for the fibreglass quilt below. The increased wind circulation in some situations tended to disproportionately chill the underside of the roof. That encouraged the formation of condensation from the rising warm air from below as central heating became increasingly commonplace.

The effective consequence of such a draughty roof space (that even Victorian ventilation might have considered excessive) is that all sorts of dust and dried out mortar debris is blown around. It nestles in the dampening, sagging, fibreglass quilt, progressively weighing the fibres down into a decaying grey mass with little or no insulating properties.

It seems never to have occurred to anybody that every loft has its own microclimate**.** They are all different in one way or another. It is almost as if it needs a Charles Darwin to recognise it.

Because hardly anyone ever goes into a loft to study it for its own sake, and certainly not as a scientific explorer motivated by his own curiosity, its environmental characteristics have never been documented.

From outside above, it suffers extreme temperature ranges from way below freezing to getting on for boiling point. Solar gain in summer, and internal rising heat, in spite of any insulation that may be there, can make it an unbearable place to be.

Winds, from howling gale to gentle breeze, both cold and damp, find deliberate and unintended ventilation holes, cracks and gaps. Roof members can flex and creak. Roofing felt can breathe in and out like lungs.

Dust and grit will swirl about like a mini sandstorm on a beach. Insulation lifts up and gets displaced. Loose fill polystyrene balls and other blown insulation materials soon pile up in a protected corner, out of the way of where it is most needed.

All of which is unseen to the occupants of the living accommodation below. Watching their favourite TV programme, they are oblivious to it all. As indeed are those who conduct surveys and fill in questionnaires on their fleeting visit.

Fibreglass is available as either a flexible quilt or as rigid slabs called batts.

From manufacture, flimsy, floppy, fibreglass quilt is factory compressed into rolls, tightly wrapped for ease of distribution.

In domestic roof construction, it is unrolled and laid horizontally between the joists above bedroom plasterboard ceilings. As it is unrolled, it springs back to its uncompressed thickness.

Where the horizontal distance between joists is greater than the width of the roll, uninsulated gaps occur. Depending on any difference between the vertical depth of the joists and the expanded depth of the quilt, further uninsulated voids are introduced.

Fibreglass is a difficult and unpleasant material to work with. Where not encapsulated in plastic wrapping, fibres readily detach themselves and pollute the air. They cause itching to exposed skin and irritation to eyes, nasal and ear passages. The fibres can cause or exaggerate breathing difficulties.

Installing fibreglass is a physical process which has Health & Safety requirements which must be followed. Often this is a token gesture. The average DIY exponent takes unreasonable risks.

Fibreglass quilt is practically difficult to satisfactorily install in a roof space where the head-room reduces towards the outside wall. That is where the roof pitch is less than 45˚.

It is particularly impractical and difficult where roofs have a pitch of 30˚ or less and/or there is an accumulation of timber roof members getting in the way. That provides a disincentive to do the job properly in the often unpleasant conditions encountered.

Because of the awkwardness, potentially, the result is even more uninsulated voids along both sides of the roof space.

Fibreglass quilt has to be torn and fitted around pipework where it enters the roof space from below. That is typical above bathroom areas in houses and kitchens in bungalows. There is no practical way that the quilt can make an effective seal against rising damp warm air from below.

Fibreglass quilt cannot easily or neatly be cut without releasing into the local atmosphere a volume of potentially harmful fibres. More often than not for practical purposes, it is "torn" apart by hand, which releases even more fibres.

Fibreglass quilt cannot be joined together with another piece. It can only butt up to, or overlap its neighbour. Inevitably uninsulated gaps and voids will be introduced.

Fibreglass quilt can be laid over the top of ceiling joists. The advantage is that it minimises the amount of cutting and fitting and reduces the volume of escaping fibres. The disadvantages are that "pattern staining" will gradually emerge on the ceiling surface below showing the lines of the ceiling joists across the bedroom.

That is caused because of the uninsulated void causing a surface temperature difference on the exposed ceiling surface below. It attracts an uneven distribution of minute house dust particles on either side of the joist.

Fibreglass quilt is virtually impossible to use above a loft hatch, which is difficult to insulate effectively, whichever way it is done. The virtually uninsulated hatch has to have a gap all round in order for it to open.

Traditionally, in a house, the hatch is placed on a landing just above or near a staircase from below. Hot air rises. The hatch effectively acts as a chimney allowing the roof space to fill with warm air, bypassing the defending fibreglass whatever its thickness or condition.

An inefficiently insulated loft hatch can make multi-layered fibreglass insulation significantly ineffective.

Fibreglass quilt is flimsy. Over the course of time, electricians and plumbers kick it about, and don't replace it properly, when it gets in their way doing essential roof space repairs and maintenance. Unthinking family members bung things in the roof space, Christmas tree decorations, suitcases and long since used childrens' toys, all piled carelessly on top of the fibreglass. No-one gives it a thought.

Fibreglass quilt only achieves its "effectiveness" when it is allowed to expand unimpeded. Any object, even the lightest, placed on top of it, out of the way, will compress it making it progressively ineffective.

In post 1965 housing, it is highly likely that by now, original ***Building Regulation*** requirements will have been negated. It is almost impossible to properly check this. Little if any, motivation to do so.

There is an unavoidable dichotomy between keeping ventilation passages open and the impracticality of precisely installing 10" (270mm) deep fibreglass quilt at the same time as preventing gaps for heat to escape through.

Phase Two (as described in this e-book from 2005) takes the evolution of domestic insulation a stage further. There is now a significant increase in the importance and duty that roof level insulation must provide if climate change targets are to be met.

The latest revision of ***Building Regulations (2008)*** which applies to proposed NEW dwellings requires 10" (270mm) of fibreglass insulation laid between and/or across ceiling joists. 5 times the original depth 30 years ago.

Theoretically, the more fibreglass insulation is applied across the floor of a roof space, the more successful it will be in slowing vertical heat loss. In so doing, the underside of the sloping roof surfaces and/or the felt or fabric under lining will be allowed to become colder.

The more cold it becomes, it encourages condensation on its under surface when it reaches the critical dew point. The escaping warm air condenses upon it. Condensation causes droplets of water to fall on the fine filamentous fibres of the quilt which then becomes "sad" or sags. Eventually it finds it impossible to regain its expanded state. It becomes self defeating. Part of a vicious circle.

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CHAPTER TWO

THE WAKE UP CALL

It probably all began about 1952. The USA had just detonated the first Hydrogen bomb. After 2 World Wars, concerns over man's effect on the planet had become a global issue.

By the time of the Coronation in 1953, the UK TV audience had exploded to 20 million. A 50 fold increase over the previous 5 years. For the first time there was widespread spontaneous awareness of what was going on outside of our immediate surroundings.

Viewers from the West Country to Westmorland were there in the pea soup London Smog when 20,000 died. They were there after the Lynton and Lynmouth deluge. The North Sea hurricane which caused a flooding disaster affecting the East Coast as well as Holland and Belgium killing 2,400, was almost on their doorstep.

The first BBC TV weather forecast began in 1954. The British obsession with the weather made it compulsive viewing.

Greater public awareness of the environment was heightened as industry and commerce got into full swing after the War. Increasing numbers of polluting road vehicles, steam trains, coal fired factory chimneys, domestic coal fires had all contributed to a series of local "smogs". They were most notably in the largest cities, especially London.

After 200 years of coal power, the need to legislate nationally to control air pollution led to The Clean Air Act (1956). It was a widespread reform with extensive implications for the built environment.

Cleaner, smokeless fuels became the norm. The debate about Climate Change had begun.

Domestic gas fired central heating became increasingly widespread across all of society. Houses were built without chimneys. The working man had a Morris Minor. His mate had a Ford Popular.

In 1957, Prime Minister Harold Macmillan painted a rosy picture of the booming UK economy. He urged wage restraint and warned against inflation, "...a state of prosperity such as we have never had in my lifetime – nor indeed in the history of this country. Most of our people have never had it so good".

For over 800 years, and certainly ever since the days of the Great Fire of London in 1666 and similar tragedies such as The Plague, Black Death, Smallpox etc in the ever expanding towns and cities, those in authority had tried to address their concerns about issues of the day in local Bye Laws or other suitable instruments .

After World War II, Attlee's reforming Labour government brought in massive change. The Welfare State, nationalisation of strategic industries, the NHS, new towns, social housing and public buildings, all created development on an unprecedented scale.

There was an urgent need for national consistency in its publicly funded building stock. It exposed the inadequacies of the local Bye Law system. There became a need to reflect the national government's long term strategic concerns on the built environment and energy supply. It took 20 years.

From 1965, the new style national ***Building Regulations*** for England & Wales (Scotland, Northern Ireland and London had their own versions) would go way beyond parochial interests. For the first time, it would give overall control to Parliament.

Before the Industrial Revolution, the economy was based on agriculture – the organic economy. The energy needs then were simple, cyclically sustainable. The sun and the rain grew crops which replaced themselves, as did trees if managed properly. Livestock replaced itself, as did people.

The Industrial Revolution needed coal, which although plentiful, had a finite supply. Coal had been mined since Roman times. Transportation over long distance was its biggest problem. Coal near the north east Tyne, Tees and Wear ports was the easiest to extract and transport by ship to other east coast ports and London. The earliest railways developed from the nearby Durham coalfields.

It was that distribution evolution across Victorian England from 1820 that fuelled the industrialisation that followed. The inland coal carrying canals gradually became obsolete.

By the 1950s, at its peak, the National Coal Board (NCB) employed 750,000 across the country. After 4 centuries of extraction, an increasing number of pits became either worked out, uneconomic or unsafe.

With the prospect of lost jobs, the Miners Union, perceiving they had the country in a stranglehold, became increasingly militant, demanding more money and better conditions.

From 1959, the writing was on the wall when large quantities of natural gas were found across the North Sea in Holland. Geologists knew what was to come. In 1965 gas was discovered in British waters off East Anglia. Ten years later oil was to follow.

This was to completely change the UK Government's perspective.

However, oil and gas, like coal is a finite resource. With cheap subsidised coal from abroad, British coal and its miners, like the canals, had had their day.

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PHASE ONE

FORTY YEARS OF FIBREGLASS

1965 - 2005

From 1965, the standards and rules that had to be met were the latest edition of ***Building Regulations***. New dwellings or major alterations remained under local authority control.

The ***1965 Building Regulations*** introduced the first limits on the amount of energy that could be lost through certain elements of the fabric of new homes.

It was expressed as a U-value. It stood for the amount of heat lost for each degree of temperature difference between inside and out. It is worked out from the thermal conductivity verified by scientific tests on unused new materials in laboratory controlled conditions. The lower the U-value, the better the insulator, the less heat was lost.

It was those results which specifiers and building inspectors relied on. In all aspects of NEW home design, they influenced which method was most suitable for any particular purpose.

Fibreglass *(which is the everyday term most people understand*) was first commercially developed in the USA during World War II. It was a very versatile modern material. It had a multitude of uses. It was mass produced for insulation purposes from about 1940.

By the 1960s it had become commonplace in the "dry" timber framed and clad homes in the extreme climates of North America. Unlike the UK, their use of "wet" bricks and mortar, slates and roofing tiles is far less common.

Fibreglass was a relatively new material. It was far removed from the comfortably familiar, tried and tested, in the traditionally conservative UK building industry. It became a key component in some of the now discredited designs of architects of that period. They were trying to develop a new style of their own, particularly in social regeneration.

In the 40 years since then, many of those "...ticky, tacky little boxes which all looked just the same..." from Pete Seeger's song of that time, have become maintenance nightmares. Integral design failings have led to premature disintegration, decay and demolition.

The newly introduced ***1965 Building Regulations*** had been an ideal way to introduce an insulation initiative which formally applied only to NEW buildings and extensions.

One layer of ½" (12mm) deep fibreglass insulation was specified over ceiling joists above upper floor ceilings. In the next edition 10 years later, that was to be quadrupled to 2" (50mm). 2" was generally used prematurely as it was easier to handle without disintegrating.

With increasing car ownership, there was a strong demand for new housing on the outskirts of towns and cities. People were only just beginning to be able to get mortgages. Speed of build became critical. A few pioneering house builders such as McLean and Calverley adopted Canadian factory prefabricated timber framed techniques in standard house types.

Fibreglass could easily be encapsulated, protected from moisture and dirt in a "dry" form of construction which could quickly be erected in all weathers. That is how it had developed in the extreme climates of North America, and had been proven over many years.

But here the tale takes a new twist. So far, it has dealt with the regulations concerning newly built homes. At that time, it was only a tiny fraction of the nation's housing stock.

What about EXISTING homes, many of them quite old? ***1965 Building Regulations*** didn't apply to them.

There was little, if any "official" guidance. There is no evidence anywhere (as of 2010) of anyone ever researching into the comparative U-value of aged, abused fibreglass quilt in unsuitable surroundings. The contrast between laboratory and loft.

Perhaps it needed 40 years for the penny to drop. Maybe some enterprising undergraduate might make a name for him or herself by taking this as their thesis.

During the turbulent decade of economic crises between 1966 and 1976, the UK was progressively converted from town gas to natural gas. It prompted a central heating boom. As a result, there was a natural motivation to install cheap fibreglass insulation. Just like they had in new houses. It was something you could tell your family and friends.

The rapid rise of innovative DIY store B&Q, with their "pile it high, sell it cheap" philosophy, saw their business grow from their first store in Southampton in 1969 to national dominance within a few short years. However helpful their staff might have been in assisting the general public, they could not fill the "laboratory to loft" knowledge gap vacated by the slow to react ***Building Research Establishment (BRE)***.

Rolls of fibreglass insulation were easy to get, cheap to buy. They came with the perceived promise that they would pay for themselves, many times over.

In the excitement, few realised that the environment of a cold, draughty, damp and dusty attic in an older house was less conducive to the sensitivities of fragile fibreglass filamentous quilt than they perhaps thought. No-one knew any different, and to this day, most still don't – or don't want to.

Building Regulations rules were tightened in 1973, following the Middle East Oil Crisis allied to the Yom Kippur War. The subsequent Stock Market crash came as Arab members of OPEC flexed their muscles causing a widespread Recession in industrialised countries.

This was especially felt in the UK not yet benefitting from North Sea oil. There was widespread industrial action. Petrol rationing was introduced. A 3 day week was declared. In a crisis of confidence General Election, Edward Heath's Conservative Government was defeated in 1974.

The industrial action of the powerful coal mining unions 1984-5 resulted in the infamous year long Miners Strike. Their defeat by Heath's successor, Margaret Thatcher, was to result in the privatisation of that industry 10 years later. Generated energy was becoming increasingly expensive, imported oil was politically uncertain.

Although domestic insulation standards had been increasing, so was the standard of heating appliances and installations. In 1970 only 31% of homes had central heating. 30 years later it was to be well over 91%. The average internal temperature went up by 50%, as a "soft" post war generation shed a few layers of clothing, which their parents wouldn't have dreamed of doing. "Ne'er cast a clout till May is out...." as grandma used to say.

By 1990, a significant majority of the global scientific community had concluded that their overwhelming evidence told them that the world's temperature was gradually increasing. They believed that it was due to CO_2 emissions created by escalating industrialisation and living standards in western style societies.

Carefully selected "blinkered" video footage on the world's TV screens was "proof". Doom monger disciples of Nostradamus took it as a sign that the world was about to end. Others took the view that the new phrase "climate change" was a natural evolutionary cycle.

Scientists and politicians concluded that the consequences of failing to take urgent action would be catastrophic for everyone. Not everyone agreed. There were many vested interests. It became a game of poker. This was big politics!

"The environment" presented itself as the one great worthy cause that could unite the member states of the European Union. It had no historical hang ups. It disadvantaged no-one. It benefited everyone. It became their corporate crusade. All could play a part for the common good. For once, everyone was on the same side. Pecking order was another thing.

("All animals are equal, but some are more equal than others" - George Orwell, Animal Farm)

In the April 1992 General Election, John Major led the Conservatives to a fourth consecutive election victory. They won the most votes in British electoral history. But their House of Commons majority was reduced.

Six months later, on what is known as Black Wednesday, the UK was forced to come out of the European Exchange Rate Mechanism. It was seen as a national disaster. It triggered a severe Recession. The newly elected Government had to take defensive action from which it would never recover.

Amongst many other decisions, they had to rethink the UK's energy strategy. They had made an earlier commitment at the ***1992 UN (Rio Summit) Conference on Environment and Development***.

They had promised to improve the energy efficiency requirements of the ***Building Regulations***. It would promote better energy efficiency in the domestic sector. It would save householders money.

As a result the ***Building Research Establishment (BRE***) developed the ***Standard Assessment Procedure (SAP)***

"... as a tool to help deliver the UK Government's energy efficiency policies."

"...Its ***(SAP)*** purpose is to provide accurate and reliable assessments of dwelling energy performances that are needed to underpin a number of key energy and environmental policy initiatives."

"... represents a significant challenge in terms of accurately and robustly assessing the performance of low-energy dwellings.

It is therefore essential to ensure the compliance assessment tools are able to accurately reflect the actual performance of zero carbon and low energy homes....DECC is therefore minded to review....all aspects of the SAP to determine its long term suitability to deliver the policy initiative...

...The underpinning information...and other relevant data that the assessment tools rely upon must also be produced to a high level of accuracy and reliability."

It is important to remember those words "accurate" and "reliable", as well as new words of "correct" and "actual" and "advice" brought into the latest EU Directive (2010).

Current UK Government methodology fails on each of them.....

In 1996 the EU Council of Ministers decided on their ***Community Strategy on Climate Change.*** This was to be adopted across the EU. The UK was no exception.

Soon after, in the 1997 General Election, the Conservative Government was humiliated. Tony Blair's New Labour Party won by an unprecedented landslide. Later that year Labour signed the ***Kyoto Protocol (1997).***

Each country was to take action to mitigate the effects of what was to become known, amongst other terms, as man-made Global Warming.

The UK's **Climate Change Programme (2000)** was launched following the earlier commitment at the 1992 Rio Summit. Of the 7 stated strategies, 2 of them are most relevant to us here:-

- ✓ **Promote better energy efficiency in the domestic sector, saving householders money**

- ✓ **Improve the energy efficiency requirements of the *Building Regulations*.**

The original ***EU Directive on the energy performance of buildings (2002)*** laid down an innovative set of elementary requirements. Each member state had to become more responsible in their usage of resources. They had to become more accountable. They would have to demonstrate how they did things.

One such innovation was to be the introduction of ***Energy Performance Certificates (EPCs)*** in respect of existing dwellings***.*** Each Government then had to take measures to make sure that happened.

Someone, somehow, worked out that in 2004 the UK was the world's 8th greatest producer of man-made CO_2 emissions. About a third was blamed on housing.

The Select Committee on Environmental Audit projected that that proportion could rise to well over half by 2050, unless something was done.

The Labour Government produced a consultation paper ***Building a Greener Future: Towards Zero Carbon Development***. It suggested a further 25% improvement in the energy/carbon performance.

Phased increments should lead to a zero carbon requirement in 2016 applied to *ALL* home energy use. That would harmonise ***Building Regulations*** with the ***Code for Sustainable Homes*** by that year.

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PHASE TWO

THE NEXT FORTY FIVE YEARS – THE BEGINNING

2005 - 2010

Labour Government (before May 2010) strategy for dealing with climate change and energy efficiency

In 1997, the Climate Change debate took hold. Tony Blair's State centric New Labour Party came into power with a huge majority.

Always anxious to be seen as a reforming pathfinder, Blair followed a Top – Down approach. This then, with the benefit of hindsight, is a Bottom – Up response. It is to be hoped, someone might take note.

For the first time, under the **UK Climate Change Programme (2000)**, CO_2 emissions needed to be cut to achieve legally set targets.

Today, the ***Department of Energy and Climate Change (DECC)*** is responsible for all aspects of UK energy policy, and for tackling global climate change.

The Secretary of State is duty bound to ensure that the UK meets all its targets for the energy efficiency and CO_2 emissions of residential accommodation. That would enable the UK to become a low-carbon economy by 2050. An intermediate target had to be met by 2020.

Ministers have powers to set greenhouse gas reduction targets. An independent **Committee on Climate Change** has been created to advise them.

Currently, the ***Department for Communities and Local Government (DCLG)*** has a large and varied responsibility for overseeing the implementation of Climate Change strategy.

That includes Planning, Building and the Environment; Housing; Sustainability; Research & Statistics. It administers ***Building Regulations***; ***Energy Performance Certificates (EPCs)*** and the ***English Housing Survey (EHS).*** It liaises with bodies such as the ***Building Research Establishment (BRE)***.

As required by the ***EU Directive (2002),*** a simplified and less costly version of ***SAP2005,*** known as ***Reduced Data Standard Assessment Procedure (RdSAP),*** was conceived. That was to provide numerical and other statistical values necessary for the completion of each ***EPC***.

In 2005, the ***Federation of Authorised Energy Rating Assessors (FAERO)***, essentially a small group of specialist software program writers, who had developed earlier work by the ***Building Research Establishment*** (***BRE)***, finalised ***RdSAP***,

In that endeavour they were advised by, amongst others, the ***Energy Efficiency Partnership for Homes.*** There were a well meaning array of 500 firms and others, satisfying any number of vested interests. Their Insulation Strategy Group was dominated by representatives of fibreglass firms of one sort or another.

2006 was an important milestone in this story. Many things happened.

The then Chancellor of the Exchequer, Gordon Brown, announced the Government's 'ambition' that all NEW homes will be built to be airtight with no CO_2 emissions by 2016. Sceptics shook their heads. This *WAS* the building industry after all!

In 2006 ***Building Regulation***s rules were further tightened (1976, 1985, 1990). At some point or other, they will have specified a depth of fibreglass insulation which will have required it to come above the top of bedroom ceiling joists.

This, then and now, presents a home owner with a dilemma. If they wish to "board" their loft for storage or any other useful purpose, they will be unable to meet ever increasing fibreglass depth requirements.

Do they abandon their plans? Or do they tackle the problem another way? It is an important decision. See ***Chapter 5 Making your loft useful Page 77*** to find the solution.

2006 saw the most innovative changes ever in the 40 years history of the ***Building Regulations***.

They were extended to incorporate some of the clauses of the ***EU Directive (2002/91/EC)*** which required energy in existing and new buildings to be measured. The long term aim was to incrementally cut overall emissions (including housing) by 60% by 2050.

Building Regulations Part L. Conservation of fuel and power has 2 parts relating to dwellings.

L1A deals with proposed NEW dwellings in conjunction with Approved ***Document L1*** which is supported by a set of 'robust' construction details, now known as ***"Accredited Construction Details".*** It was a new concept of tried and tested details. They focused on ways of limiting air leakage and thermal bridging in new construction.

For the first time ever, it gives approved methods of how roofs can be constructed or altered without having the need for ventilation. It breaks an age old tradition. A new way of thinking began to emerge.

The focus was on cutting energy use in NEW housing by 20% compared to 2002 standards. Again the sceptics shook their heads and drew breath.

Another innovation was the Governments 'ambition' - a world first - that any failure to curb CO_2 emissions could be offset by the self generation of electricity. The surplus could be returned to the National Grid. Photovoltaic panels and small wind turbines entered the mix.

L1B deals with EXISTING dwellings subject to building control procedures.

With its greater proportion of older properties, the UK housing stock was recognised as being one of the least energy efficient in the whole European Union.

A Survey for the ***Energy Saving Trust*** revealed that Building Control Officers considered energy efficiency 'a low priority'. Few would take any action over failure to comply. They thought it 'seemed trivial'. They were still grappling with the latest version of The ***Standard Assessment Procedure (SAP2005),*** HM Government's preferred method for measuring the energy rating of dwellings.

In simple terms, ***SAP*** works out an answer to the question "How much heat will this proposed building lose?" Amongst other things, it calculates likely annual energy costs for heating living spaces and CO_2 emissions.

A simplified version known as ***Reduced Data Standard Assessment Procedure (RdSAP)*** was to be used in ***Energy Performance Certificates (EPCs***). That is on EXISTING dwellings when they were put up for sale from 2008. It is that which is of prime interest here. ***RdSAP*** used the same data as for NEW construction, but less of it. It did not have "different data" which would have been more appropriate.

In NEW construction, the historically favoured, theoretical U-value, the measurement of thermal conductivity of a single material, such as fibreglass insulation, was largely replaced by the innovative "mix n' match" ***Dwelling Carbon Dioxide Emission Rate (DER).*** *[U-values were to remain for surveys of* existing *dwellings].*

DER **does not apply** to installing or upgrading insulation in EXISTING dwellings, unless major alterations or extensions are proposed. In that case it becomes compulsory to upgrade the energy efficiency of the whole house to as if it was new.

In 2006 the ***Department for Communities and Local Government (DCLG)*** published their ***Code for Sustainable Homes***.

2006 also saw ***The Review of the Sustainability of Existing Buildings***. It was based on ***English House Condition Survey (EHCS) 2004*** (*data kindly provided by* ***DCLG*** *- Author).*

2007 was to be a difficult year for those in the well established Labour Government. It still had a big majority. There was to be much in-fighting as Gordon Brown schemed to finally take over from Tony Blair.

The original ***EU Directive (2002),*** 5 years before called for:-

"... A common approach to this ***(Energy Performance Certificate)*** process. It is to be carried out by qualified and/or accredited experts, whose independence is to be guaranteed..."

The Quality Assured Energy Rating industry was of the view that that needed an industry wide body to regulate those carrying out ***SAP*** and ***RdSAP*** calculations.

A new breed of "qualified" technical surveyor was born – ***The Domestic Energy Assessor (DEA)***.

The small, (now defunct) ***FAERO*** group, who for some time had worked closely with Margaret Beckett's ***Department for Environment, Food and Rural Affairs (Defra)***, were in agreement. So too was ***The Office of the Deputy Prime Minister (ODPM)*** John Prescott. They persuaded ***FAERO*** to set up a single not-for-profit company. That would enable other suitable businesses to join, to set and maintain standards governing the energy rating of dwellings.

Faero Ltd was incorporated in February 2006 to gain approval as a Competent Persons ***(DEA)*** scheme. That was to give them 2 years before the deadline for ***EPCs*** to come into being at the beginning of 2008. Unfortunately, there was no legislation which allowed the specific recognition of ***DEAs*** who would in due course create ***Energy Performance Certificates (EPCs)***.

There was confusion and delay. In the May 2006 reshuffle of Tony Blair's government***,*** which was to be his last, ***The Office of the Deputy Prime Minister (ODPM)*** had been renamed. Ruth Kelly became the first Secretary of State over the ***Department for Communities and Local Government (DCLG).***

On ***DEAs*** the ***DCLG*** did an about turn. They no longer saw eye to eye with ***Defra***. Margaret Beckett was replaced by David Miliband. He claimed that only a third of the English housing stock with a loft, lacked an adequate thickness of loft insulation, defined as 4"(100mm). As you will see elsewhere, this writer questions that.

Faero Ltd's relationship with ***DCLG*** had become increasingly frustrated. The Department continued to contradict itself. It failed to formalise agreements which had previously been reached.

Faero Ltd's Competent Persons ***(DEA)*** scheme had already been formally recognised and designated in ***Building Regulations*** Approved Document L1A *(for NEW construction only - Author).*

It became increasingly obvious that ***DCLG*** did not want to recognise a disciplined competency as had been perceived from the ***EU Directive (2002)***. Instead

"... the Government chose to approve and monitor individual accreditation schemes itself..." *(which is totally opposite to what it intended 18 months before – Author).*

When Gordon Brown became Prime Minister in June 2007, David Miliband was replaced by Hilary Benn as head of ***Defra***. Ruth Kelly was replaced by Hazel Blears at ***DCLG***.

The passing of the ***Energy Performance of Buildings (Certificates and Inspections)(England and Wales) Regulations 2007*** effectively pulled the plug on ***Faero Ltd'***s aspirations.

At last, just in time, ***DEAs*** gained their legitimacy under

".. accredited schemes approved by the ***DCLG*** Secretary of State.".

Faero Ltd's frustration finally boiled over. The chaotic introduction of ***Home Information Packs (HIPs)*** and ***EPCs*** had been subjected to delays and reduced requirements. They became mandatory for homes with 4 or more bedrooms from 1 August 2007. They were universally unpopular.

Faero Ltd could see no point in carrying on. They ceased trading. In September 2007 ***Faero Ltd***'s Chief Executive issued a well publicised Press Statement.

"... Frankly, I have doubts that the Government has the expertise or resources to ensure that accreditation schemes work to consistent quality standards. And if the accuracy of ***EPC'***s ever starts being compromised, this will be hugely damaging to the industry and to consumer confidence.

... You also have to ask whether it is appropriate or sustainable for the cost of this regulation to be met by the tax payer..... the effective regulation of ***Energy Performance Certificates*** will depend directly on ***DCLG*** officials. They will have the unenviable task of trying to ensure consistency of quality across all the different schemes."

As of August 2010 there are a number of ***Domestic Energy Assessor*** (***DEA)*** accreditation bodies. It is presumed that ***DCLG*** has satisfied itself on matters of consistency. Their position may be at odds with the ***EU Directive (2010)***.

As a result of the belated implementation of the Housing Act 2004, the little loved and much derided ***Home Information Packs (HIPs)*** stuttered into being from August to October. It was a fiasco. No-one took them seriously. They were to be discontinued 3 years later by the incoming Coalition Government.

The only part that had to be kept was ***Energy Performance Certificates (EPCs)***. They had to be part of any house sale in accordance with ***EU Directive 2002.***

EPCs were to demonstrate to prospective buyers the energy efficiency of their proposed purchase. They were reliant on the novel ***Reduced data Standard Assessment Procedure (RdSAPs).*** That did not finally materialise until some months later in January 2008.

As part of his expense, the home owner wishing to sell his home was obliged by law to pay for an ***EPC*** survey. It was designed not to benefit him, but someone else, the potential purchaser.

The buyer's advisors and funding providers tended to take no notice of it. But because a copy had to be lodged centrally, the Government gained valuable free data! Perhaps that was the real idea all along.

The supposedly independent, professional "recommendations" given on an ***EPC*** were not given by a "qualified" ***DEA*** at all. He merely ticked boxes. That triggered a computer generated standard response from a very short list of potential answers.

In many respects, it was like getting a joke from a Christmas cracker.

Also in 2007, ***DCLG*** published ***Energy efficiency requirements for NEW dwellings***. This provided a forward look as to what standards might be in 2010 up to 2016. Also at that time they also published a Green (discussion and comments) Paper ***Homes for the future: more affordable more sustainable***.

In 2007, in line with ***The Sustainable & Secure Buildings Act 2004***, ***DCLG*** commissioned ***BRE*** to establish Key Performance Indicators (KPIs) to monitor and forecast the rate at which households would carry out certain home improvements. One of them was loft insulation.

Using what normal people might call guesswork, in forecasting the next 2 years:-

"... between 2004 and 2006, it can be expected that approximately 522,000 households in England <u>& Wales</u> will acquire loft insulation".

There was no helpful indication as to how customers were going to use it. There was no estimate of insulation thickness or type (presumed fibreglass). Whether or not it was to "top up". It is difficult to comprehend the purpose of this hairy fairy study. But the free market research must have given reassuring confidence to B&Q.

In October 2008, the climate team at ***Defra*** was merged with the energy team from the ***Department for Business Enterprise and Regulatory Reform (BERR)*** to create the ***Department of Energy and Climate Change (DECC).*** It was headed by Ed Miliband, younger brother of David.

DECC source ***Energy Trends 2008*** said that heating homes accounted for 57% of domestic energy use. Source ***National Communication (2007)*** found that domestic heating and hot water accounted for 13% of the UK's total greenhouse gases emissions.

With widespread support, after 2 decades of well reported debate, both within the EU and across the world, Parliament finally passed into Law ***The Climate Change Act 2008***.

In 2009, Ed Miliband, Secretary of State of Energy and Climate Change produced HM Government's comprehensive national strategy for climate and energy. ***The UK Low Carbon Transition Plan (The Plan)*** covered a whole range of issues.

In comparison with his brother David's pronouncement just 2 years before, Ed Miliband came out with - two thirds of the English housing stock with a loft lacked an adequate thickness of loft insulation – only he got the defined thickness wrong. He said it was 6"(150mm).

If we are to believe what their brotherly figures were telling us, within a 3 year period, that far from increasing the amount of insulation in EXISTING homes, it had been halved. It is probable that they were both wrong.

If a direct comparison is made using 4"(100mm) thickness or less, whether adequate or inadequate, David had 6,518 million out of 21,813 million. Ed had 5,381 million out of 22,239 million. David had 30%. Ed had 24%. On those figures over a 3 year period, houses with that thickness of insulation had decreased by 20%.

It is not a matter of poking fun at the Milibands. The glaring discrepancies can easily be put down to the inadequacies and inconsistencies of surveys and assessments. Both specifically require those gathering that data *NOT* to enter the loft. They are left with guesswork, and it shows. It is ridiculous! Surely we deserve better than that!

The UK Low Carbon Transition Plan was published a year before the Labour Government were ousted in mid 2010.

As at August 2010, the incoming Coalition of Conservatives and Liberal Democrats, with their different emphases have yet to resolve the detail of their compromise programme. It will come within the limitations of the Spending Review expected in the autumn 2010.

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The basis of The Coalition Government (after June 2010) energy efficiency statistics relating to the insulation of roofs and lofts of existing dwellings

The Conservative - Liberal Democrat Coalition was formed following the indecisive General Election of 2010.

Labour lost their majority. It left a hung parliament. The first for nearly 40 years. Whilst broadly in agreement, as individual parties, with the Labour Government's strategy on climate change, inevitably there were policy differences between the Coalition partners. They mostly concerned types of energy provision. They said little on domestic energy conservation.

Chris Huhne (Liberal Democrat) became Secretary of State for Energy and Climate Change in succession to Labour's Ed Miliband.

In general terms, Huhne's first Annual Energy Statement in July 2010 echoed the situation left by his predecessor. It was made clear that a thorough appraisal had to be made of the enormous debt mountain discovered after Labour left office. Until then nothing could be decided.

Whatever happens, the Coalition will work from the latest figures provided by the ***English Housing Survey (EHS2008)*** and on-going returns from the Central Register of ***Energy Performance Certificates***.

They need to scrutinise those figures first. They need to ask important questions. Perhaps this e-book might be a good starting point.

The Coalition have to decide what to do about Labour's far reaching environmental commitments. To do that they have to quickly get up to speed on the avalanche of Labour strategies and policies.

The Coalition Government need to wake up to the fact that their advisory bodies such as the ***Energy Saving Trust***, the power companies and other opinion formers have been giving out advice, which in many cases, is at best inadequate, and at worst, just wrong.

The UK will not meet its Climate Change targets honestly, without spin, unless it understands that fibreglass alone, in England's ageing housing stock is not the be all and end all. It is inevitable that if UK CO_2 targets are to be met in the future, insulation foam will have to be used far more often. See ***Chapter 5 Far less fibreglass in the future 2010 – 2050 Page 74.***

For a start The Coalition needs to better understand and correct the figures which it is given. They are based on incorrect assumptions arising from a flawed system and incompetent questioning.

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CHAPTER THREE

THE ORIGINAL EU DIRECTIVE (2002)
and
ENERGY PERFORMANCE CERTIFICATES

EU Directive (2002) was adopted into UK Law in 2006 by the passing of the ***Housing Act 2004.***

RdSAP software system - working the numbers out

The ***Building Research Establishment (BRE)*** had been developing their Domestic Energy Model (BREDEM) since the 1980s. In 2005, software writers ***FAERO*** took over that conceptual work to produce the first operational software system ***(RdSAP)***.

Based on the already operational ***Standard Assessment Procedure (SAP2005)***, the ***Reduced dataset (Rd)*** form was to be used to create the first ***Energy Performance Certificates (EPCs)***.

FAERO launched ***RdSAP version 1.*** in January 2008. What it had done was to create something that the building industry had never seen before.

SAP is used mostly in offices, in the timely, proper, procedural process of ***Building Regulation*** approval. ***SAP*** uses known information about NEW materials and components in NEW buildings. It is a carefully controlled process.

It is most unlike the "immediate" pressurised situation where ***RdSAP*** is used. The need to have a more compact ***Reduced Data*** set was to service a portable system using hand held computers in the EXISTING homes being assessed or surveyed. It's only known as "reduced" because there is less of it. Its values are still the same as ***SAP***.

Compared with ***SAP*** it is relatively uncontrolled. An end product, the ***Energy Performance Certificate (EPC)*** has to be produced there and then to put in the customer's hand.

It is vital to grasp the rapid evolution in the development of computer technology***. SAP*** began to evolve in 1992. ***RdSAP*** was to be up and running by 2008. In those 16 years, dramatic improvements in chip capacity alone had facilitated increasing miniaturisation of hardware.

RdSAP was supposed to take advantage of that rapid leap forward in technology. By then its base software ***SAP***, was 16 years old. In practice, the use to which it was to be put was to be distinctly different. But unless the software writers understood that from first-hand experience, they would not have realised that difference, unless somebody had told them.

Perhaps nobody did. Perhaps they didn't ask the right people.

Utilising ***SAP 2005*** which had already been designed, was perceived as being a much easier, quicker and cheaper solution than producing something that was more fit for purpose. Computer capability and not wishing to reinvent the wheel was the deciding factor. The task for which it was being used was to come a poor second.

Over the 17 years of New Labour, far from being a tool or accessory as envisaged by the Conservatives, ***SAP*** and its later variant ***RdSAP*** became pivotal to Government environmental policy for measuring the energy rating of dwellings. In simple terms, ***SAP*** works out an answer to the question "How much heat will this building lose?"

This e-book is only concerned with EXISTING dwellings, and in particular their roofs and loft insulation. It is therefore only concerned with the workings of ***RdSAP***.

RdSAP is simply a means of calculating and converting numbers and ticked boxes into supposedly meaningful statistics and information. It is not human. It does not think. It does what it is told.

What is important is ...what is it told?
Can it cope with what it is told, or needs to be told?

The ***RdSAP*** software has an incomplete, non-comprehensive menu of possibilities. It supplies "narrow" questions. Limited on-site pre-determined answers are applied to pre-set mathematical calculations embedded in the software.

It is those questions which are of fundamental importance. All the "tick box" site inspection requires is for the observed and "collected" values i.e. "the answers", to be applied to the calculations. The answer is only as good as the question. It can never be better.

RdSAP works on assumptions. Its fundamental assumption is that there will be little or no further information readily available or forthcoming from the home owner. What is not known, or ascertainable has to be made up.

RdSAP uses "intelligent" software "defaults" from its ***SAP*** reduced dataset. They relate to NEW materials and components in NEW buildings.

In EXISTING dwellings most, if not all, of the materials and components concerned will NOT be NEW. They will be in various stages of deterioration, decay and demise such as fatigued fibreglass insulation. Its U-value performance is bound to be <u>different.</u> The **<u>actual</u>** condition will be somewhat less than it was when new. With any form of insulation, that is critical.

What is needed is a "different" dataset. One that has a wider, more representative portfolio. One that has "decay", wear and tear factors for materials and components that have seen better days.

Depending on any number of factors, 25% - 40% of domestic heat loss is through the roof. The attention given to that by the ***RdSAP*** system is disproportionately small. It amounts to no more than a cursory glance and a guess.

RdSAP assumes levels of insulation for each of several age bands. They are consistent with when those dwellings were built. Just because 2 houses were built in the same year, it is illogical to assume that the condition of their roof and loft insulation is the same.

Changes of ownership will have occurred. Their circumstances may have changed. There will be significant inconsistencies. Fibreglass fatigue and abuse will vary from one house to another.

Illogically, the ***BRE*** "approved" software assumes that those laboratory-set U-value performance levels as used in brand NEW buildings are still the same, many years later.

It is difficult to see how they can *(at best with a± 4.5% margin of error - Author)* possibly be applied **accurately** and **reliably.** Fibreglass insulation deteriorates relatively rapidly in the hostile environment of the roof space of an older house.

RdSAP produces rough approximations. There is no known margin for error. The ***EPC*** cannot be accurate - a new requirement of the ***EU Directive (2010).*** It is difficult to understand how a calculation of heat loss in such circumstances can be anywhere near **correct**.

In that respect, ***RdSAP*** methodology as currently practised is fundamentally flawed.

For the sake of producing an ***EPC***, a result, any result, the property is made to fit whatever the limited software offers. Just don't tell Joe Public!!!

The law requires that all of those misleading and/or error prone ***EPCs*** are lodged in the Government's ***DCLG Central Register***. It is easy to see how their future policies can be based on shaky foundations.

The law obliges the customer to buy an ***EPC*** product which is not fit for purpose.

RdSAP is also used to assist the ***English Housing Survey (EHS)*** in producing supposedly meaningful statistics to help shape Government policies and pronouncements.

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Recommendations and Improvements

"..the ***EU Directive on the energy performance of buildings (2002)*** required that the ***Energy Performance Certificate (EPC)*** ... shall be accompanied by recommendations for the cost-effective improvement of the energy performance."

(Confusingly, both the terms "recommendations" and "improvements" appear to take on the same meaning. In this context they are not sufficiently different. It clearly encouraged muddled thinking. Perhaps this owes something to the innovative drafting of the ***EU Directive (2002****) – Author)*

"...In addition, to also presenting the most cost effective options. More expensive options which are less cost effective, are also to be presented.

To distinguish them from the more cost effective measures, these are to be shown in a section described as 'further measures'.

Because the ***EPC*** is designed to be produced at change of occupancy, it must be relevant to any occupier. It therefore must make no allowance for the particular preferences of the current occupier..."

RdSAP version 1 FAERO

From the outset, a list of possible energy efficiency "recommendations" and explanations was included in the earliest version of ***RdSAP***.

It was created by ***FAERO*** on behalf of the Department ***for Environment, Food and Rural Affairs (Defra).*** Although now defunct as a group, members of ***FAERO*** still exist as individual companies.

It seems that there was an anxiety over the word "advice" (which the new ***EU Directive 2010*** now requires). Did it imply liability or negligence? "Recommendations" (EU word) appears to have been adopted to avoid that possibility.

Similarly "improvements". It is taken to mean the "recommended" measures from the limited ***RdSAP*** software. The theory was, that home owners could adopt them *(as a good idea, which normal people would never think of - Author) to* improve their ***EPC*** energy banding position.

Far more insulation is added by way of DIY "improvement" or later fitted by a power company or others, than ever there is built in to start with. The quantity, quality and condition will vary greatly. That may be inconvenient to the ***RdSAP*** system, but it is essential to recognise this.

In Government there was an anxiety to see ***Home Information Packs (HIPs)*** launched on time. Following limited field trials by the newly trained ***Home Inspectors***, focus groups and others, the documentation was released after a bit of tweaking by ***Defra*** for information purposes on 23rd February 2005.

"... this will allow the ***RdSAP*** dataset, recommendations and energy performance certificate to be used for training and assessment purposes until formally replaced by the next version. It is the only system approved by ***Defra*** for this purpose. It cannot yet be used for issuing energy performance certificates for existing homes. It has not yet been approved for that purpose. Software incorporating ***RdSAP*** is therefore currently available for training and assessment purposes only.

It is currently anticipated that ***RdSAP*** will undergo two more revisions prior to its formal approval for issuing certificates. The first will finalise the dataset, recommendations and certificate design following the technical field trials.

Publication of this version ***(v2)*** is anticipated during the second quarter of 2005. Probably in early May. The second and final revision will update ***RdSAP*** (currently based on ***SAP 2001***) to the ***SAP 2005*** specification. It will ensure that ***RdSAP*** is fully compliant with the ***EU Directive (2002).***

SAP 2005 itself will be published in July 2005. ***RdSAP*** version ***(v3)*** is expected to be published during the third quarter of 2005."

Somehow, they were going to make it work within 6 – 8 months.

It seems amazing that this revolutionary process evolved without any apparent input or comment from anyone who had ever got their hands dirty. There is no easily available record of how they got on.

A disproportionate amount of effort appears to have been spent on dealing with heating systems pumping heat out, rather than relatively simple methods of keeping heat in.

"... The suggested improvements in the ***RdSAP*** energy performance certificate are automatically created in the software using default logic – for example, if there is less than a pre-set thickness of loft insulation, and the loft is accessible, then the defaulted recommendation is to add more loft insulation to bring this up to 250mm of mineral wool or equivalent."

Yes, word for word, that is what it says.

Staggering naivety! It's like a TV script from Yes Minister or Bremner, Bird and Fortune.

It goes on

"... The following three tables explain the logic behind the improvements. They also show how the certificate will present the financial savings and the improved ***SAP*** ratings from implementing the suggested improvements. An example of the current draft ***RdSAP*** energy performance certificate is included in this document. For clarity it is recommended that you look at the tables together with the example certificate.

The ***Home Inspector*** (it assumes ***HIPs*** will endure) has the option to remove some of the suggestions for particular properties. The table indicates some of the reasons why a surveyor may wish to do so. However in a number of cases there is no general circumstance when an Inspector would remove the defaulted improvement.

The lists of improvements seem extensive since they include all the possible recommendations that are available in the software for the ***RdSAP*** system to choose from. For a specific property, only those items that are appropriate for that home are presented. This means that it is never necessary to remove recommendations that cannot be applied to the home due to its construction – for instance, cavity wall insulation in a solid walled home – the software will simply not suggest that option.

Where the ***Home Inspector*** removes a recommended improvement, the reason for this must be entered in the software. This is because ***Home Inspectors*** are discouraged from removing improvements without a specific reason. The purpose of the certificate is to encourage the recipient to improve the energy efficiency of their home. It is better that they see all of the options suggested by the software – unless there is a valid reason why that improvement is not appropriate for that particular property."

The lists only included measures that were modelled in ***SAP2001.*** Energy efficiency measures that were not included in ***SAP2001*** could not be evaluated in that way. *(N.B.* ***SAP2005*** *was in use by then – Author).*

The three tables to which they refer are Category 1 – Lower Cost Measures; Category 2 – Higher Cost measures and Category 3 – Further improvements to help the environment.

N.B. There is only one suggested "improvement" for anything to do with roofs.

That is in:-

Category 1 – Lower Cost Measures.

Improve to – 250mm mineral wools laid between and across roof joists.

Description – Only when a roof is pitched and accessible. If insulation is 150mm or less then make up to 250mm.

Possible reason to delete this measure – Evidence of condensation in the loft and/or blocked ventilation.

(Clearly there is an awareness of the possible problems described in detail in this e-book. But the pitfalls they describe are not always evident, so on this basis, the wrong conclusions could be reached. In any event, the surveyor is specifically NOT required to enter the roof and will most likely not see the tell tale signs of "evidence "that the software describes – Author)

From the worked example provided in their manual:-

Section H: Energy Performance Report – MEASURES TO REDUCE THE RUNNING COSTS AND IMPROVE COMFORT- Lower Cost Measures (up to £500) Measure 2 – TOPPING UP LOFT INSULATION the text says:-

"... This cost is based upon a contractor installing an additional 100mm of glass fibre or mineral wool insulation in your loft, but a capable DIY enthusiast can install it. If you choose a DIY installation then take care not to block ventilation at the edge of the loft space as this may cause condensation. When handling the insulation wear gloves and a mask."

(Their suggestion is impractical, as described elsewhere in this e-book. It was obviously written by someone with little idea of the subject. What about goggles and hooded overalls and safety boots? Has the Health & Safety Executive seen this? – Author)

Higher Cost Measures where no text was used regarding roofs and loft insulation the budget was given as (up to £3,000)

(Insulation foam, which was wholly appropriate, was not even mentioned. – Author)

It must be remembered that the document above referred to pricing as at February 2005. There is no available evidence to indicate that that has since been revised.

Due to an oversight in the earliest ***RdSAP*** software in 2007/2008, *(when relations between FAERO and government departments were becoming strained)* there was no provision for home "improvements" to be taken into account. The beneficial effects of tried and trusted improvements such as sprayed insulation foam were not recognised***.*** They are still not.

RdSAP version 9.81 BRE

The changes in the ***2006 Building Regulations*** affecting proposed NEW buildings were truly momentous. They threw up all sorts of anomalies which had never been encountered before.

SAP 2005 was to undergo constant and rapid revision over its next 4 years. Experience and outside interest no doubt played their part. The current edition (as at August 2010) is ***SAP 2009 with May 2010 corrections***.

For ***RdSAP*** calculation purposes on EXISTING homes, ***SAP 2005 9.83*** remains

"...for the time being."

It is obvious that ***RdSAP*** is still regarded as a bit of a sideshow compared to ***SAP*** with its bias towards larger scale *(more interesting?)* industrial, commercial and public developments.

Following its acrimonious dispute, which came to a head in September 2007 with ***DCLG*** over ***Faero Ltd***, ***FAEROs*** work on ***RdSAP*** reverted to ***BRE.***

4 months later, in January 2008, ***BRE*** hurriedly brought out ***SAP 2005 version 9.81***. It now had an ***Appendix T: Improvement Measures***. But it still failed to recognise retrofitted insulation of any sort.

Amazingly, there is still no recognition today in August 2010.

Behind the scenes, there appears to be a lot going on. In 2009, The ***DCLG*** conducted a consultation. It included a debate on calculating U-values in building elements.

The National Physical Laboratory is arguably the UK's leading exponent of measuring U-values. Their Thermophysical Group was established in the 1970s. It considered that even their best measurement certainty is ± 4.5%.

"....It shows just how difficult measuring heat transmission through structures is."

RdSAP calculations "assume" what the software deems as appropriate U-values. In the best case scenario, before any other influencing factor, such as inherent fibreglass fatigue and the environment in which it deteriorates, the basis of calculation has

"... a scientifically unacceptable margin of error".

At long last, the consultation process highlighted the conflict between laboratory based results [upon which ***Building Regulations (SAP)*** and ***RdSAP*** are made] and those found in the real world. The muddled roof spaces of existing dwellings of different ages being but one example.

The ***RdSAP*** system is not human. It is computer software. It only recognises "insulation". By default, it defines that as virgin fibreglass quilt as tested in a laboratory. It uses the U-values of that unused material and no others.

When the system offers "recommendations", it only does so by reference to the term "insulation".

The "recommendation" is one of a limited library of responses dictated by the government controlled ***RdSAP*** system. Some might see it as propaganda. A cynical exercise in partiality. Free marketing for fibreglass firms!!

The "recommendation" is based on an "assessment" which

".... does not take into consideration the physical condition of any element" *e.g. loft insulation*.

It is absurd that no practical distinction is made between a durable element such as rigid, solid brickwork and the least durable elements e.g. roofing felt and fibreglass insulation. Both of which are flexible fabrics and deteriorate relatively rapidly.

The "recommendations" usually given, state that they are "cost effective". Who says so? What evidence exists? There is no warning that the cheap fibreglass will deteriorate relatively quickly and will need to be continually replenished over time. That its ability to retain heat diminishes which is decidedly NOT cost effective.

"Recommendations" are given on the basis of "cheapest" solution. That is not necessarily the best long term solution. There is no indication of other solutions. Some might be more appropriate and durable. More cost effective and "cheapest" in the long run.

The "recommendation" given ignores worthwhile alternatives which the home owner might find preferable. The ***RdSAP*** limited library doesn't have any. It fails to advise on pitfalls to avoid which are consequential in following that "recommendation".

The ***RdSAP*** software as it exists fails to provide the options and alternatives required by the original ***EU Directive (2002)*** let alone those introduced in the latest ***EU Directive (2010).***

The system's only standard "recommendation" is to increase the depth of insulation to 10" (270mm) which is the default depth required on NEW dwellings by ***Building Regulations***. That may well satisfy government tick box targets on a national scale, but is not necessarily the best or most appropriate advice for any particular home owner of an older property.

The "recommendation" given contradicts that given by both of the Miliband brothers that 4" (100mm) and 6"(150mm) are officially deemed as "adequate" insulation in EXISTING dwellings.

The "recommendation" is also dangerous. By deep loft insulation swallowing up the ceiling joists, it loses them as a sound footing for accessing things such as water tanks, aerials, bathroom light fittings or any other maintenance purpose. It encourages an accident whereby someone puts their foot through the unseen ceiling below.

There is no warning that 10"(270mm) of fibreglass, if sufficiently effective in restricting heat loss from below, might turn the underside of the wind chilled roof covering into a sufficiently cold surface. It would become a sure-fire breeding ground for condensation. That will drip down and diminish any beneficial effects that extra fibreglass might bring.

Where it is suggested to build a raised walk/crawl-way above the elevated additional fibreglass, there is no suggestion as to what the extra over cost might be. It could prove far more costly. It is not an easy thing to do.

If the "recommendation" of increasing insulation to 10"(270mm) is followed, it effectively prevents the home owner from boarding his loft. To do so would provide a useful facility such as a storage platform, which a house buyer might regard as of value to him.

Without that facility, it could put the buyer off from making the purchase. A house with a suitable storage (or other purposes) platform facility adds value to the house. Increasing loft insulation depth can be counter-productive.

Where headroom permits, as it does in many older houses, placing (non fibreglass) insulation *(such as insulation foam, which is a far superior insulator)* between rafters can facilitate a room-in-a-roof purpose other than storage. More so if a roof window is added. That really is an asset to a property. *(See Chapter 5 Making your loft useful Page 77)****.***

There is no "recommendation" on air tightness in general and roof spaces in particular. ***Building Regulations*** are increasingly centred on air tightness in NEW dwellings. Any recommendation given should be consistent with that.

Insulation foam is the only material that can guarantee the necessary air tightness performance. Fibreglass, in whatever form, cannot. Neither can any other insulation solutions.

There is no "recommendation" regarding air tightness or insulation associated with a loft hatch or any other access point. It is always awkward. There is disproportionately more heat loss through that relatively small aperture than there is over much of the fibreglass insulation laid between ceiling joists over the wider area. Heat rises. A loft hatch acts like a chimney.

There is no "recommendation" as to how the environment of the loft space, the lack of, or poor repair state of roofing felt, and condensation will adversely affect fibreglass insulation.

There is no "recommendation" as to "how" fibreglass materials should be fitted. There is no indication of problems that can arise. There is no Health & Safety advice. Incorrectly fitted fibreglass insulation with gaps and raw edges defeats the object. Depth and thickness in isolation is *NOT* the be all and end all. It's on-going performance that matters.

There is no helpful "link" to other sources of reference or guidance outside of the ***RdSAP*** system. There is nothing in "booklet" form, a DVD or a website link which could qualify and enrich the home owner's knowledge and understanding.

There is no advice on the folly of disturbing deteriorating and disintegrating fibreglass, releasing into the domestic atmosphere potentially harmful and uncomfortable fibres.

Anyone who has ever dealt with fibreglass will know what a thoroughly unpleasant experience it can be. Some will argue that the carcinogenic risk has still not been properly addressed. Authoritative US studies, allegedly with some pressure from interested parties, have indicated this not to be the case if proper procedures are followed.

However, those studies mainly concerned risks in fibreglass manufacture and installation when the material was "fresh". They considered the effects on animals. They made comparisons with cigarette smokers. They did not address the disturbance, disintegration and dissipation of mature fibres in an aged attic full of other airborne particulates such as is a common characteristic of the roof spaces of many UK homes.

*In the following passage of text, words in (italics) are those of the Author and NOT those of the **Energy Performance Certificate (EPC)**.*

A typical ***EPC*** "recommendation" given is:-

Loft insulation laid in the loft space or between roof rafters to a depth of at least 270 mm

(This is utterly impractical and could never have been written by anyone with an understanding of the subject. It is physically impossible to lay insulation vertically between sloping roof rafters. It can only be laid between horizontal ceiling joists. Typically a ceiling joist is 100mm deep. Consequently 170mm of loose insulation will protrude unsupported above the top of the joist. It makes no sense. It is sloppy!)

Will significantly reduce heat loss through the roof; this will improve levels of comfort, reduce energy use and lower fuel bills. Insulation should not be placed below any cold water storage tank, any such tank should also be insulated on its sides and top, and there should be boarding on battens over the insulation to provide safe access between the loft hatch and the cold water tank.

(This is an impractical and potentially dangerous suggestion without reference to the clear headroom. Health & Safety considerations for visiting electricians, plumbers and gas engineers could cause them to refuse to work unless there is a suitable guard rail to prevent them slipping off the raised walkway/crawl-way. In a panic situation it would be particularly unsafe. In any case, is that additional expense costed in the suggested budget?).

The insulation can be installed by professional contractors but also by a capable DIY enthusiast.

(Yes, this is true in principle. However a professional contractor will not necessarily be "cheap" unless a grant or some other inducement is involved. It depends how diligent the professional contractor is and how "capable" the DIY person is. This should never be recommended unless clear technical guidance is given, and the pitfalls explained. For insulation to be effective it has to be done very carefully. It requires far more precision than the uninitiated realise. The RdSAP author falls into that category!)

Loose granules may be used instead of insulation quilt; this form of loft insulation can be blown into place and can be useful where access is difficult.

(This is an impractical suggestion. Granules are lightweight. Loose granules in a loft get blown about by gusts of wind through the ventilation slots. The eddies of wind soon pile the granules up into uneven heaps providing minimal insulation and maximum heat loss.)

The loft space must have adequate ventilation to prevent dampness; seek advice about this if unsure.

(This is no longer the case. Building Regulations L1 has Accredited Details which permit the closing off of ventilation provided the proposal can demonstrate that the dew point which triggers condensation is not reached. The classic solution is to use 3" or 75mm of sprayed insulation foam which in design terms is equivalent to at least 6" of virgin fibreglass between rafters. Coupled with 4" of virgin fibreglass horizontally between ceiling joists this achieves the 10" (270mm) equivalent to satisfy Building Regulations in new dwellings .It also allows the loft to be boarded as the top of the timber ceiling joists are exposed – it represents the ideal solution- the best compromise.

There is no law or regulation preventing a home owner doing this on an EXISTING dwelling. It will only become an issue if the property is sold and this is queried by the buyer's surveyor).

Further information about loft insulation and details of local contractors can be obtained from the National Insulation Association (www.nationalinsulationassociation.org.uk).

(This is an improper, irresponsible and partial recommendation. It does a great disservice to other organisations and those businesses that do not choose to belong to any of them. It surely is wrong and grossly unfair for a government scheme to prefer one against another. In any case, who is to say that they are fully representative and have expertise beyond question.)

And that is only one EPC example!!!!!

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Domestic Energy Assessors (DEAs)

The passing of the controversial ***Energy Performance of Buildings (Certificates and Inspections) (England and Wales) Regulations 2007*** finally gave ***DEAs*** their legitimacy under

".. accredited schemes approved by the ***DCLG*** Secretary of State.".

As of August 2010 there are a number of ***Domestic Energy Assessor*** (***DEA)*** accreditation bodies. It is presumed that ***DCLG*** has satisfied itself on matters of consistency. Their position may be at odds with the ***EU Directive (2010)***.

Domestic Energy Assessors (DEAs) input ***EPC*** data into hand held computers running ***RdSAP*** software. It records, and where appropriate, converts their data into the format of a printable ***Energy Performance Certificate (EPC)***.

From its limited library, the computer regurgitates what it considers to be the nearest best fitting preset text for "recommendations" and "improvements".

A copy of that data is forwarded to the ***DCLG Central Register*** for national statistical analysis.

The printed out ***EPC*** is given to the home owner who has paid for it. **It is his property!**

His loft, which can be 25% - 40% of the volume of a house, is the one part of the house that the "qualified" ***DEA*** is *NOT* supposed to inspect. Specifically, the ***RdSAP*** system requires him *NOT* to inspect it.

Not to give due weight to that major component could be said to be taking money under false pretences. It is not value for money. Is the home owner being short changed? Is the prospective house buyer being misled?

The home owner has no choice but to engage a ***DEA***. He thinks he is paying for expertise from an experienced, technically "qualified" surveyor, inspector or assessor. He is not! He is simply getting the end product from a ticket machine that prints the wrong answers. To some, it might seem little different than the attentions of a traffic warden.

It is for those with a knowledge of legal negligence, or duty of care, to pass opinions. It is debatable whether or not the "qualified" ***DEA*** is being prevented from exercising a professional judgment by a process that specifically prevents him from so doing.

One might wonder what the purpose is, of having a "qualified" (allegedly experienced) ***DEA*** if they are not allowed to enter the loft, nor are they required to comment on the condition of the insulation. Without that essential input, the "recommendations" can have little credibility. The matter of professional negligence might be appropriate.

One test might be "could an unqualified person, with just some practical knowledge, do it just as well?" To what degree is it more complex than filling in an income tax return?

It is debatable whether the term "qualified" is correctly used. It could be legally misleading."Accredited"*(not the same thing – Author)* might imply a degree of inconsistency, second best, across what some might want to look up to as "a professional discipline".

The home owner has decisions to make on the basis of his receipt of an ***Energy Performance Certificate (EPC)*** that he or she has just *(grudgingly)* had to buy. Decisions have implications.

Does he decide to stay put after all, and take his home off the market?

Does he decide to carry out the "machine -recommended improvements" in order to dissuade a prospective purchaser from trying to negotiate a discounted price?

If he does so, should he have realised that the "recommendations" didn't warn him about X or Y?

Would the home owner have moved, had he known this or that?

Those of a legal mindset might pose other questions.

There is no available evidence to suggest that such possibilities were ever discussed by those creating or commenting on the ***RdSAP*** system.

Similar data is collected by the recently formed ***English Housing Survey (EHS)*** in England. Their results (their first), belong to them, not to any of the 16 – 17,000 individual volunteer households who took part in that national survey in 2008. The field work was carried out by "qualified" surveyors who are not necessarily ***DEA****s*, although there is no particular reason why suitable ***DEAs*** could not carry out that work.

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CHAPTER FOUR

ENGLISH HOUSING SURVEY

The ***English Housing Survey (EHS) 2008*** is the Coalition Government's source of information on the condition and energy efficiency of housing in England. It came from the merger of the ***2004 English Housing Condition Survey (EHCS) Review*** with the ***Survey of English Housing.***

Its on-going data is collated at the ***Department for Communities and Local Government (DCLG) Central Register***. It is supposed to provide a statistically accurate and reliable representative "picture" of all types of housing and their ownership. It measures the nation's progress against its Climate Change commitments. It forms a reference point for making government policy. *(.....for "statistically accurate" read nearest best guess – Author).*

The ***EHS Survey 2008*** might be thought of as the modern environmental equivalent of the Domesday Book. The difference being that the Normans travelled the length and breadth of England interviewing all and sundry and cross checking answers until they got it right. They did not do so by approximating an unrepresentative sample and claiming that that was good enough.

In February 2010, before the General Election, the first ***EHS*** Headline Report for 2008-2009 was published. As of August 2010, its Final Report is not yet available.

Some as yet unpublished data has kindly been provided by the ***DCLG***. Some subsequent correspondence involving the ***Building Research Establishment (BRE)*** has also been included. It clarifies those figures, how they were obtained and the uses made of them.

The ***EHS Survey*** was carried out at a quiet time in the housing market. Around the time of the launch of ***Energy Performance Certificates (EPCs)***. A copy of every ***EPC*** has also to be lodged with the ***DCLG Central Register***.

EPCs were part of the short lived, ill fated ***Home Information Packs*** (***HIPs).*** They are a requirement of ***EU Directive (2002).***They were produced by the first generation of ***Domestic Energy Assessors (DEAs).*** They sold their service to individual home owners thinking of putting their property on the market.

DEAs were *NOT* part of the ***EHS*** survey. Their ***RdSAP*** methodology and output are consistent with it***.*** Although their purpose was different, the ***EHS*** survey questions had certain similarities with those from ***Home Information Packs (HIPS)*** and ***Energy Performance Certificates (EPCs)***.

This thesis uses ***EHS Survey*** data for mid-point ***April 2008***. It is partly a social survey by interview. It is also partly a technical survey by inspection.

EHS employed a specialist contractor with a large and widely dispersed team of interviewers and "qualified" experienced (non- ***DEA***) surveyors. ***EHS*** provided the Questionnaires.

The contractor, and in turn his (presumably self employed) surveyors, would have been paid at a commercial rate to do a job. No more, no less. Therefore each interview and physical inspection would have had a prescribed time limit in which the work had to be done. The ***EHS*** surveyors were not invited to go beyond their strict remit. Nor was there any apparent incentive or motivation for them to do so.

It is of no concern to this paper what they were paid. Nor how long they took. Experience of life says that individuals would have been under pressure (self induced or otherwise) not to overstay their allocated time. Equally, left to themselves, working on their own, it would not be unreasonable to have expected them to find the easiest and quickest way of fulfilling their task in a manner for which they could not be criticised.

To the bystander, the level of detail of the enormously lengthy and time consuming ***EHS*** Questionnaires appears comprehensive and impressive. To the surveyor, doing it repeatedly, it must have seemed tedious, if not daunting.

It might dissuade anyone but the most persistent *(such as the writer of this e-book)* against further scrutiny.

It would appear that what the ***EHS Survey*** was trying to do, or if not, what it is being used for, *(although nowhere is this clear to outsiders)*, is to simulate a situation as if the whole nation's ***Energy Performance Certificates (EPCs)*** were available all together at any one time.

If that is the case, it is a perfectly sensible thing to do, providing there can be confidence in the data that they are using.

Amongst other things, ***effectively what that will provide is a <u>provisional</u> RdSAP for every home in the country.*** If that is so, it would be helpful if someone could say so, in order that Joe Public can feel part of it, rather than feel excluded from it.

There is little doubt that the ***EHS*** social and technical surveys were meant to be thorough. The approach was understandably professional and clearly designed to provide meaningful data.

However, the ultimate outcome depends on the questions asked in the first place. How the answers or findings were recorded. How they were statistically processed.

In 2008 ***EHS*** gave the total number of English dwellings as 22 million.

Understandably, the ***EHS Survey*** could not deal individually with a number like that. It purported to convey its projected trends and changes as representative of that number.

The extent to which their trend tracking gives a sufficiently accurate and reliable picture in all respects is debatable.

It would be hard to argue that ***EHS*** estimated figures are nothing more than a rough rule of thumb. May be useful for making comparisons, or spotting trends. Probably inadequate for candid calculations to the degree now required by the latest ***EU Directive (2010***). If indeed they are to be used for that purpose. It would be surprising if they were not.

In the foggy world of big number CO_2 forecasts, by the time disinterested, remote statisticians, apply mistakenly unrepresentative numerical values and factors, it could be a classic case of GIGO *(Garbage In, Garbage Out)*.

Policy makers might then end up miles off track. That would affect us all! - But there again, is all of this just a job justifying game?

The cynic might say that in the global Kyoto bingo hall, where politicians, trying to impress, loudly shout out meaningless numbers to one another, it is not unlike the story about the monks who had been closeted together for years. They no longer told one another jokes. They just called out a number, at which they all laughed, because in so doing, they all knew what the joke was.

The Office for National Statistics (ONS) commissioned the ***EHS*** work. They said that survey addresses were chosen at random in different regions. The majority of those volunteer households selected would have had a physical technical inspection by an ***EHS*** surveyor.

Depending on the questions asked on the survey – technical or social, for consistency, those answers were taken as representing a kaleidoscope of situations.

The ***EHS Survey*** relied on age banding. It assumes that the lofts of all homes within that period are the same. It is a ridiculous oversimplification.

The blind belief in ***RdSAP*** methodology to accurately and reliably translate or interpret survey data relating to loft and roof insulation will easily be seen to be foolhardy in the extreme.

Source - ***English Housing Survey 2008 - millions of households***

Of the **22.2 million <u>English</u> dwellings**,
18.3 million were in the private sector (P).
Of those **15 million were owner occupiers.**
3.9 million were in the social sector (S).

	Private		***Social***		***approx .***
Pre 1919	4.5	+	0.25	=	4.75
1919 - 1944	3.1	+	0.52	=	3.62
1945 - 1964	3.1	+	1.27	=	4.37
1965 - 1980	3.7	+	1.13	=	4.83
1981 - 1990	1.6	+	0.33	=	1.93
1990 - 2008	2.3	+	0.42	=	<u>2.72</u>
			approx. **22.22 million**		

In the following text where italics have been used, they are this writers comments alone and NOT part of the EHS survey.

8.37 million (nearly 40%) of all dwellings were built before 1944.
Almost all of them (probably 90%) would not have been built with a roofing felt underlining.

6.35 million (nearly 30%) of all dwellings are terraced houses.
A very high percentage would most probably have been built before 1944.

5.78 million (nearly 30%) of all dwellings are semi detached.
A very high percentage would most probably have been built before 1965. Typically a high percentage of those would have been built as "council (social) houses". In general they would have been very well maintained. Consequently they were an attractive purchase to occupiers when the right to buy was offered to them. Councils also re-roofed dwellings and modernised them to make them attractive to buyers.

Arguably, most dwellings built before 1944 would have had slate roofs.

Arguably, almost all dwellings built from 1945 would have been built with a roofing felt under lining.

Arguably, most dwellings built from 1945 would have been built using concrete interlocking roof tiles.

Arguably, all dwellings built before 1965 would NOT have been built incorporating fibreglass quilt insulation.

By 2008, some of the above would have been re-roofed, most likely with concrete interlocking roofing tiles but almost all (if not all) with a roofing felt underlining.

The combined total of ALL dwellings built before fibreglass introduction 1965, is 12.75 million. That is 55% of ALL English dwellings still standing originally never had any insulation.

The 45% balance which was built later always had a fibreglass legacy. Arguably, virtually all dwellings built after 1965 would have incorporated fibreglass quilt insulation, probably 2" (50mm) thick as a minimum when new.

EHS derived its data from a selected sample of **16 -17,000 volunteer households - 1 in every 1,375** out of a disparate housing stock of **22 million**. The extrapolated results will be an approximation. A best guess with a margin of error.

The ***EHS Survey*** could not have been designed to be factually accurate. The ***EHS*** claimed that they were intended to be statistically accurate. That is not the same thing.

What such a margin of error might be, is a statistic which might be argued over. The very clear danger is demonstrated in the earlier comparison of the figures used at different times by the Miliband brothers.

David used ***English Housing Condition Survey 2004 (EHCS)*** figures. Ed used ***English Housing Survey 2008(EHS).***

Both Surveys will have used similar methodology, if not the same personnel. They both referred to English homes with lofts lacking adequate thicknesses of loft insulation.

David said it applied to **one third** of the nation's housing stock. Ed said **two thirds.**

They can't both be right. Probably both are wrong.

What is at issue here is not that they are both stupid, or one is lying. It is the lack of thoroughness by which information was collected in respect of loft insulation. That is not the fault of the respective surveyors. It is the fault of the instructions which they were given.

This paper is entitled **"The Great Fibreglass Fib!!!"**. It is concerned particularly with roofs, which can account for 40% - 60% of a dwellings external surface, and through which 25% - 40% of a dwellings heat can be lost.

Arguably, over all house types and locations, the heat lost through the roof of any dwelling is the biggest single factor.

If statistical climate change outcomes are to have any sensible meaning, the loft insulation in any sample surveyed is of critical importance, if the results are to be representative of a much greater number. It is important to see what questions were asked about that topic.

EHS 2008 Questionnaire

The following is taken from the ***EHS*** questionnaire:-

Questions asked:-

Section 6. Loft inspection

In this Section, there are 8 questions to be answered in each of the 16-17,000 homes to be physically inspected. Presumably ***EHS*** considers the questions sufficiently important for them to be answered properly. The tick box answers (without the flexibility of elaboration) are designed to dovetail into an ***RdSAP*** calculation for that household.

Type of loft – Fully boarded; No boarding or partial boarding; Room(s) with permanent stairs; No loft (flat or very shallow pitched roof).

Roof insulation above living space? – Yes; No; Don't know.

Type of loft insulation – Mineral wool/fibre glass; Vermiculite beads; High performance quilt; Rigid foam board; Not applicable; Don't know.

Approx. Thickness of loft insulation – No insulation; 25mm; 50mm; 75mm; 100mm; 125mm; 150mm; 200mm; 250mm; 300mm; >300mm; Don't know thickness.

Loft information from: - Inspection; Occupant; no information.

Any roof structure problems seen? – Yes; No.

If yes, describe and transfer to Section 21 – describe

Is there any evidence of cavity wall insulation in the loft? - Yes; No.

According to correspondence from the ***BRE***, development partner of the ***EHS***, their contractor's surveyors were NOT expected to enter the loft or roof space.

They were merely asked to conduct what might be described as a "head and shoulders" inspection through the loft hatch using a step ladder (presumably to suit their own height) which they supplied themselves. That was confirmed by ***DCLG***.

It is understandable that non-practical institutionalised administrators would have Health & Safety and insurance anxieties. It is perfectly true that an inexperienced, unaccompanied person could get into difficulties in an interviewee's loft, especially if there was no fixed floor area upon which to stand or kneel.

However, a self employed "qualified" surveyor should be sufficiently experienced. He would have to have his own insurance policy. He would not be in the interviewee's home on his own. In any case he would probably have a mobile phone, or even a whistle, if he got into difficulties.

To succumb to those concerns, without addressing them in a practical way, makes a nonsense of any questions that were required to be asked. If results are to be relied upon, it is an exercise which requires a greater thoroughness and familiarity.

To anyone who has ever surveyed the inside of a loft, a step ladder is inadequate. It is not a safe solution if the top steps are being used because there is nothing to hold on to. It cannot be secured in position, unless a second person is holding it tight. It could easily topple over. Anyone who imagines it to be a safe and sensible method clearly has no idea of what is involved.

A folding, sectional or telescopic ladder or a fixed loft ladder is essential to safely access the inside of a loft in order to establish an eye line. A minimum of 3 foot or 1 metre above the top surface of ceiling joists is required. That minimum elevation allows the surveyor to "survey" or look down upon the horizontal plane of the loft floor level. Unless he does so, he cannot do his job responsibly or properly.

Specialist loft surveyors, such as those employed by **The Carbon Footprint Insulation Company Limited,** who understood their subject in depth, would normally expect to spend no less than 15 minutes, fully in a loft, giving it a thorough look over. That is without filling in a detailed analysis etc....

The ***EHS*** surveyors were NOT expected to get into the loft. They were only expected to provide themselves "with a 360 degree view" with their eye line at loft floor level. In that position, their all round view would probably have been obscured by any number of the sort of obstructions encountered in a roof space.

A single beam torch, even with an electric light present, would not enable the overall condition to be seen due to the harsh light and deep shadows. The depth of insulation and its integrity would be, at best a guess.

The view from a submarine's periscope is not the same as that from a hovering helicopter.

Without a more thorough inspection, many of the answers given on the ***EHS*** survey would have to be considered questionable, unlikely to be accurate, and by definition, unreliable.

The ***EHS*** Survey physical inspection assumes that if there is no documented evidence of thermal improvements (even if seen with the naked eye) then the predetermined assumption remains.

There is far more insulation, in existing lofts, added by way of "improvement" than ever there is originally incorporated. By far the greatest volume of insulation added will have been DIY fitted fibreglass from B&Q type sources. It will have been installed in varying thicknesses, with varying degrees of care and proficiency over a 40 year period.

It is simply ridiculous to assume that home owners keep receipts for rolls of fibreglass for years on end. Yet the ***EHS*** rules state that if receipts do not exist, nor does the insulation.

In pre-1965 houses which had no inbuilt loft insulation, and yet successive occupants have added "improvement" insulation without keeping receipts, the ***EHS*** system says that it doesn't exist.

If there is fibreglass insulation present, then the surveyor records it as new, even if it is in dreadful condition and years old.

Of the 8 questions asked, there are 2 particular questions which are fundamental to any ***RdSAP*** calculation which leads to an assertion of CO_2 emissions. They are:-

Q. Type of loft insulation

Q. Approx. Thickness of loft insulation

It is not necessary to be a scientist. A layman can glean his knowledge from Wikipedia.

Wikipedia tells us

"... . The effectiveness of insulation is commonly evaluated by its R-value (or U-value). That does not take into account local environmental factors for each building. Construction quality issues include condensation potential and problems with draught proofing. The properties and density of the insulation material itself is critical. e.g. short strand fibreglass insulation is not as durable as long entangled strands..."

The "quality" of the ***EHS*** surveyors' answers in respect of the questions relating to an interviewee's loft, has to be seriously questioned. Not because the surveyors are professionally inadequate, but because the questions are.

Q. Type of loft insulation.

The ***EHS Survey 2008*** dealt with existing dwellings by reference to when they were built. The implication was that somehow there are "neat" and consistent characteristics that are convenient for computers to model in age bands. Such a belief is unreal.

Houses may look the same on the outside, but the condition and contents of a rarely visited loft can vary considerably. That lack of appreciation is worrying.

In the ***EHS*** Questionnaire, *(echoing the **RdSAP** menu)* the choices of insulation type were limited to cheap and cheerful DIY products available from the early 1970s when ***B&Q*** emerged at the beginning of the home improvement boom.

In those days, no-one fully understood how insulation worked. What was necessary to make it work properly. That situation is little better today. Installing insulation is like taking medicine. It is an act of faith that it is doing you good.

It is a pity that those who drew up the ***EHS*** Questionnaire did not display a greater knowledge of the many sorts of insulation available. The choice recklessly restricted answers to something that was expedient for a limited software program to process.

The explanation could be that ***SAP 2005 version 9.80*** (the original version in use at the time of training the first wave of ***DEA***s in time for January 2008) gave the following instruction:-

"...**Attics**...*should be included* if they are habitable rooms, accessed by a fixed staircase.

Roof spaces (even though within the insulated envelope i.e. where the roof insulation is provided at rafter level) *should not be included* unless they are habitable rooms accessed by a fixed staircase."

The presence of a "fixed staircase" governed everything. Roof spaces didn't seem to matter. Perhaps that is why so little attention is given to the many aspects of roof and loft insulation.

The ***EHS*** Survey does not enable a distinction to be drawn between "original" built-in insulation, in varying thicknesses from 1965, and "improvement" insulation added later.

In the ***EHS*** Survey, there is no differentiation in the degree of inevitable deterioration due to age and condition of fibreglass, the other material types given and their microclimate environment. It is critical in accurately and reliably determining a dwelling's heat loss.

It is disappointing that the ***EHS S***urvey Questionnaire did not offer an option of sprayed insulation foam. It is well known to the ***Building Research Establishment* (*BRE*)** who are the development partner of ***EHS***. ***British Board of Agrement (BBA)*** Certificates have been issued to several manufacturers and installers.

In view of its scientifically proven and potential benefits, insulation foam is a far superior material. It might otherwise be considered an oversight or ignorance not to have included it. If nothing else, but for future comparative purposes.

Q. Approx. Thickness of loft insulation

This is too simple a question for the ***EHS*** Survey to ask. The implications of what rests on the answer can be extremely misleading. Although the processes are similar, the purpose of the ***EHS*** Survey is different to that of an ***Energy Performance Certificate (EPC).*** The conduct of a ***Domestic Energy Assessor (DEA)*** is much more transparent. It is instructive.

An ***Energy Performance Certificate (EPC)*** only affects a buyer and a seller of one property at a time. The vagaries of a coarse ***EHS*** survey answer can have serious consequences. It is multiplied up by many times to give a supposedly representative statistic of a much larger sample.

In the case of an ***EPC*** which uses the same ***RdSAP*** system of generalised assumptions, it is interesting to note that in the ***DCLG*** (2008) booklet ***Homebuyers and sellers guide to Energy Performance Certificates,- Getting ready for the assessment –*** the home owner is advised what ***"The (DEA) assessor will want to know".***

Surprisingly, the home owner is not asked if he or his predecessors have ever added to the loft insulation (if any) since they moved in. Arguably, that is one of the most important things the ***EHS*** Questionnaire ought to need to know.

The home owner is asked when the property was built. There is a good chance they don't know. The deeds might be lodged elsewhere making it difficult for the home owner to find out or prove it. What if they are wrong? Does the "qualified" ***DEA*** surveyor override him?

Without any input from the "qualified" ***DEA*** surveyor, the ***RdSAP*** system automatically assumes the default thickness of loft insulation. It refers to the age of the property irrespective of whether or not insulation still exists, or its condition or disposition.

All the "qualified" ***DEA*** surveyor is asked to do is to casually look into the loft from an unsuitable and unrepresentative vantage point and effectively "guess" at the insulation thickness irrespective of everything else. The ***EHS*** surveyor is asked to do the same.

The U-value assumed by the ***RdSAP*** system is that of fibreglass or mineral wool in its virgin condition as tested in a laboratory. ***The National Physical Laboratory)NPL)*** give their result, at best, as a ± 4.5% which is too crude – even when brand new - to be considered as scientifically accurate.

Even if the ***EHS*** surveyors have the experience (which they almost certainly will have according to the ***BRE***) to recognise the disparity in what they are being asked to do, they have little opportunity in the system to say so. They are not being paid to pass an opinion, they are simple being asked to tick or put numbers in boxes – and then get paid.

That is all the ***RdSAP*** system requires in order to provide the degree of accuracy and reliability promised by the ***Department for Energy and Climate Change (DECC)***.

It is not credible. It is laughable!

There is nothing written down to suggest that ***DEAs*** and ***EHS*** sub-contract surveyors will not act in the same way.

It should not be forgotten that the earliest houses to have insulation built in, now have what remains of a depth of fibreglass which is around 40 years old. Fibreglass as a material may have a long life. Its effective life is relatively short.

Fibreglass quilt has an inbuilt predisposition to "tire". To become sad and deflated over time. It loses its natural springiness. It can no longer hold the volumes of air pockets that it once did. It reverts back to its compressed form without voids. In due course, it becomes a poor insulator.

The laboratory measured U-value of virgin fibreglass insulation, itself an approximation, is very unlikely ever to have achieved its design duty in an older house loft. As much as anything, that is due to the awkward and unpleasant environment. At best, when it was newly installed, it would have been not much more than an act of faith.

Just because it is there, and is visible, does not mean that fibreglass insulation is still doing the job that it was meant to do. If it ever did. Similarly, the other insulating materials on the ***EHS*** survey list also deteriorate badly.

There is no evidence or guidance note anywhere which suggests that ***RdSAP*** calculations really reflect the state of that inevitable deterioration. There does not appear to be any field testing anywhere to establish a mature, in-situ U-value of spent insulation. Perhaps there never has been.

It is astonishing, that such a sophisticated system such ***RdSAP*** should assign a totally unrepresentative set of U-values to worn out materials **AS IF THEY WERE NEW**. There can be little confidence in the results that they come up with.

In that respect, both the ***EHS*** surveyors and ***Domestic Energy Assessors (DEAs)*** are landed with a methodology which is fundamentally flawed.

It is not the age of the house that matters so much as the age and condition of its insulation. It is the EFFECTIVENESS that matters. Little else does.

The resultant ***RdSAP*** calculation for each home is worked out via a worksheet usually on a hand held computer.

The ***RdSAP*** software default assumption seems to be that "insulation" *IS* fibreglass and vice versa. Whilst that might be a fair assumption, for homes built from 1965, it does not necessarily follow for homes built before that date. Nor does it follow for additional insulation added since the homes, ***ALL*** of them irrespective of age, were built.

The implications are that ***Energy Performance Certificates (EPCs)*** may be skewed, giving the wrong energy consumption banding. Home buyers could feel misled. That could lead to legal proceedings.

The ***EHS*** statistician far removed from where the multitude of data was gathered, and with little personal interest or technical knowledge, will multiply ***EHS*** Survey findings by many times *(1,375 perhaps)* to reach a mathematical conclusion upon which important decisions will be taken and strategic policies made.

The Coalition Government could easily be misled, as the cumulative effect may lead to wrong conclusions.

It does not require much imagination to realise how risk prone this process is. "Human error" is a useful scapegoat. There is no responsibility or accountability for the end result.

In the ***EHS*** Survey, out of 22 million homes only 40% would have had insulation of differing thicknesses when they were built after 1965.

Lofts, attics – call them what you will, but they are rarely pleasant places to go. They are mostly dark, dirty, full of nose bunging itchy fibres, dust and grit, cobwebs and maybe birds, mice, hornets. They are either stiflingly hot or bitterly cold, and are often awkward to enter.

To move about, it is often necessary to balance on narrow joists which often cannot be seen. One is always fearful of sticking one's leg through the bedroom ceiling below. It is useful to have the attributes of a trapeze artist and the dexterity of an ice skater. It requires concentration negotiating long forgotten boxes and other effects which have lain there for years like coffins in a cemetery. All of this usually by torch light or lantern.

The ***EHS*** surveyor charged with deciding the approximate thickness of insulation is unlikely to be motivated by an urge for precision. He or she will know full well that the likelihood of anyone *(if indeed there is anyone)* quality checking that answer is least likely to concentrate on what will almost certainly be the most inaccessible and least obvious of answers.

The reason that the thickness of insulation is an important issue, and equally importantly the failure of the ***EHS*** Survey to properly consider its condition, is that the eventual conclusion of this exercise and its conversion into terms of CO_2 emissions is of enormous strategic significance.

The ***EHS*** Questionnaire clearly recognises that insulation thickness can be extremely variable, even in one loft – there are 12 possible answers!!! Otherwise it would not ask for an approximation. Accurately working out an "average" is impossible. ***EHS*** surveyors working from a step ladder have no chance.

Approximation encourages guesswork or sloppiness. In the environment of an uninviting roof space, where constantly banging one's head is an occupational hazard, and where no-one is likely to check the answer, then approximation can be taken to extremes with no retribution. That is the basis upon which the ***EHS*** Survey works.

Similarly the condition of insulation is a vital factor in its efficiency. All of the insulating materials on the Questionnaire deteriorate relatively quickly. Some more than others. Yet the calculations being done by the statistician will not recognise this. They will "assume" it is brand NEW!

Questions NOT asked but should have been

Condition of roof felt or other under lining if any

The ***EHS*** questionnaire does not ask any questions about the roof under lining or roofing felt. Not to do so demonstrates a lack of understanding of how insulation behaves and condensation occurs in an older property. Condensation ruins fibreglass.

After fibreglass and loose insulation, it is this element, the under lining, which is the next most likely to deteriorate. It has a relatively short life. In older houses it may not exist at all.

By asking the right questions about the condition of roof felt or other under lining it is possible to predict the rate of decline of the nation's housing stock.

It is little different to the diagnostic process followed by doctors. Structurally, roofing felt is the "weakest link".

In medical terms, non-visible high blood pressure is known as "the silent killer" of humans. Hidden away, seldom seen, utterly ignored "roofing felt deterioration" is the equivalent in peoples' homes.

Once the roof lining starts to go, it accelerates the deterioration of the remainder of the structure. It also demonstrates a home owners neglect or indifference to essential periodic maintenance tasks. It is important that the government know this.

It has always been wrongly assumed that the under roof lining would last as long as the slates or tiles above it. That it would always provide protection for the delicate fibreglass beneath it. That is often not the case.

The condition of the roof underlining, or lack of it, has a direct bearing on the effectiveness of any form of insulation, particularly fibreglass.

Given that the majority of the UK housing stock is elderly, it becomes a strategic concern as to the necessary degree of eventual replacement by new housing.

The ***EHS*** questionnaire does not ask whether the roof is covered with slates or tiles (plain clay or concrete interlocking). Nor does it ask if the house has been re-roofed recently, or it remains as it was originally constructed. As a dwelling ages, the frequency increases of air gaps. Heat escapes through the roof more freely.

Unless they are extremely sophisticated *(which certainly does not appear to be the case - Author),* any ***RDSAP*** calculations made as a result of the ***EHS*** Questionnaire, cannot produce a conclusion which can be relied upon.

Like fibreglass, roofing felt suffers from fatigue. It oscillates like a sail as the wind passes over it, sucking it up and down under the roofing tiles. It reduces its working life relatively rapidly. Eventually it sags and/or rips. It is not uncommon for felt to be left ripped and dangling for

years. It allows wind driven rain to drip onto deteriorating fibreglass quilt, using it like a sponge, accelerating the decline of the dwelling's defences. Progressively losing more heat.

Although what we term roofing felt has been in use for 150 years, it was not commonplace in the UK until the late 1930s.

Victorian and Edwardian domestic roofs saw "torching" employed on the back face underside of slate and tile roofs. Torching was a continuous triangular sectioned fillet of stiff strong mortar. It was applied in much the same way as random stone wall pointing. Along every roofing tile batten to keep out wind driven rain, snow and draughts.

That was the time honoured traditional methodology. It relied on an abundance of cheap labour and many apprentices who were made to learn their trade over many years. The Great War of 1914 – 18 saw many of them killed and maimed.

Building activity did not resume until the gradual recovery after the Great Depression which was then stifled by World War II. The Public Health Act 1936 consolidated guidelines for local authority Bye-Laws as towns and cities continued to grow. It wasn't until 1966 that the national ***Building Regulations*** provided a consistent framework.

By then, labour was no longer cheap and was in short supply. Mass production of less costly roofing felt had evolved and was readily available. It became the norm as a secondary line of protection against the elements. It encouraged the increasing use of relatively inexpensive factory mass produced concrete interlocking roofing tiles.

The ageing, and often poorly maintained Victorian housing stock was beginning to show signs of wear and tear. The early 1970s saw a period of many innovations. Plastic rain water goods, factory made roof trusses, balanced flue central heating boilers and microbore central heating pipes all made their debut. All new houses were required to have a 2" (50mm) layer of fibreglass covering the floor of their roof space.

North Sea oil and gas and the Balance of Payments crisis were the predominant forces of the day. Climate Change hadn't been thought of.

Today, there are still many older houses that do not have felt under lining. Usually their torching has totally or partially crumbled away. It will have dropped on top of badly deteriorated, disintegrating fibreglass quilt *(probably untouched since someone made a token effort 30 years ago)*.

Today, it is generally recognised that the quality of workmanship and supervision are not of the same high standards of yesteryear. Building contractors ceased to employ tradesmen "on the books" years ago. Whilst specifications and standards are applied to NEW buildings, the same duty of care is often sadly lacking in repair and maintenance work on EXISTING properties.

Dormers (chalet roofs) and otherwise Hard to Treat Homes

The ***EHS*** questionnaire did not ask anything about dormers or chalet roofs as they are sometimes known, and yet strictly speaking it should have. Why?

Dormers (chalet roofs) come in ***the Hard to Treat (HTT)*** category as described in ***A Study of Hard to Treat Homes (2008).***

The Summary says:-

"..there are 9.2 million dwellings (**43% of the total stock)** in **England** considered to be ***HTT*** ".

".. **75% of all homes were built before 1976**....."**.

*(That was when **Building Regulations** required them to have 2" (50mm) of fibreglass quilt across bedroom ceilings. Today it is 5 times more than 40 years ago - Author)*.

The Study referred to the ***EHCS*** dataset of 2002 – 2004. Given that their predecessor found that nearly half of the total housing stock is considered ***HTT***, it is astonishing that the ***EHS Survey*** did not attempt to go into that problematic segment in more analytical detail.

The Study defines "A ***'Hard to Treat'*** dwelling as one that, for whatever reason, cannot accommodate 'staple' or cost-effective fabric energy efficiency measures..." *(by that they mean fibreglass! - Author)*

The Study refers to the definition given by the ***Energy Saving Trust (EST)***. They give by way of example "...schemes such as ***Warm Front***..."

"Officialdom", particularly the ***Energy Saving Trust*** is blinkered by a biased obsession towards fibreglass. That is a too narrow (perhaps ignorant) a view held by the uninformed who think that fibreglass *IS* insulation and vice versa. It displays a complete lack of practical and technical knowledge.

In all of the media material produced by the ***EST*** there seems to be no recognition of anything else. Ignorance or ulterior motive? They do seem to be technically illiterate!

In the case of ***Hard to Treat Homes***, a much more practical, down to earth approach would be more constructive if it is not to perversely encourage perfectly good, attractive homes into eventual dilapidation. Government statistics class dormers as untreatable, because they have inaccessible voids which cannot be filled satisfactorily with fibreglass. That is without removing and replacing roof coverings at enormous expense.

Older dormer construction has unavoidable heat losing characteristics which are different and more extreme than lofts or attics.

Dormer roofs constructed before 1970 will almost certainly have no insulation. Their vast roof surface areas will probably be losing 80% of their warmth. They will also suffer from disproportionate solar gain in summer months as global warming takes hold.

Dormer roofs constructed from 1970 - 2000 will probably have some insulation trapped in their sloping ceilings and dormer cheeks. By now it will be of inadequate thickness. It may well have slipped or otherwise moved. Inevitably, there will be hidden gaps and voids.

However picturesque they may be, as well as being costly to heat, dormer roofs can be uncomfortable to live in. As far as heating bills are concerned, it could be like living in a shed.

Nowadays, dormer roof voids can be treated with rapid setting polyurethane foam. It is carefully injected from inside through the plasterboard (or lath and plaster in the case of much older properties) ceilings and walls.

The Carbon Footprint Insulation Company Limited with their **Warmer Dormer** system are the specialists in that field. It can economically be done a room at a time.

The cost cannot be compared with fibreglass quilt. That is not a viable alternative. It can't be done. Nor can it be compared with cavity wall insulation for the same reason. In the medium to long term, it is far cheaper than continuing to waste money on escalating heating bills.

It is clearly evident that up and down the country there are a significant minority of dwellings which have this attractive design characteristic. Many of these properties are *NOT* hopeless cases to be abandoned and unworthy of further consideration. They play a vital part in making England look the way it does.

For that reason alone, they are worthy of the effort to conserve them. To think otherwise would lead us back to the discredited bland social architectural ghettos of the 1960s – 1970s.

It is in the national interest to devise a scheme whereby these older dwellings can be brought up to an optimum level of insulation rather than give up on them merely because fibreglass can't do the job.

Without corrective action, as regulations tighten, only dormer roofs constructed in recent years will have any likelihood of ever meeting increasing insulation standards.

With the compulsory introduction of ***Energy Performance Certificates*** (***EPCs),*** the sale valuation of such a home will increasingly be adversely affected. Their energy efficiency will be comparatively lower to other house types.

If, as the possibility exists, energy INEFFICIENT homes eventually become penalised by way of higher Council Tax, those otherwise visually pleasant buildings may become less marketable. That could be emphasised where, in rural areas without natural gas, "cottage style" homes are reliant on more expensive LPG or oil.

This might eventually have planning implications by encouraging ill-maintained eyesores in the very hearts of communities such as those with conservation areas.

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CHAPTER FIVE

FAR LESS FIBREGLASS IN THE FUTURE

PHASE TWO 2010 – 2050

Proven Insulation foam does what fibreglass can't do!

Fibreglass was a Phase One (1965 – 2005) material. It has had its day.

The new ***EU Directive (2010)*** marks the beginning of Phase Two. It is the end of fibreglass dominance of the UK domestic insulation market. It sets new criteria by which insulation performance will need to be measured on the troublesome majority of older homes.

If the incoming Coalition Government is to honour the UKs current commitments, then the more stringent procedures which they will be obliged to adopt will uncover the inadequacies of present arrangements. It will expose the mistaken over reliance on fibreglass in meeting domestic CO_2 emission targets.

Already on NEW homes, ***Building Regulations*** now require rigorous testing for air tightness. Clearly that is the only way in which zero carbon targets will be met on EXISTING homes.

As far as air tightness goes on EXISTING homes, only insulation foam can make them as good as NEW. Nothing else can!

Those NEW dwellings will not replace the existing housing stock quickly enough to meet the outgoing Labour Government's over optimistic zero carbon target for ALL dwellings by 2050.

The only way that will be achieved easily and quickly is for extensive use of sprayed and injected insulation foam in the roofs and lofts of older and nearly new houses. Insulation foam retains heat because it seals all gaps and fills all voids. It is permanent. It is durable. It does not break down, powder or flake under normal conditions. Once set within seconds, it neither shrinks nor swells. It does not disintegrate.

Its cellular construction is similar to timber so it can be said to "breathe". It is virtually waterproof.

It is regrettable that insulation foam is not recognised by the Labour Government's ***RdSAP*** software system for creating ***Energy Performance Certificates (EPCs***).

Arguably, insulation foam is the one solution ideally suited to enable the government of the day to progressively meet its CO_2 emissions targets via the cumulative ***EPCs*** collated on the ***DCLG Central Register***. It would also provide correct and actual evidence to support its reporting to the EU authorities in accordance with ***EU Directive 2010***.

Insulation foam has been used as a "home improvement" in the UK for 40 years. In that time over 160,000 older house roofs (mostly in England) are reported to have been restored, stabilised and insulated. A number of companies continue to offer that service. **The Carbon Footprint Insulation Company Limited** being one of them.

It is not only well proven here on older properties, it is increasingly used all over the world in new construction where their climates are far more extreme than ours.

In its early days in the UK it was featured on Tomorrows World on BBC TV. It has since been formally recognised by ***BBA Certification***. It is covered by ***Accredited Details*** in the latest edition of ***Building Regulations***. It enables a loft to be sealed, keeping out draughts, keeping warmth in. It prevents condensation. It can also be used against the transmission of noise.

Retrofitted insulation foam is sprayed onto the back of slates, tiles or roofing felt between timbers at rafter level. It can be applied in any thickness to vertical, sloping and horizontal surfaces such as ceilings.

Insulation foam can be injected into inaccessible voids such as existing dormer roofs and other ***Hard to Treat (HTT)*** conditions to add to the embarrassment of those technically unaware "experts" who only know of fibreglass.

Not only does foam better insulate the existing roof space, it repels solar gain. It also renovates and repairs the outer roof covering which neither fibreglass nor any other insulation solution can do. It reinforces, strengthens and supports ailing roofs like the plaster cast on a broken limb. It is invaluable in maintaining the character of the community, preserving listed buildings and conservation areas.

Insulation foam and fibreglass quilt are not directly comparable. They are distinctly different. Fibreglass is an "open cell" material. It lets warm air pass through. It loses heat. Insulation foam has a closed cell construction. Its voids are sealed. It keeps warm air in.

Insulation foam is proven to be far superior to virgin fibreglass in every respect where official comparisons have been made.

Insulation Foam is many more times as effective as badly fitted, ageing and deteriorating fibreglass quilt. Over time, insulation foam becomes comparatively more effective and a far better return on investment.

For simplicity, think of insulation foam as a vertical solution and fibreglass quilt as a horizontal solution. They can complement each other well when forming a room in a roof or a useable space for storage or other purposes.

Unlike fibreglass, insulation foam has multi-purpose applications.

Insulation foam is a polyurethane material. The science is over 100 years old. It was originally developed by the Germans as a synthetic rubber for use in military vehicle tyres and suspension systems in World War I.

Its commercial properties were not exploited until the 1960s as the "plastic revolution" evolved in the USA. Insulation foam arrived in the UK about 15 years after fibreglass.

Polyurethane foam has become one of the most widely used, but largely unrecognised materials in almost every facet of modern society. It tends to be used as a component part of something else which *IS* recognised e.g. furniture; vehicles etc. In one form or another, virtually every home will have something containing polyurethane.

Polyurethane insulation foam is increasingly used in its own right in manufacturing and building construction all over the world. Reinforcing, stabilising and insulating roofs is but one example.

Insulation foam installation is a chemical process requiring appropriate equipment. It has Health & Safety requirements which must be followed. Although importers take an opposite view, in this writer's view, it is NOT suitable for DIY use in the UK.

Insulation foam used in dwellings is certified fire retardant. Where it is used to form a room in a roof, it should be covered with plasterboard over rafters. That creates a sandwich with a still air filled insulated void between the two materials.

Nowadays, there are many insulation solutions. Insulation foam is the only one which is durable, and permanent. Fibreglass can't do what insulation foam can do.

No other insulation solution can do what insulation foam can!

Demonstrably, it is the most versatile solution. Long term, it offers the best value for money.

Insulation foam dramatically saves on domestic heating bills. It saves on periodic roof maintenance costs. It increases the value of the home. It makes the home a better sales proposition. It enables the loft to become a useable space for you to use for any purpose you choose. It enables home owners to remain in their homes when they might otherwise feel obliged to move to gain more space. It increases the versatility of the nation's housing stock.

Insulation foam pays for itself!

The Carbon Footprint Insulation Company Limited are specialist sprayers and injectors of fire retardant rapid rigid setting polyurethane insulation foam. Learn more at:-

http://www.myroofinsulation.co.uk

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MAKING YOUR LOFT USEFUL

Over many years, the design and usage of homes has evolved to suit the way we live.

For example, in Tudor times, the Hall was a grand space where most things happened. Today it is not much more than a passage linking rooms with specific functions.

The drawing room of the 1950s was the withdrawing room of a century before. The Victorian parlour is now the TV room, whilst the garage is a "garage" in name only. Today it can be all sorts of things, although unlikely to be the "home" of the family car or cars, which now stay outside in all weathers.

Because of cost, new homes are built to smaller dimensions. They are "compact" like a caravan. Everyday storage units are "fitted". The imposing heirloom "real wood" sideboard and wardrobe went to the tip long ago. They have been replaced by self assembled, flat pack reconstructed veneered chipboard and plywood made from wood waste and off cuts.

In large old houses, in towns and country alike for 200 years, servants' quarters were in the attic or garret, as it was more frequently called. By contrast today, in cities, the well off fall over themselves to live in the "penthouse" at the top of a building.

The Victorians loved "clutter". Their possessions were always on display with pride. Today, the opposite tends to be true. Possessions have a "shelf life", a temporary use. When they are no longer needed, they could go to a tip, in a skip or be put away. Often the only place to put things is in the roof. Because it only has 4 letters, we will use the term "loft" to mean attic, garret or roof space.

Making your loft clean, dry, and useful in any way adds value to your home. It will more than pay for itself. It is an amenity. When eventually you move out, whoever moves in "...will have nowhere to put anything" – unless you give them one. It might sell your home for you.

At worst, a DIY storage platform for less than £100, or a full blown professional loft conversion for £30,000 or more, could prove more than cost effective. But it requires careful thought to make sure that it does not break the law and that the outlay can be recovered if the house has to be sold in a hurry in a volatile market.

Where minor internal alterations are contemplated in an existing dwelling, if the space is to be used for ***non-habitable*** purposes, it is not usually necessary to get ***Building Regulation*** approval.

Provided there is no permanent staircase from the floor below, it is difficult to see how a usable roof space could be described as truly ***habitable***.

It would be virtually impossible for an outsider to monitor the "permanence" of a fitted loft ladder left in its temporary down position.

There is normally no need to apply for Planning Permission for a roof window on a rear or a side elevation.

Typically, Victorian and Edwardian terraced houses ideally lend themselves to greater use of their roof spaces, as well as being in greater need of roof repair and insulation. That is because they were normally built with a 45 ˚ pitch and have a wide span from front to back. Consequently they can have a more than adequate headroom and floor plan area.

Once you get into having to satisfy local authority planners and get building regulation approvals, the cost implications go into a different league. But you can maximise what you have got without having to do that.

Bedroom ceiling joists are typically 4" (100mm) deep. Depending on the span and type of their supporting structure, they can vary between 3" (75mm) and 6" (150mm).

When ***Building Regulation*** requirements were upgraded, fibreglass was required to be deeper or thicker than those joists. Those who wished, or felt obliged, to bring their homes up to ***Building Regulation*** standards, faced a dilemma.

If home owners wished to board their lofts, either in whole or part, they would need to fix the boarding onto the top of the timber joists. They could not do that if fibreglass was required to protrude above that level.

In theory, one way around it was to put timber counter battens, of an appropriate depth above the ceiling joists to accommodate the additional fibreglass depth required. Practically, it was only going to be sensible to do this once. Even for the most dedicated of DIY exponents.

Who is to say that ***Building Regulations*** will not be further upgraded in the future, requiring fibreglass insulation to be thicker still?

Effectively, ***horizontal*** fibreglass quilt insulation had reached its limits.

The major disadvantage of raising the level of boarding is the resulting reduction of headroom. This is a vital factor in deciding to do anything in a roof space. For example, the minimum floor to ceiling height of a ***habitable*** room, which building inspectors would look for in a loft extension application is 7'6" (2.31 metres). By way of comparison 6'6" (2.0 metres) is the acceptable clear height of a doorway, across its 3'0" (0.9 metres) width.

The home owner needs to take care. If the supposedly habitable room does not conform to ***Building Regulations***, a Valuation Surveyor will not recognise that extra facility in his pricing of the property. It would not be wise to spend too much if the outlay could not be recovered.

Fibreglass quilt laid over the top of ceiling joists prevents floorboards being fixed onto the top surface of the timber ceiling joists. To all intents and purposes, this prevents the roof space from being used for any useful purpose.

It also makes any access to remote positions of pipes, tanks, cisterns, boilers or electrical equipment such as bedroom and bathroom light fittings, aerials difficult and unsafe.

To overcome the problem, for anyone wishing to make their roof space useable, it became necessary to position insulation ***vertically*** on the inside slopes of roofs between rafters.

The ideal solution to using both insulation foam and fibreglass quilt. Fibreglass quilt laid between ceiling joists (typically 4" (100mm) deep and to spray insulation foam to a depth of 3" (75mm)onto the sloping underside of roofing felt, or directly on to the back of slates or tiles, between rafters (typically 4-6"" (100-150mm).

Because insulation foam in design terms is at least twice the duty of fibreglass. The 3" counts as 6" in calculations. Thus 4" of fibreglass + 3" of insulation foam = 10" (270mm) equivalent of fibreglass insulation which satisfies ***Building Regulations*** in NEW dwellings.

The loft can then be boarded across the ceiling joists. In so doing it will encapsulate the vulnerable fibreglass to protect it, enabling it to give the maximum duty expected of it.

That combination allows draughty ventilation openings to be closed off *(without violating **Building Regulations**)*, creating a sealed environment reducing heat loss to the absolute minimum.

In older houses with no roofing felt, it stabilises and reinforces the slates and tiles so that they can't fall off, maintaining the external character in keeping with its surroundings.

In that way it is ideal for use on listed buildings, as the character of the building is preserved and enhanced for all time.

In order to get things clear in your mind - if it is feasible and worth it, do the following.

Firstly, establish if you can stand up in the centre of the loft with a bit to spare. Victorian and Edwardian terraced houses for example, and there are still many of them, are deep front to back. Typically the distance between the insides of the front and back walls is usually about 23'- 0"(approx. 7.00 metres). The roof pitch is usually 45˚.

That means that from the bedroom ceiling line to the underside of the ridge, in the centre of the roof, allowing for ceiling joists and boarding on top of the joists (say 6" or 150mm), there should be a clear height of about 11' 0" (approx 3.38 metres). The normal clear height of a bedroom is 7'6"(approx. 2.31 metres).

At the highest point in the loft, it is likely that a minimum height of 7'6"(2.31 metres) can be relied upon for a horizontal distance of 7'0" (approx. 2.15 metres). The typical width, side to side of a terraced house between inside walls is usually 16' 0" (approx. 4.92 metres).

If the inside dimensions between walls is 23' 0" x 16' 0". The maximum area of a storage platform or even a room in a roof is 368 sq. ft. (34.4 m^2). Of that, just under 50% is at the full height of the bedroom below.

To visualise that, find a spot on the ground floor with all internal doors open so that you can see the inside walls in each direction. That is the mirror image of your loft floor area.

A roof window on either a rear or side elevation, does not normally require local authority permissions. However it needs to be fitted by a professional tradesman.

Floor boarding and a loft ladder (preferably folding wood) and simple electrics (essential to have a qualified electrician) can quickly, easily and cheaply transform the unused part of your house into a valuable addition.

By getting the slate or tile roof covering checked and repaired, then spraying certified fire retardant insulation foam between the rafters which are then covered by plasterboard to provide a finished surface, your house is instantly at least one third bigger for an outlay of less than £7,000 or so. On that basis it should more than pay for itself.

The configuration of each house roof varies considerably. But at least this thought process gives you an idea of what you could achieve for any particular outlay.

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