How To 'Save A Fortune' Designing & Building Superb Eco-Friendly Homes ~ Quickly & Simply ~ Using The Best 'Tried & Tested' Methods!

The 'Essential Guide' For Anyone Thinking Of Building Timber-Frame Houses In The UK *OR* Irish Republic.

Ignorance is supposed to be 'bliss', but did you know that the 'quality' of the design work can ~

- More-or-less halve or double the basic 'building costs' AND 'carbon-footprint' of any new house WITHOUT changing the size and/or accommodation of your proposed new home; OR the quality and type of fittings and/or finishings; OR even the method of construction to be used?

- Furthermore it can have a similar effect upon future 'heating bills' and all the related 'greenhouse gas' emissions WITHOUT needing to change the method and/or type of heating and fuel; OR the type and/or thickness of insulation incorporated into the dwelling; OR the method of construction that is used?

You will once you've read this book! And you'll learn how the method of construction chosen can ~

- Halve or double BOTH the basic 'carbon-footprint' AND the basic 'building costs' of any new home; even if you DON'T change the proposed design OR the quality and type of fittings and/or finishings!"

Which just goes to show how very expensive being kept in ignorance can be!

Using The Knowledge = Superb Eco-Friendly Homes Designed & Built At Easily Affordable Prices!

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Author's Note About Using This Book:

There is always a temptation for readers to jump straight to particular sections that appear more 'interesting' or succinct; relative to your own particular interest; which increases the risk that you might be tempted to 'skip-over' sections and thereby miss out on vital information; however I hope that the absence of a chapter index and the compact and concise nature of this e-book will make it easy for you to avoid the temptation!

Cost and Eco-Credentials

If there's one thing that affects virtually everybody; it's the sheer cost of living in the UK and a huge part of that is the cost of building, buying or renting residential property.

- There are numerous historical and present day examples of buildings created with the primary intention of making a 'statement' about their creators; whether that be the architect responsible for the design or the owner/occupier who commissioned the building. Almost without exception the buildings were/are deliberately extravagant and imposing to reflect the vanity of people whose main concern is that their building should cause everybody else to stand and gaze in awe at the physical manifestation of their 'social status' and/or wealth!

Of course; given sufficient wealth, cost becomes irrelevant, but for most of us; the main concern is how can we afford to have the house we want? We are also becoming more aware of the need to conserve the Earth's dwindling resources by switching to the use of renewable and/or sustainable materials. Similarly there is great concern about how much 'greenhouse gas' is emitted simply to heat the UK's buildings.

None of which is helped by the general perception within this country that anything that is healthier or more eco-friendly will inevitably be more expensive too ~ **IT ISN'T INEVITABLE!** As George Gershwin's well-known song from "Porgy & Bess" ~ "It Ain't Necessarily So!" ~ implies; such perceptions are misleading!

How else do you explain the following experience?

EXPOSING THE 'MYTHS'!

Built back in the mid 1970's; this is a perfectly normal-looking 'traditional' four-bedroom, two-bathroom, detached house that was designed and built in an eco-friendly way that cost less than HALF-THE-NORMAL-CONSTRUCTION-PRICE to get it built and yet; without being updated; over 25 years later, it was still comfortably exceeding the (then) current Building Regulations thermal insulation requirements!

But don't bother asking the so-called "experts" how to do it ~ because they won't know! That's what makes that house and this book so unique ~ it tells you how almost anybody could build such a house!

Furthermore; the 'open-market' value of the property upon completion was more than double the total cost; i.e. buying the building land + all the construction costs + the associated financing costs! Being able to achieve such an outcome was a truly excellent result that proved the vast potential for huge cost-savings using eco-friendly designs and building methods within the 'mainstream' housing market whilst also producing houses with substantially reduced 'carbon-footprints' and major long-term ecological benefits!

- Incidentally; with minimal effort and/or cost that first house could still be easily upgraded to meet and exceed all the current Building Regulations thermal requirements too!

What was started all those years ago; has been steadily developed and streamlined to improve design efficiency and simplify the eco-friendly building methods so that it is still at the 'cutting-edge' for maximising cost-savings and ecological benefits for house-builders and 'self-builders' alike. Minimising the cost allows

house-builders to maximise their profitability and 'self-builders' to actually build what they want within budget ~ how much better it is when the best way to do it has huge ecological advantages and benefits too!

- **The eco-friendly design and construction methods used today; allow house-builders and self-builders to physically match or exceed the theoretical thermal and airtightness performance of 'SIPS' constructions, etc. whilst avoiding all the design restrictions such constructions normally involve! Build costs are still less than HALF-THE-NORMAL-CONSTRUCTION-PRICE and the construction methods used are significantly more eco-friendly than any factory-manufactured version of similar houses can ever be!**

There are truly few things more satisfying in life than knowing that you have just successfully halved the cost that would otherwise have prevented you from ever being able to afford the house you wanted to build or have built!

- But what is even more satisfying is knowing that you have not just reduced both the construction costs and the future running costs of a new home, but you have also substantially reduced the 'carbon-footprint' and future 'greenhouse gas' emissions related to that new home too!

As the old saying goes ~ "It isn't what you do, it's the way that you do it" ~ that really makes the difference! This e-book is all about showing you a proven, tried and tested way to reap the maximum short and long-term financial benefit for yourself whilst helping to minimise the ecological impact of new homes.

Don't get distracted by biased or ignorant people!

Much of what you will read here may seem like good, old, plain common sense. The reality is that it is based upon over 35 years professional and 'hands-on' self-building experience driven by a desire to do things quicker, simpler and cheaper to reduce the cost and effort involved to design and build high-quality houses. Like most people; I'm basically lazy and I don't see the point in making things more difficult than necessary! To that end; I have constantly looked at the best building methods at home and overseas, physically trying them out, refining those that work and dumping the rest.

- When you tackle house-building as a 'solo' DIY hands-on exercise on an extremely limited* budget; in your spare-time, with a construction period measured in months rather than years; it's amazing how it focuses the mind to find out what works and what doesn't! (*I used a bank overdraft!)

Whilst my knowledge and experience appears to be rather unique within the UK; it doesn't mean that there is anything unproven, untried or radical about what I do ~ in fact the finished construction is virtually identical to how factory-produced timber-frame houses are fabricated both within the UK and abroad ~ but with the huge advantage of using a 'bespoke' approach to the structural design so that it is much more efficient by reducing the fabrication costs and avoiding the wasteful use of materials inherent with the 'standard' one-size-fits-all structural design-work that the manufacturers use! The original method of construction I used was based upon 'mainstream' North American methods which were already achieving productivity levels 200% – 300% better than traditional UK house-building methods forty years ago! The method has steadily evolved and become much more efficient over the decades. It has always been significantly more eco-friendly as well as substantially cheaper than any other 'mainstream' building method in the UK and these days houses can be designed and built to match the thermal performance of anything achievable with 'SIPS' construction ~ at around 50% of the cost!

- I'm all too well aware that my unique (in UK terms) knowledge and experience flies in the face of 'popular opinion' within the UK's house-building/self-build industry. Fortunately; need and necessity have always driven me to ignore all the typically negative advice; whether from professional, trade or commercial sources; that is primarily intended to steer people away from anything that (a) the 'adviser' doesn't understand or know how to do, or (b) might lead to a loss of business for them!

BEWARE: Acting upon negative advice will invariably steer you away from finding the cheapest, most efficient, solution to achieving your objectives and towards the solution that best suits the adviser's own objectives! (In that context; it doesn't really matter whether the advisers are biased or simply oblivious to their own ignorance!)

- The **ONLY** time that negative advice is worth listening to; is when it comes from somebody who has personally tried to do the same thing and has then found a better way to do whatever it is!

So have 'fun' next time anybody tells you something; isn't possible, can't be done, or isn't recommended!

- See if they squirm when you ask them; have they ever actually tried to do it; e.g. ask the heating specialist whether they have ever assessed how much cheaper it might be to simply increase insulation levels; instead of installing their 'recommended' heating system; ask the builder or architect whether they have ever been involved with designing and/or building timber-framed houses that didn't get fabricated (at great expense) in a factory? (If they are honest; they'll say no!)

FACT: The vast majority of luxury timber-framed houses built around the World are fabricated on-site; even in Canada. (Historically; over 200,000 such homes are built by 'DIY' enthusiasts every year in the USA alone ~ with the overall number fabricated on-site exceeding 3 million every year worldwide!)

As already mentioned; there is nothing unproven, untried or radical about anything discussed in this book ~ even though it shows how adapting 'mainstream' house-building methods from overseas has dramatically driven-down 'build' costs and radically improved the eco-friendliness of new houses built within the UK.

"The world is full of people quick to tell you how something cannot be done ~ and professional people can be just as guilty of doing that as anybody else ~ but once you recognise that these people have "closed minds" about "everything they cannot do"; you will realise that most things actually can be done, you just need to find somebody who actually is capable of doing them!"

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But before we get too involved with eco-friendly construction methods; we'll start by looking at how the 'quality' of the design work involved can seriously affect the 'build' costs, the 'carbon-footprint' and related 'greenhouse gas' emissions irrespective of how the house is eventually built; i.e. the way that good, eco-friendly design work can drastically reduce the 'build' cost and ecological impact of any new house!

How Eco-Friendly Are Your Design Ideas?

FACT: The more eco-friendly your design is; the cheaper it will be to get the house built, and the lower the 'heating costs' and related 'greenhouse gas' emissions will be for the entire life-span of the property! (**Remember that fact because the opposite effect is also true!**)

Can you afford the 'bespoke' house you want?

The best place to start designing any house is by deciding exactly what accommodation is required and then defining those accommodation needs; i.e. what size of rooms you want and their prospective usage; e.g. older people with visiting children/grandchildren will probably benefit from having a ground floor 'ensuite bedroom' with the 'guest' bedrooms and bathrooms, located upstairs. Relevant future needs should also be identified; a couple may not need to have a 'family-sized' home initially, but it can be beneficial to build it anyway, but to keep the initial 'build' cost down by only fitting out and finishing the ground floor accommodation, leaving the first floor accommodation to be done later when more space becomes necessary for the growing 'family'.

- The outcome should be a specific set of accommodation requirements including any essential needs in terms of initial accommodation and/or ground floor accommodation, etc. At this stage; it should also be possible to work out the approximate ground floor and total floor areas required ~ don't forget to allow (say) 15% extra for circulation space ~ and dividing the total floor area into the available 'build' part of the budget will give the maximum 'overall' cost per m^2 that you can afford for the new house. (**NB:** If you are proposing to leave the fitting out and finishing off of part of the accommodation until a later date ~ only assume 50% of the floor area involved when calculating the total floor area for initial costing purposes.)

At this point; you will already know whether the accommodation that you want can be built within your available budget; thereby allowing you to proceed or re-think the project accordingly.

Calculating the 'build' and/or 'land acquisition' budgets!

Whatever overall project or development budget figure is available; the first major outlay will normally be for land acquisition.
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- If the land has already been acquired then the purchase cost is a finite figure and the only other 'land' related cost to consider is for any extraneous development costs that may arise in order to bring services on-site and/or overcome poor ground conditions, etc.

However; many 'self-builders' and builders will be starting from scratch; i.e. they can assess the accommodation requirements of the house they want to build and thereby arrive at an approximate 'minimum' build budget which can be deducted from the overall budget figure to leave a balance that represents the 'maximum' that can be spent on land acquisition.

- In the case of speculative development projects; it is normal to start by assessing the likely 'sales return' for the proposed type of house; then deducting selling fees and the required profit margin to arrive at the maximum development budget figure from which the approximate 'build' cost can be deducted. The balance that is left is nominally the 'land acquisition' budget; however a 'cash-flow' forecast has to be prepared to calculate the overall financing costs; irrespective of whether money is borrowed or not; to cover the land acquisition and construction costs over the course of the development and that figure is also deducted to leave a net figure available for land acquisition.

Calculating the actual 'land acquisition' cost!

Building plots and development sites come in all shapes and sizes but, for practical purposes, the 'land acquisition' cost includes everything that is required in order to be able to build 'normal' houses on the site; i.e. the cost of getting services to the site, the cost of dealing with sewage disposal on or off the site, the cost of overcoming poor ground conditions and, of course, any rectification work such as dealing with old buildings, foundations, contaminated soil, etc.

- The speculative builder will work out the cost of all such extraneous items, add-in site acquisition fees and deduct the total from the net figure available for 'land acquisition' to reach a 'maximum' economic price for buying the land; before negotiating hard to get the actual price down because of the extraneous 'difficulties' involved!

- Self-builders also need to work out the cost of all such extraneous items, add-in site acquisition fees and deduct the total from the available 'land acquisition' budget to calculate their 'maximum' viable purchase price; before they too start negotiating hard to get the actual price down because of the extraneous 'difficulties' involved!

What you should always remember, when designing any new property, is that none of these extraneous costs will add value to the finished property; i.e. the value of the property isn't dependent upon how expensive the foundations are, or how much it cost to connect to mains' electricity, sewerage or water.

Expenditure upon any such extraneous items is only incurred in order to enable the property to be built where it is ~ but whatever the location; the property's value at that location will be the same whether it involved spending extra money or not!

- It is simply a matter of common sense that when deciding how to design any house that is to be as inexpensive and eco-friendly as possible; you must always spend as little as possible on everything and anything that cannot be seen or used; because it never adds value to the finished property!

As you will see later; applying such simple common sense design principles can have a major impact upon reducing the 'build' costs and the 'carbon-footprint' without loss of amenity or value to the finished property.

How eco-friendly do you want your new house to be *OR* do you just want maximum value for money?

Actually it doesn't matter which way your inclination takes you because the more eco-friendly your house design is ~ the lower will be the construction cost, the 'carbon–footprint', the future 'running costs' and related 'greenhouse gas' emissions! So either way; it's a "win-win" situation for everybody!

Never forget that the converse is also true; i.e. the less eco-friendly your house design is ~ the higher will be the construction cost, the 'carbon–footprint', the future 'heating costs' and related 'greenhouse gas' emissions for the entire life-span of the property!

Most designers seem to ignore that simple fact; hence the number of over-priced, ecologically damaging houses built in the UK. (**NB:** Percentage-based 'fees' are automatically higher if the project cost is higher!)

Although totally impractical; the 'nil' cost, most eco-friendly, 'home' you could ever have is simply to live and sleep on a beach or in a field, etc. literally under the stars! Nothing is built so there is no monetary *OR* ecological cost involved ~ although other aspects of such 'living' may not be so environmentally friendly!

At the other extreme is the deliberately ostentatious 'home' designed with the primary intention that it should impress all and sundry with the 'social status' and/or wealth of the person concerned; unfortunately, with total disregard for the environmental impact and ecological damage caused by its construction and use.

- Once again; it is simply a matter of common sense that when deciding how to design any house to make it as inexpensive and eco-friendly as possible; you should always minimise what is required in order to create the accommodation you want ~ rather than designing a house that (even with exactly the same accommodation, quality of fittings and finishings, method of construction, etc.) requires a considerably more extravagant structure; thereby needlessly increasing the 'build' cost, the 'carbon-footprint', the future 'heating costs' and related 'greenhouse gas' emissions!

The moral, as far as house-building is concerned, is that for any given accommodation requirement; 'less' will always be more effective, both in terms of reducing 'build' costs and in minimising the ecological impact of the house.

- Good quality design-work; i.e. design-work that minimises the basic 'build' cost and ecological impact of a new house; puts you in control, it allows you to decide exactly how much you spend on things that will directly add value to the property and/or the pleasure of living in the property. Similarly; it puts you in control of how environmentally-friendly the house will be in terms of its initial 'carbon-footprint' and its ongoing heating related 'greenhouse gas' emissions!

NB: If any house is to cost more than necessary or to be less eco-friendly ~ it should be through your specific choices and decisions made knowing the likely cost and ecological consequences involved; instead of being something that generally happens by default in the UK; due to the designer's ignorance!

Finding the necessary 'quality' of design-work is often a major problem!

The underlying mistake made by virtually everybody is that they assume that once they have decided the size and extent of the accommodation required in a house; the 'build' cost is only affected by what materials are used to build the house and what 'quality' of fittings and finishings are specified!

- Amazingly; that mistaken presumption is perpetuated and reinforced by the industry's professional consultants; i.e. the architects and quantity surveyors (or self-styled "construction cost consultants" as they like to call themselves these days!) whose standard approach to any 'over-budget' project is to tell the client that they (the client) need to agree to some reduction in the size/scale of the project; i.e. lop a bit off; and/or agree to cutting-back on the 'quality' of the proposed fittings and internal/external finishings currently specified ~ as if being over-budget is somehow all the client's fault for being over-ambitious relative to the amount they can afford to spend!

Understandably; clients are very upset when told that their proposed house will now have to be an inferior version of the cherished 'dream' home they have emotionally 'nurtured' for so long!

- What makes matters much worse is that the typical response; used by most professional consultants faced with an 'over-spend'; is that if the potential over-spend had been spotted earlier, it would simply have meant making those same 'cuts' earlier. Understandably; that isn't normally much consolation to any client; nor, unfortunately, is it generally true.

The real problem is virtually always a lack of 'quality' in the design-work due to deep-rooted 'flaws' in the design process! Following the sequence of events already outlined is sufficient to ascertain whether a client's proposed project is basically affordable or not; and once you know you are starting with an affordable project ~ how can any professional designer then allow things to get so far out of their control?

As a professional consultant myself; I have always worked on the principle that a consultant's job involves advising the client at every stage; not waiting until everything is designed and detailed and then blaming the client for being too ambitious if it turns out to be over-budget!

- Clients have a right to expect their design consultants to know what is or isn't affordable within any given budget and to advise them accordingly; i.e. as things progress.

Unfortunately; UK clients are also led to believe that professionally-qualified consultants know how to design projects in the most cost-efficient way to maximise what they (the client) can get for their budget; which is totally at 'odds' with the industry's standard 'slash the size' and/or 'slash the quality' approach to reducing any project's overall cost which; significantly; always leaves the underlying 'build' costs totally untouched!

- Depending upon the client's priorities; isn't it every consultant's **primary** duty* to either maximise how much the client can achieve within a limited budget or, conversely, to minimise the cost of achieving everything that the client wants? (*That won't happen unless they know how to reduce underlying 'build' costs; either by design and/or through the choice of structural materials used!)

What 'external forces' will affect the new house design?

Having already decided exactly what your accommodation requirements are; i.e. the size, function and location of the various rooms you want; in terms of ground floor and/or first floor needs, etc.; you will also have ascertained that the accommodation you want can be built within your available budget; either as originally proposed or as subsequently modified in the light of any budgetary constraint or surplus.

- The acquisition, or potential acquisition, of a building plot or development site will have a profound direct and indirect effect upon the design of any house.

The direct effect will depend upon the size, shape, orientation and topography of the land; e.g. the relative size of 'footprint' required for the ground floor of the proposed house, making the best use of any 'views' and ensuring that particular rooms benefit from 'sunlight' at the appropriate part of the day, the existence of any significant slope or cross-falls, etc. Within this context; the siting of the proposed house may also be affected by the existence of mature trees, or wild life; i.e. badger setts, rare plants, insects, etc.; or the existence of 'concealed' utility pipes, sewers, cables, etc.

The indirect effect will arise from local vernacular styles and planning policies (and politics).

NB: It is important to realise that planning policies; i.e. obtaining or modifying detailed planning consents; are all about the general location, relative scale, individual siting, proposed usage and external appearance of buildings.

- Apart from the rare occasion when the 'structure' is an integral part of the appearance of the house; e.g. a 'Hauf-Haus' style; the proposed method of construction is irrelevant to the basic design and aesthetics of any new house *AND* it is also totally irrelevant to the planning authority!

(That makes it easy to switch existing 'approved' plans to an 'eco-friendly' method of construction; i.e. timber-frame; because doing so doesn't normally entail having to approach the local planning authority to obtain an amended/revised planning consent.)

NB: A substantial proportion of our clients have already either bought a site which has detailed planning consent or they have obtained detailed planning permission before they approach us. The example, illustrated left, is quite typical of a client liking the design but not the financial cost and perceived poor quality of 'traditional' construction!

Whilst major design changes will always involve making and agreeing either a brand-new planning application or, at least, a revision or amendment to an existing planning approval; minor changes to maximise the efficiency of the timber-frame design are easily accommodated and rarely 'trigger' any need to refer such changes back to the planning authority.

- Note: A relevant Building Regulations / Warranty application and approval will always be required.

Of course; whilst the method of construction is irrelevant in the context of the 'quality' of the design work required to produce eco-friendly house designs; the method of construction is still exceedingly pertinent to building a house as efficiently as possible; i.e. to achieve the lowest possible 'build' cost and the minimum possible 'ecological' impact, future 'heating costs' and related 'greenhouse gas' emissions!

Reducing the 'build' costs, the 'carbon-footprint', future 'running costs' and related 'greenhouse gas' emissions

As already stated; where house-building is concerned; for any given accommodation requirement ~ 'less' will always be more effective, both in terms of reducing 'build' costs and in minimising the ecological impact of the house. It is time to explain exactly what that means!

- At its most basic level; 'less' simply means minimising the quantity of 'construction' (materials, etc.) required to build a house that provides the required accommodation.

So how is that achieved?

All building materials have an environmental impact; even the genuinely sustainable and/or renewable ones; whether through the various manufacturing processes involved, the need to transport the basic raw materials to the manufacturing 'plants & factories' and subsequently to distribute the finished products to where they are needed by the builders, or simply to get materials from where they are grown to where they will be used; every material has a negative impact of some sort upon the environment.

- Accordingly; whilst some methods of construction, and the associated materials involved, will have a much higher or lower ecological impact than other methods; every method will have at least some detrimental impact on the environment.

NB: That makes the 'quality' of the design work central to all efforts to maximise the efficiency of how the required accommodation is provided because that will minimise the amount of 'construction'; i.e. materials, etc; needed to provide it ~ which will, in turn, reduce the 'carbon-footprint' and minimise the financial cost!

The "Effect of Shape"

By their nature; all dwellings require a 'ground floor' at the bottom, a roof over the top and walls around the outside ~ whatever they are built of! Now let's assume that your accommodation needs require a total floor area of some 1,500 ft^2/140 m^2; i.e. inclusive of 'circulation' space; to create the home that you want to have.

At a rudimentary level; if a simple rectangular-shaped two-storey house is designed, then obviously, the 'ground floor' (i.e. the dwelling's 'footprint') and roof areas will each be equal to 50% of the total floor area. However; if a single-storey house is designed, then the 'ground floor' (footprint) and roof areas will be the same as the total floor area; i.e. for a two-storey house, the roof and floor (footprint) areas are halved and so is the construction (and 'build' cost) involved; but with the expense of constructing a first floor for the other 50% of the total floor area.

- However; this doesn't apply to the external wall girth and total wall area. Whilst the external wall foundations will typically increase by about 27% for the single-storey version, the external wall area will actually decrease by around 42%! So although the wall foundations will be 27% more expensive; the external walls will actually become 42% cheaper by going single-storey!

Similarly; if those two options are made more or less square-shaped, then the 'footprint' and roof areas will still be equal to 50% of the total floor area or the same as the total floor area respectively; i.e. nothing changes.

- But; although the wall girth of the foundations under and the total wall area will scarcely change for the bungalow; for the house, the external wall foundations and the total wall area will actually decrease by about 14% compared to the initial rectangular version ~ saving 14% of the construction required and the financial cost involved!

When the plan-shapes become an 'L', 'T' or even 'Z' shape; i.e. plan-shapes that don't 'enclose' courtyards; it increases the construction required and cost involved because of having to form the roof junctions. Once again there is 'nil effect' upon the floor and roof areas although there is likely to be an increase in the circulation space needed in order to access the various 'arms' or 'wings' of the dwellings. (Consequently it is likely to lead to either some reduction in one or more room sizes or to an increase in overall floor area in order to retain room sizes.)

- These plan-shapes will typically have a 3% increase upon the external wall foundations and the total wall area for the original house. The single-storey (bungalow) alternative will increase the foundations by some 45% compared to the 27% increase for the original bungalow and although

still saving some 33% of total wall area this is much less than the 42% saved by the original bungalow!

The least economic and eco-friendly plan-shape is the (classical) 'H' shape with its semi-enclosed courtyard areas. Still no change in terms of the floor and roof areas even though the effective 'footprint' would encompass the overall length and breadth of the dwelling.

- The 'classic' 'H' plan-shape will typically cause a 33% increase for both the external wall foundations and the total wall area compared to the original house. For a single-storey version, the external wall foundations will increase by about 87%; i.e. well over 3 times the 27% increase for the original bungalow and the saving of total wall area will be down to about 33% of the 42% saved by the original bungalow; i.e. just 14%!

There are a variety of results that directly arise out of the design decisions that might be made about how exactly the same accommodation requirements, etc. can be provided within a house; with the effect upon the basic financial cost reflecting the greater or lesser quantity of 'construction' required; i.e. the ecological impact of the design decisions made!

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Before considering the 'short-term' effect of the various plan-shapes upon the constructional cost and 'carbon-footprint' when designing and building a new house; let's consider the 'long-term' effects; i.e. the future 'heating costs' and related 'greenhouse gas' emissions.

- Some 40% of all 'greenhouse gas' emissions from the UK is caused by the heating needs of the UK's buildings; whether from power stations producing electricity for electrical heating appliances or gas/oil/solid fuel fired-boilers, room-heaters and open fires within individual buildings; so it is hardly surprising that even the UK has eventually brought in legislation requiring reasonably effective minimum thermal insulation and airtightness standards.

Unfortunately; the statutory standards totally ignore the effect of house design upon 'heat loss'; so it is just as easy for heating costs to be much higher or lower, as it is for construction costs to be much higher or lower; without having to vary the size, or type of accommodation!

Just as the total floor area is 'fixed' irrespective of the plan-shape and number of storeys; so the volume of air that requires warming is also 'fixed', irrespective of what plan-shape is used how many storeys are planned.

- The real problem is that the same isn't true regarding the amount of 'heat lost' through the floor, walls and roof elements of any house.

The standards are based upon a common misconception that achieving a particular level of insulation means that a house will be energy efficient. It is certainly true that; for any particular house; increasing the level of insulation will make that house more economical to heat ~ however that isn't the same as saying that irrespective of how houses of identical floor area are designed; if they have the same level of insulation installed throughout, they will all be equally economical to heat.

- Consider this; if our 'base' house has an external wall area of about 200 m^2 and that external wall 'loses' a total of 'X' units of heat; then, as seen above, changing the plan-shape and/or number of storeys could vary the external wall area to anything from 86% upto 133%; i.e. from about 170 m^2 upto about 270 m^2. As the 'heat loss' per m^2 will be the same; the overall 'heat loss' through the external walls will vary by exactly the same percentage decrease / increase as the change in wall area; i.e. from 86% of 'X' upto 133% of 'X'!

- The same thing happens with the 'heat loss' through the roof and/or any 'suspended' ground floor; e.g. with the same level of insulation; a 1,500 ft^2/140 m^2 two-storey house has only 50% of the roof/upper ceiling and ground floor area of a 1,500 ft^2/140 m^2 single-storey bungalow ~ so the house loses 50% less than the amount of 'heat lost' through the bungalow roof and ground floor!

- Solid 'ground floors' are slightly different because the amount of 'heat lost' through the 'ground floor' doesn't vary directly with the change in floor area; the 'heat loss' is higher around the perimeter
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than under the main 'body' of the dwelling; so whatever the percentage increase in wall foundation girth ~ the relevant 'heat loss' increases by exactly the same percentage. The 'heat loss' elsewhere under the dwelling depends on both the area involved and the distance from the nearest external wall; so a 'squarer' shaped dwelling will lose significantly less heat than a 'thin / narrow' dwelling.

'Solid ground floor' variables aside; the effect of plan-shape and the number of storeys; has exactly the same relative impact upon the 'long-term' heating costs and the related 'greenhouse gas' emissions as the relative design efficiency has upon the 'short-term' impact in the form of both construction costs and the 'carbon-footprint' of the proposed dwelling!

FACT: The only way to make different shaped and/or height versions of the same accommodation equally efficient is by increasing / decreasing the value of each element's level of insulation by exactly the same percentage value as the areas of the various elements increase or decrease compared to the same elements' areas for the 'base' house design; e.g. a 25% greater external wall area requires a 25% increase in the entire external wall area's thermal insulation value in order to keep the amount of 'heat loss' through that element the same.

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Now that we have considered the 'long-term' effects; i.e. the future 'heating costs' and related 'greenhouse gas' emissions; let's consider how the 'quality' of the design-work affects the 'short-term' constructional costs and a new house's 'carbon-footprint'.

Taking a basic rectangular two-storey house; with a length that is 1.5 – 2.5 times the width; as our starting or 'base' point; the primary cost adjustments will depend upon whether the proposed dwelling, or the main 'blocks' in the case of a more complex plan-shape dwelling, is basically square or rectangular and single or two storey.

Use Steps One - Four below to adjust the 'base' cost and relative ecological impact for the proposed design.

Step One:- Apply a 5% reduction if the proposed plan-shape is square; i.e. the length is less than 1.25 times the width; conversely apply a 3% increase if the length is more than 2.5 times the width. (**NB:** Overall span restrictions may make it impractical for larger dwellings to be square without introducing multiple-spans.)

(For 'L', 'T', 'Z' or 'H' plan-shapes; add together the lengths of each 'block' to create an 'overall length' and then use the width of the widest 'block' to calculate any adjustment as in Step One above.)

Step Two:- If a single-storey house is proposed; now apply a 3.5% increase to the figure derived from Step One.

Step Three:- If the overall plan-shape isn't a simple square or rectangle; apply a 2% increase to the figure derived from Steps One & Two above ~ for each two-storey 'arm' or 'wing', **and/or** a 5% increase to the figure derived from Steps One & Two above ~ for each single-storey 'arm' or 'wing'. (**NB:** These increases apply to the total floor area, and not just the area within the 'arms' or 'wings'.)

(**Example:** Any proposed dwelling having one single-storey and two two-storey 'arms or 'wings' ~ would increase the overall 'build' cost and ecological impact by 1 x 5% + 2 x 2%; i.e. a 9% overall increase.)

Step Four:- If the proposed dwelling is a classic 'H' plan-shape, apply a 1.5% increase to the figure derived from Steps One – Three above.

By this point; the cost and ecological impact involved ~ to provide exactly the same accommodation requirement ~ could vary from down to 95% for a square-shaped two-storey house right upto 129% for a single-storey 'H' shaped bungalow!

However the whole process can be taken a step further; i.e. by utilising the roof-space to provide some of the required living accommodation. The cost of living accommodation within the roof is typically about 70% of the main building's 'build' cost per m^2. It is feasible to move about 40% of the required accommodation into the roof-space of a bungalow and about 20% into the roof-space of a two-storey house.
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- Doing so will reduce the amount of construction required; i.e. the overall 'build' cost and ecological impact; by some 12% for a single-storey bungalow and 6% for a two-storey house.

- It will also reduce the 'footprint' down to just 60% of total floor area for a bungalow and 40% for a two-storey house.

That is exactly the design approach used in order to maximise the viability of building this pair of semi-detached houses; i.e. the 'selling prices' vis-à-vis the 'build' costs.

- When designing this pair of semi-detached 'town houses' a couple of years back; we 'gained' an entire master bedroom suite comprising the main bedroom, a spacious dressing room and a full ensuite-bathroom within the roof-space; ironically, the economic design also meant that the reduced 'footprint' enabled the site to accommodate a pair of three-bedroom, two-bathroom houses instead of just a pair of two-bedroom, single-bathroom houses; thereby maximising the profitability of the development, whilst also minimising the ecological impact!

Finally; if the required accommodation includes attached or built-in garaging; then the floor area involved will typically cost less than 45% of the main building's 'build' cost per m^2.

- So even if only a single-garage is incorporated; that will still decrease the overall 'build' cost by about 5.5%, whilst a double garage would decrease everything by about 9% overall.

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We 'inherited' the house illustrated below when the client approached us to 'convert' it for timber-frame having already 'paid-off' the architect. It still remains the only timber-frame structure* we have ever designed that incorporates an element that couldn't realistically be built by somebody working 'solo'.

Built just after the 'millennium'; this property combined single-storey, two-storey and a substantial section of single-storey with roof accommodation as well as an integral double garage within its 4,500 ft^2 / 415 m^2 overall floor area. (At one stage; it was also going to be built as a 'single-skin' construction clad externally with 'Tyrolean' render and stone quoins.) Although not built to 'super-insulated' standards; its 'heating' requirement was still substantially lower than would be required for a dwelling 1/3rd its floor area built simply to meet current statutory thermal standards!

*The roof-space at the far end (above the garage) required two cantilevered roof beams to support it; the length & size of which were too long and heavy for 'solo' erection.

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So the overall effect of how any new house is designed could affect the 'build' cost by virtually 50%; i.e. from the most economic and eco-friendly 'square-shaped' two-storey house with 'roof' accommodation and an integral garage that will reduce everything overall by about 19%, to the most extravagant and least eco-friendly format of a single-storey 'H' shaped bungalow which would increase everything by an extra 29% overall!

However 'plan-shape' and the 'number of storeys' is only one element. There are two more 'elements' that can also have a major impact on your efforts to minimise the 'build' cost, 'carbon-footprint', etc.

The "Effect of Size"

Whilst considering how efficiently and/or inefficiently the design of any house can be when the designer is working to a "design brief" stating a fixed amount of living accommodation and space is required; it would be remiss to ignore the effect of any decision to increase or decrease the size of that accommodation.

- Expanding the accommodation space by 40% to 2,100 ft^2/195 m^2 requires just an 18% increase in the length and breadth; i.e. the external wall foundations and total wall area; whilst compressing the accommodate space by 20% to 1,200 ft^2/112 m^2 requires a 10% decrease in length and breadth.

Obviously; there is no reason why the dimensions of all rooms have to increase or decrease by exactly 18% or 10%; as long as the same number and type of rooms exist, the overall cost effect will be the same too.

- The overall effect upon construction is that it will *ALWAYS* change disproportionately *LESS* than the actual increase or decrease in size; i.e. losing 20% of floor area will save much less than 20% of the construction involved ~ causing a marked increase in the 'build' cost per m^2 ~ which indicates a much less efficient use of resources!

- Conversely; gaining 40% extra floor area doesn't increase the construction involved by anything like 40% ~ which causes a marked decrease in the 'build' cost per m^2 ~ indicating a much more efficient use of resources!

The juxtaposition of the effect of plan-shape and size upon the construction cost and 'carbon-footprint' related to creating a new dwelling is such that the overall construction cost involved to create a 1,200 ft^2/112 m^2 single-storey rectangular-shaped bungalow *OR* a 1,500 ft^2/140 m^2 two-storey square-shaped house; comprising the same number and type of rooms but with more generous sizes; is virtually identical!

Similarly; the 1,500 ft^2/140 m^2 rectangular-shaped house used as the original 'base' or starting point house above requires virtually the same construction input as creating the same number and type of rooms but of more generous size within a 2,100 ft^2/195 m^2 square-shaped house or bungalow utilising the maximum feasible accommodation within the roof space!

NB: That means that when the 'quality' of the "designer's work" is good enough; it is not only possible to minimise and control the cost and ecological impact of any new dwelling by the judicious choice of plan-shape and number of storeys used, but it is also possible; when the building plot is spacious enough; to design and build much larger houses without increasing the construction cost or 'carbon-footprint' caused!

As previously stated ~ if any house is to cost more than necessary or to be less eco-friendly ~ it should be through your specific choices and decisions made knowing the likely cost and ecological consequences involved; instead of being something that generally happens by default due to the designer's ignorance!

⇨ Anybody interested in the more detailed analysis and explanation of everything discussed above; i.e. where the above percentages and conclusions have originated from or even how to go about finding and buying an ideal building plot; should read the 'An Insider's Design Guide' titled "How To Design The House You Really Want *(So It Can Be Built)* For A Price You Can Afford!" ~ ISBN No. 0 9543049 0 X ~ available from www.SelfBuildBooks.co.uk; which explains in detail how using an integrated design approach can reduce your costs by 30% - 60% and save you £10,000's *OFF* a project's cost!

The "Effect of Materials"

The over-riding "common sense" principle followed so far; is that using design to minimise the amount of construction needed to build a new dwelling containing the required accommodation; automatically equates to a directly proportionate reduction in the financial cost, the materials used and the degree of environmental damage ('carbon-footprint') caused by building the proposed dwelling.

- All of which happens irrespective of what the actual materials used are; i.e. the type of construction is irrelevant to the underlying 'quality' of the design work required to produce eco-friendly houses.

Despite the possibly adverse perceptions associated with the idea of minimising the construction cost, and associated ecological impact, of building new houses; I don't subscribe to the presumption that the result will look highly undesirable; i.e. bland, boring, square, brick 'box' houses. Such houses are the result of

using 'useless' designers who think that designing very attractive looking houses automatically means that they must be more expensive to build than the glorified brick 'box' houses adorned with a few windows!

Nor am I going to go on and on about how ecologically damaging the so-called 'traditional' UK building methods are; the people involved already get totally paranoid whenever anybody draws attention to such things; suffice to say that the bulk of 'traditional' UK building materials are manufactured from finite resources; i.e. they are non-renewable and non-sustainable; and any unnecessary dependence upon manufactured materials also results in the totally unnecessary emission of 'greenhouse gases' due to the manufacturing processes that are involved!

- The principal materials used in 'traditional' construction are also heavily dependent upon cement; the production of which is responsible for over 10% of all 'greenhouse gases' released into the atmosphere worldwide every year!

Whilst this is another area where common sense dictates that we should always avoid, or at least minimise, our usage of cement-based products; i.e. concrete, concrete blockwork, cement-based roof tiles, etc.; there is a much more compelling reason why avoidance is good ~ the alternatives are not only lighter, cheaper and more versatile, they are also sustainable and/or renewable and, therefore, immeasurably more eco-friendly than any simple construction cost comparisons might suggest!

- Even when, arguably, the use of concrete is unavoidable; i.e. wall foundations; common sense tells us that we should keep its use to the minimum necessary to do the job. The amount required depends upon the type of sub-strata; i.e. its 'load-bearing capacity'; and the weight that needs to be supported. With heavier loadings and/or poor ground conditions, the need to avoid 'differential settlement' means wider and deeper, reinforced concrete foundations need to be used; often in the form of a reinforced concrete 'raft foundation' which, in turn, often needs to be supported by reinforced concrete piles underneath.

The prevalence of such foundations is indicative of the dearth of 'good' designers within the UK; because any 'good' designer will always minimise the need for concrete in the foundations by (a) reducing the weight that needs to be supported and (b) minimising the potential side-effects of subsidence problems.

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Built in the early 1980's; as part of a larger housing development; these six bungalows were originally designed to be built 'traditionally' on top of reinforced concrete 'raft' foundations which, in turn, were to be supported by reinforced concrete piles.

Unfortunately; with the construction costs much too high relative to 'selling prices'; and the 'consultant civil engineers' unable to produce a more economic solution; the developer decided to 'scrap' them.

My twin-edged solution was to 'convert' them to timber-frame and then use a simple 'ring-beam' to support the external walls ~ the 'consultant engineers' reacted by claiming it couldn't be done ~ but it could and was; even the NHBC approved and 25 years later they are all still as good as new!

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It is amazingly easy to create a total "win-win" situation because the best way to minimise the need for concrete in foundations is to simply eliminate the major cement-based manufactured product involved; i.e. concrete blockwork; and replace it with a totally sustainable and renewable, natural material; i.e. timber.

- Compared to a 'traditionally' constructed house; a timber-framed house can be upto 80% lighter in weight, allowing much narrower and thinner, 'slim-line' concrete foundations to be used.

- Whereas concrete blockwork always cracks wide open in the event of any 'differential settlement'; timber-framed walls are rarely affected, so concrete foundations don't need to be made wider and deeper and reinforced concrete 'raft foundations' can generally be dispensed with altogether!

- Due entirely to the two major problems involved with the use of concrete blockwork; namely its inherent structural instability and its ability to absorb water like a 'sponge'; 'traditional' construction almost invariably requires a twin-skin cavity wall construction; irrespective of whether the outer cladding is brickwork, stonework, tile-hanging, rendering, half-timbering, etc.; consequently 'traditional' construction needs a 'wide' and/or deep concrete foundation underneath. Timber-framed houses don't have such problems; so apart from brickwork and stonework claddings, where the sheer weight involved makes it impractical; all other claddings are attached to and supported by the timber-frame so not only does that do away with the need for twin-skin cavity wall construction, it also allows the foundations to be a single-leaf wall carried off a 'slim-line' concrete foundation.

- Naturally; because concrete is itself very heavy, any reduction in the size of the concrete foundations required also reduces the load that the ground has to support even further ~ thereby allowing the amount of concrete needed to be reduced even more!

The net result isn't just a huge cost saving and major reduction in the 'greenhouse gases' normally created in the production of the construction materials, etc. for any dwelling built 'traditionally'; it can often allow the economic development of sites that would otherwise have been totally uneconomic to develop due to poor ground conditions; as graphically illustrated by the six bungalows ~ which; ironically; ended up being the most profitable properties on the whole development!

- Moving away from needing heavy cavity wall construction allows very attractive houses to be designed and built; using a variety of claddings attached to the timber-frame; that are much less expensive and more eco-friendly than the bland, 'penny-pinching' faceless 'boxes' that are often built to provide so-called 'affordable' or 'social' housing!

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The original "ProFrame®" house used timber-frame to maximum financial and ecological advantage:-

Using various external cladding materials to make a simple, compact, "square" (4:3) plan-shape house look attractive, whilst also reducing the 'build' cost!

Front and rear walls are 'single-skin' ~ built off a 4" / 100 mm brick wall on 'slim-line' foundations.

NO internal loadbearing walls or foundations.

A single drain serves two bathrooms, kitchen, utility and cloakroom.

Usable accommodation was maximised at > 95% of floor area by keeping 'circulation space' to < 5%!

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As you can see; by pursuing simple, common sense, design principles; we can successfully reduce the 'build' costs and slash the 'carbon-footprint' of any new house ~ simply through (a) economically designed construction and (b) the "win-win" decision to replace a heavy, environmentally-damaging manufactured product with a sustainable and renewable 'natural' material.

Are there any "down-sides"?

Realistically; it has to be acknowledged that there are some difficulties that builders and self-builders still need to overcome if they are to get houses designed to be as cost-effective and eco-friendly as possible.

When considering what 'external forces' affect house design; obviously the characteristics of the 'building land' may restrict the size and shape of any new dwelling; although 'poor' ground conditions will always be less problematical using the design and construction principles outlined in this book.

The indirect design restrictions such as local vernacular styles and planning policies (and politics) may also 'dictate' the style and aesthetic appearance of a new house; however all planning authorities ignore the construction method and choice of structural material that will be used; unless it is integral to the finished appearance of the dwelling; i.e. exposed.

- Planning authorities are only concerned with four things when new buildings are proposed; aesthetics, use, location and scale; and only aesthetics and scale (overall size) have any relevance to the economic design-shape of a new house.

The concept that good residential design should always include using an appropriate non-masonry structural material whenever possible; for the reasons already outlined; rather than designers being restricted to just choosing the visible wall and roof cladding materials; will be an 'alien' concept to most UK designers, as will accepting the principle that economic design is the most essential part of every good design process!

- The root of the problem yet again lies within the attitudes and training of the industry's own professional consultants!

Architects are taught that architecture is primarily an 'art' form; hence the poor reputation that architects have long-held in the UK for 'lacking' the ability to keep projects within their clients' budgets! None of the UK's annual architectural awards are concerned about the financial success or otherwise of the projects submitted for judging; it's purely about aesthetics and functionality; effectively reinforcing the message that the client's financial concerns shouldn't affect an architect's "licence" to design as he/she sees fit!

- The Scottish Parliament Building is a first-class example of that attitude. It won numerous architectural awards despite needing a multi-million pound 'bale-out' to get it built! If it hadn't been for government ministers' generosity with 'other' people's money (our's), the project would have ended-up 'dead-in-the-water'!

I'm old-fashioned enough to believe that any professional consultant should always be working solely for the benefit of his, or her, client; so any failure to deliver what the client wants; i.e. the 'design brief' requirements ~ including the budget; is a fundamental breach of that duty.

- No matter how beautiful a 'portfolio' of design work may be; it is totally useless to the client if it exceeds the client's declared budget and doesn't get built!

- Conversely; aesthetics and functionality are critical to the 'open-market' value of the finished dwelling, because in any particular location, the new dwelling's value will always be based purely upon what can be seen and used!

The 'moral' for builders and self-builders is to ensure that the houses are always designed to be built as cost-efficiently (and eco-friendly) as possible ~ thus ensuring that you can afford to build them ~ then use the balance of the budget on fittings and finishings, etc.; i.e. things that will directly enhance the pleasure to be derived from living in the dwelling *AND* directly enhance the value of the finished property too!

NB: It's a poor designer indeed who loses sight of the fact that no value is ever gained by spending any extra money on anything that cannot be seen; whether it is spent to overcome poor ground conditions or simply to get mains' services to the location of the dwelling; 'good' designers always keep such expenditure to the absolute minimum.

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Before moving on to consider the best way to actually build eco-friendly houses; so as to minimise the 'carbon-footprint' as well as the 'build' costs; you may have noticed there is an obvious 'gap' in what has been advocated so far; namely, all the things that are normally 'highlighted' in the 'media' as being what makes any home "eco-friendly"!
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I'm referring to such things as 'rainwater harvesting', 'grey-water' re-cycling, 'solar' water-heating, 'photo-voltaic' roof tiles and panels, geo-thermal 'heat-pumps', etc.

- Whatever the respective merits of these products; the only reason why these particular things are heavily promoted as 'eco-friendly' is that the various manufacturers concerned are in business to make as much money as possible out of selling them; i.e. unlike the 'eco-friendly' approach to designing and building houses advocated in this book that will always save you money; these are all proprietary products being 'marketed' for profit, and just like any other product will cost you money.

- The other thing that they all have in common is that they can be incorporated and used on any project or development; eco-friendly or not; i.e. irrespective of how any dwelling is designed or constructed; provided that space and/or finances permit!

As a professional consultant with decades of personal 'hands-on' experience as a self-builder to draw upon; I always look at how to achieve similar objectives without spending a fortune on proprietary manufactured products; e.g. if you insulate sufficiently to remove the need for central heating ~ geo-thermal 'heat-pumps' (and their cost) become totally irrelevant! Accordingly; I have no intention of using, or suggesting the use of, products where the cost involved makes any conceivable 'ecological benefit' very expensive to achieve.

- Everything advocated in this book is simply about how using good 'quality' design work and simple, eco-friendly construction methods can substantially reduce 'build' costs, 'carbon-footprints', long-term 'running costs' and the related 'greenhouse gas' emissions; i.e. it's about creating genuinely eco-friendly houses that also save you money; rather than about spending a 'fortune' on attaching so-called 'eco-friendly products' to ordinary, non-ecologically designed houses!

By all means consider and choose such things; getting the house designed to be built as economically and eco-friendly as possible will also have the effect of automatically maximising your available budget for adding such things to your project or development ~ that's yet another benefit of following the good, practical, common sense, approach to genuine, eco-friendly housing advocated throughout this book!

⇨ Anybody interested in the more detailed analysis and explanation of everything discussed above; i.e. how to remove the 'hidden' costs that add no benefit or value to your new house, how to use materials to reduce building costs, innovations ~ good or bad, and the finishing touches that will get you planning permission; should read the 'An Insider's Design Guide' titled "How To Design The House You Really Want *(So It Can Be Built)* For A Price You Can Afford!" ~ ISBN No. 0 9543049 0 X ~ available from www.SelfBuildBooks.co.uk; which explains in detail how using a fully integrated design approach can reduce your costs by 30% - 60% and save you £10,000's *OFF* a project's cost!

Perhaps the final comment before moving on to consider how to build eco-friendly homes should be to remind you that the eco-benefits can only be fully realised when the designers actually do know what they should be doing!

- At the very least; 'architectural' designers need to liaise with the timber-frame designer throughout the design process so that minor adjustments can be made as necessary to ensure that the architectural design doesn't needlessly compromise the efficiency of the structural design! (NB: The ProFrame® bespoke integrated design and construction system automatically specifies which detail drawing shows the relevant construction needed to meet the individual structural timber-frame requirements.)

Whilst some of the advantages to be gained from using timber-frame have already been illustrated by the featured projects; there is considerable scope to save labour and material; i.e. money; and to reduce the 'carbon-footprint' on any project by using a "bespoke" approach for the structural timber-frame design.

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A couple of recent projects posed a whole range of potential problems that illustrate just how beneficial the flexibility of the ProFrame® "bespoke" integrated design and construction approach can be both generally and when required to overcome more specific problems than just dealing with poor ground conditions.

They also illustrate how 'designers' can complicate matters and dramatically increase 'build' costs, etc. whenever they don't do their job properly!
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(1) Never forget ~ you do need the planners' agreement!

One delighted client spent a lot of time and energy getting one of our earlier architectural designs modified to meet his personal requirements; eventually ending up with a generous five-bedroom, three-bathroom first floor layout with an integral double garage and spacious lounge, dining room, study, kitchen/family room, utility, cloakroom and study accommodation on the ground floor ~ all contained within a 2,300 ft^2 / 210 m^2 total floor area ~ which he duly submitted for planning permission.

- His delight turned to dismay when the planning authority demanded that his proposed roof structure was completely re-designed to match the local vernacular-style! The revised roof not only introduced two extra gable ends; it also required four more sloping valleys and a central 'gutter' ~ coincidentally; it also meant that none of the roof trusses or 'girder' trusses could be supported on loadbearing walls at both ends; some couldn't even be supported at one end ~ unless the internal accommodation layout was completely re-designed! Fortunately; he found an escape 'route' ~ us!

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The front and side of the client's house is pictured as it nears completion with its revised roof to 'fit-in' with the local vernacular style and resplendent in its 'Cotswold' (Bradstone) random-stone cladding.

This view shows the front entrance door to the Entrance Hall below the Landing window and the Lounge bay-window with the Bedroom 2 window above. The first floor window on the side is to the 'ensuite' bathroom shared by Bedrooms 2 & 3 and two secondary windows below to the Lounge.

This full-frontal view shows the Master Bedroom windows in the gable above the Garage which is awaiting the arrival of its panelled 'over-head' door.

Note the tight-fit of the house on the plot ~ that is the boundary fence abutting the house wall at the side of the Garage; fortunately there was space for a footpath down the left-hand side of the house!

Of course; when the timber-frame was erected; it didn't require any scaffolding; so permission to erect scaffolding, in the adjoining owner's garden, was only needed for getting the Bradstone claddings done!

Whilst the front view (above) wasn't affected by the roof re-design; the rear view (left) shows the two 'new' gables and the end of the central 'gutter'.

The rear view has French doors to the Dining Room (awaiting a replacement DG unit), then the Family Room 'annexe' with the Kitchen window (lower left) whilst Bedroom 3, 4 & 5 windows are above.

This is another project where the timber-frame was erected and made weather-tight as a single-handed project ~ despite the complicated roof structure, long floor joist spans, etc. ~ proving yet again the practicality and flexibility experienced when using the ProFrame® approach for the site-fabrication of timber-frame houses.

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The ProFrame® inspired design solution removed the need for internal loadbearing walls; which allowed the existing internal layout to be maintained as well as minimising the foundations too! It also enabled the first floor joists to span the 35' / 10.7 m between external walls without increasing the floor depth or cost. It also reduced the number of external wall openings requiring 'lintels' to just two! (There are nineteen window, entrance door and garage door openings in the external walls; most or all of which would have had 'lintels' with 'normal' timber-frame design methods.)

⇨ Many of the full-colour pictures used to illustrate the highly-detailed 'step-by-step' timber-frame construction guide were taken during the 'single-handed' building of this house! To find out more about how to get site-fabricated timber-frame houses built quickly and economically; you should read the 'An Insider's "Hands-On" Construction Guide' titled "How To Build Superb Timber-Frame Houses *(The Professional Way To Match Package-Kits And 'SIPS' ~ Without The Huge Cost!)* It's Quick, Simple AND Amazingly Cheap!" ~ ISBN No. 0 9543049 1 8 ~ available from www.SelfBuildBooks.co.uk; which explains in great detail exactly how builders, carpenters and 'DIY' enthusiasts alike can do it without needing any previous experience; because there are *NO* joints involved in timber-frame houses ~ everything is simply nailed together!

(2) Even the highly successful trussed rafter manufacturers don't always produce the optimum, cost-effective solution despite using very sophisticated truss design software!

A few years ago; a client approached us with a house design for his building plot in Co. Wexford (Irish Republic). The house was designed with a gabled roof, lowered first floor eaves to front and rear elevations and multiple dormer windows to both elevations. What made the design particularly complicated was that the dormer windows were not 'paired-up'; i.e. every dormer was out-of-line with the dormers on the opposite elevation.

- Given the spans involved and the lack of suitable load-bearing walls; it was obviously going to be cheaper to use trussed rafters than to cut and frame the roof 'in-situ'; but when he sent off plans and requested quotations for the roof trusses from various truss manufacturers, the quotations he received were all very expensive!

Although the chosen method of house construction doesn't affect how the roof structure is constructed and our unique ProFrame® programme is fundamentally about producing "bespoke" structural timber-frame designs; the inherent flexibility when using ProFrame® allowed us to 'design' the roof structure differently, so that when the trussed rafter manufacturers submitted revised quotations using our 'new' trussed rafter layout; our client saved more money than the total amount of our professional fees for the entire project!

How Eco-Friendly Are Your Building Methods?

REMEMBER: The more eco-friendly your building methods are; the cheaper it will be to get a house built, and the lower the 'heating costs' and related 'greenhouse gas' emissions will be for the entire life-span of the property! (**BEWARE: The converse is still true too!**)

We have seen how the total quantity of construction needed to meet any given accommodation requirement can be substantially decreased; thereby automatically causing a substantial reduction in the 'build' cost, 'carbon-footprint' and future 'heating costs' and related 'greenhouse gas' emissions for any new house.

Furthermore; we have also seen how the overall quality and eco-friendliness of the construction can be dramatically improved by the judicious substitution of a renewable and sustainable structural material in place of an environmentally damaging, manufactured product!

- That substitution not only yields huge ecological benefit; it also impacts upon the physical requirements for building any house. By reducing the size of concrete foundations required and negating the need for cavity walls, it drives down the 'build' cost and 'carbon-footprint' still further.

- And; as if that were not enough; it also creates the potential for much greater aesthetic flexibility ~ with, ironically, the added benefit of lowering, rather than increasing, the 'build' cost still further!

Timber-frame is recognised and acknowledged as being the most 'eco-friendly' form of construction for 'main-stream' housing found anywhere worldwide; timber isn't just genuinely sustainable and renewable, it also embodies huge quantities of carbon dioxide (drawn out of the atmosphere) and thus directly helps to

minimise 'global warming'; something not even 'adobe' can match despite requiring just mud and straw as its constituents!

It might now seem that through 'skilled' design-work and careful choice of structural materials, we have found a way to build the ultimate cost-efficient, minimum 'carbon-footprint' houses; certainly such houses are not achievable without using such an approach; however if the full potential benefit; of truly building the ultimate cost-efficient, minimum 'carbon-footprint' houses; is to be realised, there is still the far from insignificant matter of how such houses actually need to be built in order to achieve that objective!

- It may seem obvious that designing houses to be timber-framed is the logical, common sense approach to creating eco-friendly houses; however that doesn't mean that simply using timber-frame will automatically produce the ultimate cost-efficient, minimum 'carbon-footprint' houses!

If timber-frame is the answer; what is the UK's problem with it?

In a 'nut-shell'; the problem is the huge financial and, to a lesser extent, environmental cost of the typical UK approach to timber-frame house-building!

- As an objective 'professional'; with decades of experience with both 'traditional' UK house-building methods and timber-frame house-construction; it is very obvious that timber-frame is not only a much easier way to build 'high-quality' houses, it is also a much cheaper and faster way to build 'high-quality' houses too.

Unfortunately; the reality ~ as far as the vast majority of the UK's new timber-frame houses is concerned ~ is that they have actually been just as expensive as any 'traditionally' built new houses and have also failed to deliver the full benefit of timber-frame's unique ability to minimise the ecological impact of new houses.

- I have spent most of the last three-and-a-half decades looking for more efficient and/or cheaper ways to build 'high-quality' houses quickly; whether here in the UK or elsewhere around the World; and over the last few years I have realised that, by fulfilling that objective, I was also finding ways that directly reduced the ecological impact of the new houses too.

So what exactly has been causing the UK's new timber-frame houses to be exceptionally expensive and less ecologically friendly than they should be?

- The answer is the UK's almost unique reliance upon factory-produced timber-frame 'kits' and 'SIPS'!

The problem doesn't lie with the materials involved; they are generally identical whether used in a factory environment or on a building site; although the 'standardised structural design' approach used in factories does waste a lot of timber, etc. compared to what would be required if the houses were designed using the author's ProFrame® "bespoke" structural timber-frame design programme!

Wherever the timber, etc. is coming from; it does have to be delivered to where it will be used. For the vast majority of new timber-frame houses built around the World ~ that means directly to the building site. That is the unavoidable ecological price of having any new timber-frame house built that was hinted at earlier!

- As you will see later on; the problem with factory-production is that the fabrication of wall-panels doesn't offer much opportunity to streamline either the design or production involved; so instead of saving customers money; all the additional factory overhead costs and transportation costs end up added-on to the basic material and labour costs. The cost then gets increased even further because the manufacturer also has to cover the cost of office and senior management staff as well as ensuring there is a 'healthy' profit margin sufficient to cover all the factory costs during "quiet" periods and provide an adequate annual profit for the business.

- From an ecological impact perspective; delivering material to a factory and subsequently still having to transport the wall-panels, etc. to the building site means totally unnecessary extra HGV journeys have been added to the process. Furthermore; whilst power tools; such as saws and nailing guns; are likely to be used irrespective of where the wall-panels are fabricated, a non-essential factory has had to have been built and subsequently heated, etc. (**NB:** 40% of *ALL* the UK's 'greenhouse gas' emissions are caused by 'space heating' within the UK's domestic, commercial and industrial buildings.)

- Once fabricated; wall-panels still have to be loaded onto, and unloaded from, the HGV that delivers them to the building site ~ another totally avoidable operation that also involves 'cranage' and/or fork-lift trucks and more related 'greenhouse gas' emissions. Once delivered and unloaded at the building site; the wall-panels still have to be transported to where each dwelling is to be constructed and, finally, they have to be lifted into position for fixing in place ~ almost invariably involving the use of a forklift truck, JCB, etc. to carry and/or lift the wall-panels!

The financial impact is obviously huge; the environmental impact may be less 'huge', but everything 'highlighted' above is totally unnecessary and avoidable and needlessly increases both the financial cost and the ecological impact of building new timber-frame houses. The impact of each item may seem relatively small; but they soon mount up ~ as the effect upon the financial cost amply illustrates ~ and the increased ecological impact caused directly by the introduction of 'factory-based' prefabrication is very significant.

- There is a time and place for 'factory-produced' components; I happily embrace the use of factory-produced prefabricated roof trusses and windows; conversely, I have found it easy to save a couple of hundred pounds (per house) by buying in standard section PAR (planed all round) joinery timber and producing rebated door-linings on a basic work-bench with a couple of passes of a circular-saw and a quick 'finishing-off' with a power planer ~ typically less than two hours work per house!

Obviously; whatever approach is considered for use, it has to be capable of producing items that are good enough for the required purpose and/or fully meet statutory requirements!

- Aside from large developments; where the sheer volume required within a given (limited) time-scale might make 'on-site' production impractical; it is certainly true that neither complicated joinery items nor roof trusses would be produced in factories ~ if it was much quicker and cheaper to replicate such things 'on-site'!

Ultimately; my justification for using, or recommending the use of, any factory-produced item has always been based upon whether (a) it is noticeably cheaper and (b) it is much quicker than any alternative approach to producing an equivalent product.

- It simply isn't practical to cut and frame up things like windows without a proper, fully-equipped 'workshop' and the cost of creating that facility for a small housing development could not be justified. Neither would the 'material cost' saving ever cover the cost of the skilled 'labour' required to produce the windows, etc.

- Similarly; although sometimes unavoidable, a 'cut' roof; i.e. cutting and framing up the roof structure 'in-situ' from lengths of timber; is invariably slower and more expensive than using factory-produced roof trusses.

However if you discount the unique situation created by 'large-scale' developments ~ where the need to push through a very large volume of work becomes the critical factor ~ it is very difficult to justify the typical UK approach of using factory-produced timber-frame 'package-kits' for house-building at all!

- Despite the apparent similarities; unlike factory-produced roof trusses; factory-produced (timber-frame) wall-panels are invariably much more expensive to buy than the cost of simply cutting and fabricating the same wall-panels 'in-situ'; i.e. on-site.

- Nor is the extra cost confined to the manufacture and supply of the wall-panels; because once delivered to the building site; they will also cost you much more to erect and assemble them into a timber-frame house compared to simply erecting and assembling an identical timber-frame house using site-fabricated wall-panels!

Naturally; timber-frame manufacturers are very subjective in how they seek to 'hide' the high costs involved. By adding in all sorts of other 'bought-in' components such as staircases, windows, doors, etc. to create a 'house package'; they try to make it look like they are actually manufacturing and supplying a 'complete' house 'kit' rather than just manufacturing the wall-panels. They also emphasize that they handle the planning and Building Regulations applications for you so there are no separate professional fees involved. (**NB:** What they are less keen to include is the additional, usually substantial, cost of 'hiring-in' an erection crew and the heavy lifting gear to get their 'package' of house components actually assembled to create a house!)

Finally; to distract everybody's attention away from the fact they are always going to be an expensive 'option' for any project; rather than offering a genuine, cost-busting service; they all produce lovely, glossy brochures depicting beautiful colour images of their 'product range'!

- You won't find any roof truss manufacturer doing that ~ they sell to the 'trade'; i.e. builders, contractors and developers; people who know that they will always be saving money by ordering prefabricated roof trusses from a manufacturer. All they have to do is say what they want and get quotes from several potential suppliers before choosing which one to use.

By contrast; it is well-nigh impossible to get timber-frame 'kit' manufacturers to give a 'competitive' quote for a 'bespoke' design that meets your requirements or for supplying just the required wall-panels. It is also virtually impossible to actually compare any two manufacturers' quotes against each other because they will generally only quote for one of their own range of house plans and even then there will still be enormous variation in terms of what is included in the standard 'package-kit' specification, etc. which effectively creates a series of small but distinct 'monopolistic' positions within the marketplace; each occupied by an individual manufacturer.

- Of course; the other reason why most timber-frame 'kit' manufacturers refuse to give a basic quote for supplying just the wall-panels or make it difficult to compare their prices with other manufacturers; is because they are very well aware that; unlike roof truss manufacturers; they are incredibly expensive compared to site-fabricated timber-frame houses and so they need to concentrate on marketing their range of 'proprietary' products as being exclusive, branded designs where 'everything' is done for you!

In many ways; the growth of the UK's 'package-kit' based timber-frame house-building has only been possible because of (a) the ridiculously high-cost / poor quality of the UK's 'traditionally' built houses and (b) the dearth of knowledge and/or training about timber-frame construction and/or structural design amongst the UK's professional consultants ~ despite the fact that 'modern' timber-frame construction has been used in the UK since the late 1920's!

- Unfortunately; the UK's 'traditionally-built' houses have provided a very easy target for timber-frame 'package-kit' manufacturers to exploit; allowing them to successfully highlight the inherent superiority of timber-framed houses without making them 'defend' their own high prices. A situation compounded by the UK's lack of trained professional consultants which has effectively stifled the amount of site-fabricated timber-frame housing being built in the UK!

As an obviously similar manufacturing operation; it is very enlightening when you compare and understand the reasons behind why roof truss manufacturers have been so successful in cutting everybody's costs, whilst timber-frame wall-panel manufacturers have only managed to push everybody else's costs sky-high!

- Both products require structural calculations to be done in order to ascertain the correct combination of size, stress grade, spacing and fastening requirements for the timber used; both require accurate cutting of the timber and both require the timber components to be fastened together to form a rigid 'structural product' made to the correct overall size and shape; however that is where any 'similarity' ends!

The fundamental difference between fabricating roof trusses and fabricating wall-panels is that; whereas wall-panels are simple and straightforward to fabricate 'on-site' or anywhere else; it is extremely difficult and expensive to fabricate roof trusses 'on-site' and traditional 'cut' roofs are also slow and expensive to construct.

- That has allowed roof truss manufacturers to streamline the whole process; using smaller, lighter timber sections and huge computer-controlled 'jigs' and hydraulic presses to fasten whole trusses together with lightweight galvanised mild steel connectors ~ none of which is feasible for 'on-site' fabrication ~ and thereby to substantially reduce costs; especially given the repetitive nature of producing roof trusses. In fact they have been so successful that they have achieved a considerable lowering of 'build' costs despite having to absorb all the additional costs arising from occupying factory premises and delivering the finished products the length and breadth of the country.

Conversely; it is very easy to see why the fabrication of wall-panels doesn't offer much opportunity to streamline either the design or production involved.

- All wall-panels are rectangular; even gable panels only have one 'angled' edge; so they can be accurately set-out and fastened together before being 'squared-up' and sheathed; so they don't need a 'jig' at all, just the two primary diagonal measurements equalised ~ which takes less than a couple of minutes per wall-panel, irrespective of its size!

- The framing members for wall-panels are simply nailed together ~ whether in a factory or 'on-site'!

- The sheathing is simply nailed onto the framing members ~ whether in a factory or 'on-site'!

In fact; unlike trying to construct roof trusses or framing up roof carcassing; wall-panels can be fabricated by pretty well anybody who is capable of using (a) a tape-measure and pencil for marking-up timber ready to cut and checking that the lengths of a wall-panel's diagonals are equal; (b) a handsaw to cut pieces of wood to length and (c) a hammer to drive in nails.

- No prior knowledge, experience or training is necessary; which makes site-fabrication ideal for trade operatives, 'DIY' enthusiasts, farmers, self-builders, building contractors, etc.; in fact anybody fit and healthy enough to do 'basic' manual work. More experienced people can also use nailing guns, power saws, etc. to speed up the work.

- The only pre-requisite is the availability of technical expertise to provide the structural design details and specifications for everybody to work with 'on-site'; the work itself being basically 'unskilled'.

When seen in that context; it is easy to see why the vast majority of timber-frame houses built around the rest of the World don't involve the use factory-produced wall-panels, etc. and how 'DIY' enthusiasts in the USA manage to build more (timber-frame) houses every year than the entire output of the UK's house-building industry ~ even if you count in all the new UK flats and apartments as being houses! Even in Canada; where extreme weather conditions and temperatures preclude building out-of-doors for about four months every year; the vast majority of Canadian timber-frame houses are still site-fabricated; with the expense of factory-production being justified solely on the grounds of keeping the industry going during the extremely inclement winter months!

The point has already been made that; **unlike the 'eco-friendly' approach to designing and building houses advocated in this book that will always save you money;** all the things that get 'highlighted', in the 'building' and 'self-build' media, as being things to make a home "eco-friendly", are always proprietary products being 'pushed' by the manufacturers concerned so they can make a profit out of selling them; i.e. they are things that will always increase your 'build' cost! As illustrated above; that categorisation is equally applicable to manufacturers of timber-frame 'package-kits' and 'SIPS' because; just like the so-called 'eco-products'; they will always substantially increase your 'build' costs too.

The point has also been made that; as a professional consultant with decades of personal 'hands-on' experience as a self-builder to draw upon; I always look at how to achieve similar objectives without spending a fortune on proprietary manufactured products.

- Being a professional consultant allows me to be totally objective about the best way to achieve the desired cost-efficiency and minimised 'carbon-footprint', etc.; I don't have manufactured products to sell, so my professional role is solely to advocate what is in the best interests of my clients; i.e. the most cost-effective and/or eco-friendly way to achieve the house they desire; so that they can make a knowledgeable choice and/or decision in accordance with their own priorities! For the purposes of this book, I have simply assumed that that is what my clients; i.e. the readers; want to know ~ otherwise they would not have bothered getting a copy of the book in the first place!

The problem for most timber-frame construction in the UK is that all the 'highlighted' options are proprietary products; i.e. manufactured solely because the manufacturer believes it can make a substantial profit out of the customers; just like all the other products in the earlier 'list'. As emphasized above; they are not in business to save anybody money; i.e. to lower their 'build' costs; quite the contrary; their business success depends upon maximising their profit margins by charging as much as they can for their 'kits' and/or 'SIPS'.

- The good news is that there is nothing achievable by 'kit' or 'SIPS' manufacturers that we cannot match or better at a mere fraction of the cost by simply following a good, old, plain common sense approach to how it is done!

Of course; good, old, plain common sense systems and methods are never going to be advertised and/or promoted by any commercial entity because manufacturers don't advertise or promote things that they cannot make money out of; i.e. any of the sort of common sense things that will actually save people money; especially when they could even start losing money if knowledge of such 'low-cost' common sense alternatives becomes sufficiently widespread!)

Creating superb eco-friendly houses!

It is often said that things are always easier with the benefit of 'hindsight'; well what you are reading is the culmination of very nearly four decades of enlightened 'hindsight' gained from professional and physical involvement with the building of thousands of new houses; including fifteen personal "hands-on" DIY 'self-builds'; comprising 'traditionally-built' and 'timber-framed' houses.

- As mentioned above; most of the timber-frame houses built around the World each year, don't use factory-produced wall-panels, they are fabricated entirely on-site. And that simple difference can halve the cost of getting virtually any timber-frame house erected and weather-tight as well as ensuring that building the new house causes the absolute minimum ecological impact.

The on-site fabrication and erection of timber-frame houses can vary from using fully sheathed (open-panel) wall-panels; as per the ProFrame® system, through to open-framed "stick-building", as widely practised throughout North America and in many other areas and countries of the World.

- "Stick-building" may initially seem to be faster but, despite it's popularity in North America, it isn't really an ideal way to fabricate timber-frame walls because the "stick" frames are not rigid and so have to have diagonal bracing timbers cut into them purely to allow them to be erected unsheathed. That then creates another problem because it is almost impossible to hold sheathing in place whilst nailing it to the vertical framing (after the frames have been erected) without at least two people and scaffolding being involved. Using our ProFrame® system totally avoids such problems and its greater efficiency makes it much quicker!

Although the original construction methods I developed were designed so that I could work totally single-handed; without needing lifting gear or scaffolding; the intention being that I could be totally self-sufficient and not dependent upon other people being available to help; that philosophy has endured throughout the subsequent decades spent refining and developing techniques and methods to maximise efficiency / minimise costs inconjunction with developing a "bespoke" structural design and construction programme to remove all unnecessary material, load-bearing walls, etc. from the structure so as to reduce to an absolute minimum what is actually needed to build any specific house.

- I quickly realised that any construction method that became dependent upon 'cranage', 'scaffolding', multiple workers, etc. would automatically increase the basic cost of building any house; whereas ensuring that the need for any of those things remained 'optional' and never became a necessity; would ensure that the 'build' cost would always be minimised.

The beauty of using the ProFrame® approach to timber-frame is that it literally only involves using a 'saw' to cut pieces of timber to the correct length; trimming the length and/or width of sheets of 9 mm thick plywood/OSB sheathing with a circular-saw; nailing the lengths of timber together to form a frame; using a tape-measure to check that the two diagonals of the frame are equal and then nailing on the plywood/OSB sheathing. It literally is that simple to fabricate structural wall-panels ~ the 'building blocks' of timber-frame!

- As each wall-panel is fabricated on the 'floor deck/slab' adjacent to where it will be erected; there is *NO* lifting or carrying involved; the panel is simply swung up into a vertical position ready for permanent fixing in place!

- When the next panel is ready; it is also swung up into a vertical position and nailed flush to the end of the first panel ~ automatically creating a truly vertical; i.e. 'plumb'; corner without needing to use either a 'plumb-bob' or a 'spirit-level'!

- Each subsequent panel is similarly erected and attached until the entire external wall is completed.

- Using a lightweight line; stretched across between consecutive corners; panels in the middle of each wall can be brought into alignment as necessary ~ automatically ensuring that the whole wall is truly vertical ~ still without needing to use a 'plumb-bob' or a 'spirit-level'!

Any upper floor is basically similar to any other joist floor; apart from having a continuous 'header-joist' across the ends of the floor joists. The floor 'deck' sheathing 'doubles-up' to create a horizontal 'structural diaphragm' that holds the external walls rigidly in place.

- As the wall-panel fabrication and erection process gets repeated at each and every upper floor level, etc. there is never any need for lifting gear because the wall-panels are always fabricated on the 'floor' adjacent to where they will be erected!

The roof carcassing is basically the same irrespective of whether it is on a 'traditionally-built' or 'timber-framed' house; apart from getting the roof trusses erected and braced before gable panels are erected so that the roof trusses can give immediate 'support' to hold them rigidly in place.

⇨ Anybody interested in reading a fully-illustrated and highly-detailed 'step-by-step' full-colour guide showing exactly how to ~ get the foundations right; cut, fabricate and erect wall-panels; form structural and non-structural openings; cut, frame and sheath joist floors; build roof structures and gables ~ whether providing 'attic' accommodation or not; fit windows, etc.; close-in the roof; create genuinely 'super-insulated' walls quickly and simply; i.e. how to get a timber-frame house site-fabricated and built ready for external claddings and internal 'trades'; plus essential guidance for managing a 'crew' of carpenters so they work together efficiently; should read the 'An Insider's "Hands-On" Construction Guide' titled "How To Build Superb Timber-Frame Houses *(The Professional Way To Match Package-Kits And 'SIPS' ~ Without The Huge Cost!)* It's Quick, Simple AND Amazingly Cheap!" ~ ISBN No. 0 9543049 1 8 ~ available from www.SelfBuildBooks.co.uk; which explains in great detail exactly how builders, carpenters and 'DIY' enthusiasts alike can build timber-frame houses without needing any previous experience; because there are *NO* joints involved in fabricating timber-frame houses ~ they are simply 'nailed' together!

Considering the practicalities!

Every so often; "self-build" magazines feature people who have reduced their building costs to a minimum by simply undertaking all the physical work; however the projects featured invariably seem to use 'traditional' building methods and typically take 3 – 6 years!

It defies all logic to waste so many years of your life just to achieve a "low-cost" self-build; especially when even a 'solo' self-builder can achieve similarly low, if not lower, costs and still get a project completed in a matter of several months; rather than several years; using a "hands-on" approach based upon the 'tried and tested' approach to designing and constructing houses advocated within this "Eco-Homes Guide"!

- No matter how much we might admire the determination of people willing to persevere with a project for so many years, such an approach can never be justified; especially when it is so easy to get houses built, even single-handedly, inside twelve months.

I also find it hard to believe that the 'savings' are as good as claimed because any project taking that long must incur all sorts of indirect extra costs; whether borrowing costs, rental payments, etc.

- The original 'ProFrame®' house; featured on pages 2 & 14; was completed in just nine months ~ working only during evenings and weekends ~ single-handedly! The only practical training I have ever had being two terms of woodwork lessons during my first year at grammar school; proving that virtually anybody can successfully build a timber-frame house using the 'ProFrame®' approach to 'eco-friendly' house-building!

- Great reductions can be made to the 'build' costs per m^2 and the ecological impact of any new house by applying the 'ProFrame®' integrated approach to the design and construction of virtually any project *AND* it is perfectly feasible for virtually anybody to adopt a DIY "hands-on" approach; instead of employing others to build the timber-frame for them; thereby reducing those costs even further.

Physically fabricating and erecting luxury timber-frame houses; as a builder, building contractor, sub-contractor carpenter or as a "hands-on" DIY self-builder; is ridiculously simple, quick and straightforward, even when working single-handed. We have physically done it many times ourselves and we have various clients who have also done it, are currently doing it or planning to do it too.

One intrepid client's project illustrates many of the advantages of using the 'eco-friendly' methods of the ProFrame® approach to timber-frame houses.

The client bought an 'infill' plot between two rows of consecutive houses which had originally been left empty because it was the location of the village pond and stream; long since filled-in. (The plot is typical of many seemingly ideal 'plots' that haven't been built on when the surrounding land was; primarily because it wasn't deemed worth the expense of overcoming the ground problems!)

Having bought the 'problem' plot for a suitably cheap price; its viability was transformed by adopting the 'solution' that we had used for the six bungalows; i.e. a timber-frame house built off a 'slim-line' reinforced concrete 'ring-beam' linking 'short-bored' concrete piles.

The picture (right) shows the site with piling completed, and the steel reinforcement and plastic 'shuttering' awaiting the pouring of concrete to form the 'ring-beam'.

The 'grey' bit (middle right of the picture) is for the base of the chimney stack; which proved very useful as the means of reducing joist sizes for the suspended ground floor* ~ as can be seen in the picture below!

Our client very sensibly sub-contracted the whole of the piling, steel-reinforcement, plastic 'shuttering' and concreting work for the 'ring-beam'; so as to be fully-indemnified by an insurance-backed warranty against any problems or defects; but he then proceeded to do everything else himself until he had the timber-frame structure and roof carcassing ready for the brickwork and roof tiling.

* With the whole site covered with at least 3' / 900 mm of fill; the ground floor had to be self-supporting ~ the 'LVL' joists gave the quickest, cheapest and easiest way to construct it!

As can be seen; despite working single-handed; the whole of the timber-frame and roof carcassing was again carried out without the need for scaffolding!

The 'block-house' effect is due to leaving the sheathing over the lower-storey openings for 'security purposes'; the upper-storey openings are hidden underneath the 'breather-membrane' which was attached before erecting the wall-panels; the lower-storey 'breather-membrane' will be fixed immediately after the lower-storey openings are cut through the sheathing.

The 'upstand-blocks' seen (right) along the 1st floor edge help to align the wall-panels and prevent them sliding over the edge of the floor deck during erection!

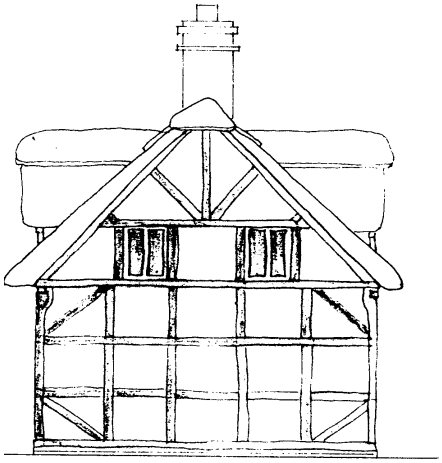
Scaffolding finally appears in the next picture as the brickwork starts to go up. Normally the windows would also have been fitted prior to the brickwork but a belated decision; about which window manufacturer to use; delayed the windows' arrival on site; so they were fitted later instead.

The ground floor layout of the house was very efficient; utilising an 'open-plan' lounge, dining room and kitchen to minimise the 'build' costs. The house also had a very low 'heating load' and totally dispensed with central heating in favour of a multi-fuel room-heater for space heating and hot-water.

The 'small' window sizes to the west-facing front elevation were deliberately chosen to prevent any excessive solar heat gain!

Some Food For Thought!

Simplicity carried to an extreme perhaps; but whether under thatch or roof tiles, half-timbered or rendered; something similar to this sketched 'cottage' could be self-built as an ideal introduction to doing a DIY "hands-on" project for under £30,000 plus the plot! The 'carbon-footprint' is minimal; as are the prospective 'heating costs' and related 'greenhouse gas' emissions!



Right-hand gable elevation

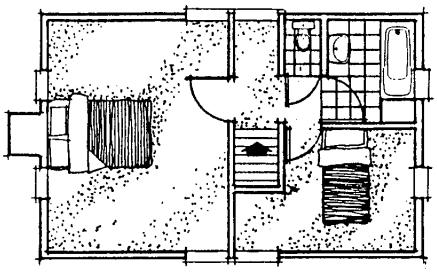
Front Elevation

There are no dimensions given; although the need to incorporate a staircase that meets Building Regulations / Warranty requirements will dictate certain minimum space requirements!

- The whole point of including these sketches is to emphasize how simple it is to create a very distinctive compact home at minimal cost and relatively little effort, even for a single-handed 'DIY' enthusiast. The other attraction of the plan is that it could fit onto an equally compact building plot for which there would be relatively little competition to push up the price!

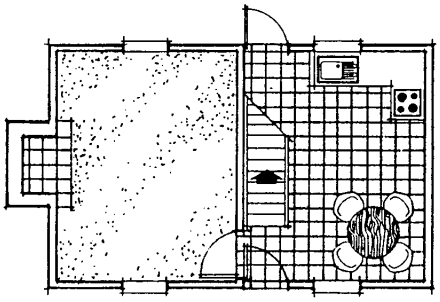
The internal layout is a "model" of simplicity with no internal load-bearing walls. External walls are 'single-skin' construction with minimal "slim-line" concrete footings under. Plumbing and electrical installations, drainage requirements, etc. are minimal; high insulation levels will also mean minimal heating costs and remove the need for central heating!

- Total construction time for a "hands-on" self-builder intent upon doing as much as possible single-handedly; i.e. effectively about 70% of the work; but with only evening and weekend working time available; is estimated to be about three months / thirteen weeks from start to finish!



First Floor

This provides a large double bedroom and a generous single bedroom with scope for a built in wardrobe/cupboard plus bathroom and separate WC.

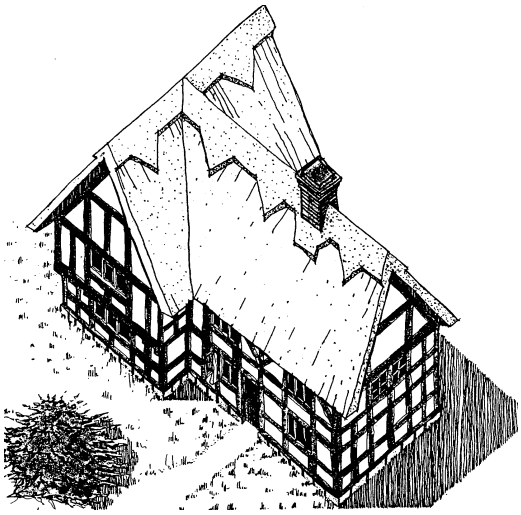


Ground Floor

This provides simple but delightful cottage accommodation comprising a large lounge with a proper working inglenook fireplace and separate dining/fitted kitchen!

More Food For Thought!

Obviously that simple 'two-up, two-down' cottage will be too small for any family larger than a couple with one child; but this 'larger' version ~ shows how easily family-sized accommodation can be created and built.



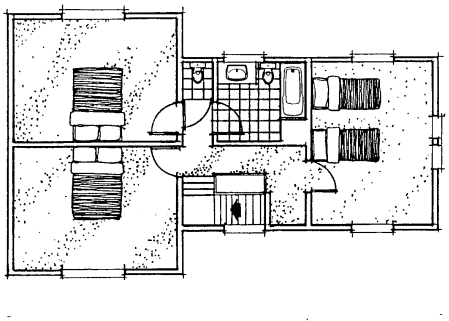
Did You Want/Need Something Larger?

How about this larger version of a "medieval" cottage? Still keeping everything very simple with a choice of either thatch or tiled roof over the half-timbered or rendered elevations; this "dream" cottage could also form the basis of an ideal first-time "Hands-ON" project that could be built for around £46,000 plus the plot!

(**NB:** Keeping any internal layout simple and uncluttered always helps to keep the 'build' cost and 'carbon-footprint' as low as possible.)

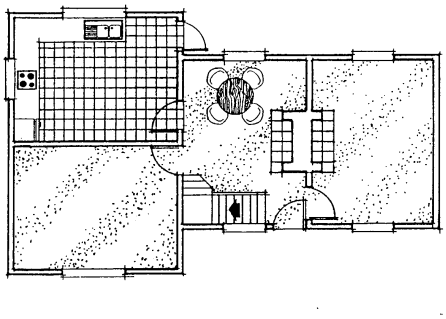
As before; the internal layout is another "model" of simplicity with no internal load-bearing walls. External walls are single-skin construction with minimal "slim-line" concrete footings under.

Plumbing and electrical installations, drainage requirements, etc. are still extremely simple and straightforward; high insulation levels will also mean minimal heating costs. So a high-pressure hot water system and gas-fired condensing boiler with under-floor heating to ground floor only ~ or build a "super-insulated" version instead and remove the need for central heating of any sort!



First Floor

This provides three large double bedrooms plus family bathroom and separate WC. It would also be quite easy to incorporate an "ensuite" shower room if required.



Ground Floor

This provides delightfully generous cottage-style accommodation comprising spacious family room, a large lounge and dining hall both with a proper working fireplace and separate breakfast/fitted kitchen!

- Total construction time for a "hands-on" self-builder doing as much as possible single-handedly; i.e. about 70% of the work; but with only evening and weekend working time available; is estimated to be five months / twenty-one weeks from start to finish ~ that's not just getting the 'cottage' built and weather-tight, but includes everything; i.e. it assumes that only the 'thatching' and (possibly) the internal 'dry-lining' would be 'sub-contracted' out!

Incidentally; given the internal layout of both cottages; they would suit virtually any relatively level plot, irrespective of orientation and aspect. With minor modification; they could also be turned round and built "end-on" to the frontage of a narrow plot if necessary! It is often the simple ideas and designs that are best!

Using Good Old Common Sense Is A Very Sound Philosophy!

It is far more likely that you will be able to achieve what you want without having to compromise if you always use a logical, common sense approach to the project at all times.

- Brochure pictures may look pretty; but the best place to start planning a new house is by deciding what accommodation is required, then to find a suitable plot at a relatively realistic price. That allows the balance of the budget available for the actual building work to be assessed. Part of that balance will be absorbed by the cost of "housing" the basic accommodation you require, but the building costs will also be cut significantly if a sensible, practical, inexpensive, eco-friendly method of construction is used. What you save can supplement the rest of the budget and help to provide the finishing touches, embellishments, higher-quality fittings and finishings, etc. exactly as you desire!

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In concluding this discourse upon how to 'save a fortune' designing and building superb eco-friendly houses ~ that ensure you can reap the maximum benefit and advantage ~ a timely reminder is in order!

You will find countless dissenting voices and contrary opinions about much of what is written here ~ but almost without exception ~ such dissenting opinions will stem from (at best) a lack of knowledge, awareness and/or experience and (at worst) a vested interest in simply protecting the dissenter's own position or product! They definitely won't have had any "hands-on" experience doing what is advocated in this book! As a chartered surveyor and pro-active "hands-on" DIY enthusiast and self-builder; my only 'vested' interest has been a purely 'selfish' interest in finding the best solutions for myself and my clients based upon nearly four decades of wide-ranging practical and professional experience including extensive research overseas; these days that also means we can easily achieve 'U' values down to 0.10 or even lower!
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Final Observations

Nobody advertises or promotes the reality that ~ the biggest reduction you can make in your 'build' costs, the 'carbon-footprint', the future 'heating costs' and related 'greenhouse gas' emissions ~ is all down to how any new building is physically designed and what materials and construction method is used to build it!

- **WHY?** Simply because there is ***NO*** money to be made by advocating such an approach ***AND*** sadly; the industry has ***NO*** interest in promoting anything that allows its clients and customers; i.e. **YOU**; to reduce the expensive prices **YOU** have to pay in order to get a new house built.

I have always been a lazy person; not in the sense of trying to avoid having to do things; quite the opposite in fact, I've always had far more things I want to do than time in which to do them! Accordingly; I have never seen any point in making anything harder, more difficult or more time-consuming to do than absolutely necessary; life is much too short! However expediency doesn't mean accepting 'second-best'; it simply means that I always try to minimise what I need to do in order to achieve my chosen objective.

Having experienced 'first-hand' the slow, dirty and expensive nature of so-called 'traditional' construction whilst undertaking my first 'self-build' project; when I started contemplating doing a new 'build' project; I was driven by pure self-interest (desperation?) to find a quick, cheap, practical; **i.e. intelligent**; way to self-build a new house for myself ~ irrespective of what method or form of construction it would involve!

- Discovering that our American 'cousins' were using something called 'stick-building' to build high quality, luxury timber-frame houses and achieving 200% - 300% greater working efficiency than anything our 'traditional' construction methods could deliver was like a breath of 'fresh air'.

Builders, building contractors, sub-contract carpenters and self-builders can all benefit hugely from adopting the modern, 'eco-friendly' approach to designing and building new houses that has been advocated; it involves a logical, tried and tested, proven approach using site-fabricated, timber-frame to deliver the lowest possible 'build' cost and minimum 'carbon-footprint' for your projects.

As the 'An Insider's "Hands-On" Construction Guide' sub-title says ~ it's "The Professional Way To Match Package-Kits And 'SIPS' ~ Without The Huge Cost!" ~ it's also full of good, old, plain common sense too.

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Thirty-five years ago; we took the most efficient house-building method we could find at home or abroad; learnt everything we could about it, then improved it. We have continued to improve it ever since. Using it; our first new-build project achieved a **54% saving** compared to 'normal' UK construction costs to build the same house! Subsequent ProFrame® projects; whether my own or for clients; have always reduced the basic 'build' costs by between 40% - 60% compared to following any of the 'routes' advocated by the UK's so-called "house-building experts"; i.e. using the UK industry's 'traditional', or timber-frame 'kit', constructed houses; best of all, the ProFrame® designed houses have been equally successful at reducing the 'carbon-footprint' involved ~ creating a genuine "win-win" outcome ~ something everybody should be striving for!

- For a fully-detailed and illustrated explanation of how to achieve the necessary 'quality' so that new house designs do minimize the 'build' cost, 'carbon-footprint', 'heating costs' and related 'greenhouse gas' emissions; read the 'An Insider's Design Guide' entitled "How To Design The House You Really Want ~ For A Price You Can Afford!" ~ ISBN No 0 9543049 0 X ~ available from www.SelfBuildBooks.co.uk.

- The assembly and erection techniques involved to build weather-tight timber-frame houses; i.e. ready for the following trades; are fully explained 'step-by-step' within our full-colour, fully-illustrated companion book 'An Insider's "Hands-On" Construction Guide' entitled "How To Build Superb Timber-Frame Houses ~ It's Quick, Simple AND Amazingly Cheap!" ~ ISBN No 0 9543049 1 8 ~ available from www.SelfBuildBooks.co.uk.

NB: Everything I have referred to within this "Eco-Homes Guide" and all other "Insider's Guides" is designed to save you money! The ProFrame® "bespoke" integrated design and construction programme handles all the 'technical stuff' for "Self-Build-Pro (Chartered Surveyors)" clients' timber-frame projects within the UK and Irish Republic (Eire); i.e. throughout the British Isles. Initial consultations are free of charge.
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