BOOK REVIEW

by John Messer.

CROPS IN CONSTRUCTION HANDBOOK

by Andrew Cripps, Richard Handyside, Liam Dewar and Jonathan Fovargue.

To begin at the end. The first sentence of the Conclusions of this Handbook reads, "Through this handbook we have seen that there is enormous potential for crop and animal based products to help to make UK construction more sustainable at the same time bringing real tangible benefits to the UK agricultural sector".

In the Introduction to this Handbook it is stated that the construction industry uses over 300 million tonnes of materials each year, or about 5 tonnes per person, and produces between 30 and 40 percent of the total National waste, with 20 to 25 million tonnes of it going into landfill. It adds that two-thirds of the total UK energy is absorbed by the Industry principally in the manufacture of concrete and fired bricks and blocks.
Thus, it is argued, the building industry should be encouraged to use building materials that decompose into their composite parts when their useful life has ended but have the similar material properties as the inorganic building materials they replace.
Such materials are available and are based on agricultural products. They are not only environmentally friendly but they can also help to give a boost to farm incomes by replacing food crops that are less profitable to grow or are in surplus. However, it is noted that market information for building materials based on crop or animal by-products is hard to obtain and that this is a reflection of the modest development in this sector. This modest development is because, in first cost terms, crop and animal based materials are often more expensive not only in the UK. but in the EU as they are competing with the profitability of other crops and, if imported into the UK they are subject to a fluctuating exchange rate. This book has been prepared to encourage greater use of sustainable building materials.

The book considers six areas where crop or animal based building materials can be used in buildings. They are:

Insulation
Light structural wall materials
Paints and finishes
Floor coverings
Geotextiles
Thatch

Each area is considered in a separate chapter under a similar although not identical format ie :

What the Materials are used for,
Why consider using Natural Materials,
Their Performance.
Design issues and,
Product Data Sheets

The chapter on Insulation will be considered in some detail, but in the review of the other chapters only the salient matters of interest will be highlighted.

Figure 3.1

What / Where	Properties needed	Crop-based options	Other natural options
Horizontal insulation (loft) for thermal properties	Maximum heat insulation, minimum cost, (preferably lightweight)	Hemp, flax or other fibres wool	Recycled paper
Vertical (wall) or sloping for thermal properties	Thermal insulation self supporting rigidity	Fibre batts (wool, hemp, flax etc) But needs a breathing wall construction	Recycled paper
Horizontal under-floor insulation (load bearing)	Thermal insulation, compression strength	Probably none - not robust enough	
Cavity fill insulation	Thermal insulation, able to be injected	Probably none	
Acoustic insulation - flow resistance	Density, low stiffness	Hemp / flax batts, wool	
Acoustic insulation - dynamic of impact resistance	Density, stiffness optimised - may carry some load	Coconut fibre, hemp / flax boards, straw boards, wool	
Fire protection	Resistance to fire, resistance to flame spread	Cork, reed, compressed straw, wool, Others with treatment	

Insulation

Insulation is used to control the movement of heat either into or out of a building or to dampen sound. Coconut fibre, cork, rye, flax, hemp, reeds and wool are farm products that either on their own or incorporated in boards can be used for insulating buildings. Table 3.1 gives some situations where insulation is required and a crop or animal based building material can be used, and the Insulating performance of three of them is shown in Table 3.3.

The detrimental effect of moisture on the efficiency of insulating materials is well known but, unlike most, if not all, mineral insulating materials some of those based on organic material can absorb some moisture before their insulating efficiency is affected.
A case study describes a small housing estate at Haverhill in Suffolk where the walls of two houses were cast in-situ using a mix of hemp and lime matrix between timber battens. The base slab was made of the same matrix. The performance of these houses was compared with houses of traditional brick construction.
It was found that the overall structural strength and stability was the same, that the hemp and lime houses performed less well acoustically but met minimum requirements, that there was less condensation in them, and the amount of building waste from both types of houses was similar. The heating requirement was "no greater than in the traditional house". In spite of this conclusion thermographic photographs indicated a lower heat loss from the hemp house, and, "although not proven in this case, it is likely that the difference between these two relates to moisture in the materials affecting the thermal performance of the insulation in the masonry construction".
It is also useful to note that crop based materials are, in general, more flexible and have a higher density than traditional materials, and so are useful to deaden sound. They have around twice the heat damping ability when compared with mineral based materials.
Product Data Sheets for the seven products are given and, as an example, that for light lime construction is shown here.

Light Structural Wall Materials.

UK farming produces plenty of straw. It is used to feed and bed down stock and much of it is ploughed back into the soil. In the Handbook it is suggested that some 4 million tonnes are produced in excess of farming needs although with the requirement of the Single Farm Payment to improve organic matter in the soil, more straw may be composted or ploughed in so that this figure may, in the future, prove to be on the high side.
The Handbook suggests ways straw bales and lightweight straw panels can be used in buildings and suggests ways of protecting straw based walls from dampness by lining with plaster board or rendering and also suggests ways of protecting straw them from insects, rodents, and fire.
It is a well known saying that bricks cannot be made without straw and fibrous materials such as straw or hemp with lime can improve the performance of brick and in cast construction. The use of these materials in the manufacture of unfired blocks in order to save energy and costs is discussed. Three Data Sheets are provided.

Paints and finishes.

Many paints and finishes are made from mixtures of several ingredients, some being mixtures derived from both inorganic and organic materials. This chapter is largely made up of lists of the materials made from farm products and that are used in paints and finishes either on their own or with other products. There are tables giving the pigments and dyes derived from plants, (including wild woad - blue, and who can forget how our forebears used it - the cultivation of which unexpectedly produced a yellow dye), and other crop products used in paint such as binders, thinners, solvents and emulsifiers.
This chapter gives some examples of natural paints and finishes and their properties, stressing that they are non toxic, ie. no lead or arsenic, and that they can dry quickly with little smell. Table 5.2 shows "Other paint elements from crops" and lists several plants and animal products that are produced in the UK.

Figure 5.1

Pigments and Dyes	*Colour*
Madder root (Rubia tinctorum)	*Red (Turkish red)*
Reseda or Weld (Reseda Inteola)	*Yellow to Olive green*
Wild Woad (Isatis Tinctoria)	*Blue*
Cultivated Woad	*Yellow*
Indigo (Indigofera anil & tinctoria	*Blue*
Various vegetables	*various*

Floor Coverings

Members of the Association are unlikely to be involved with floor coverings professionally, and the only comment of your reviewer is to welcome the recommended use of wool carpets in the residences for the elderly.

Geotextiles

Geotextiles are permeable textiles or fabrics used in conjunction with soil, foundations, rock, or earth. This chapter follows the general Chapter format. For example the applications, properties required and crop based

options are given in Table 7.2. and examples are given of crop based fabrics used to stabilise peat on The Pennine Way and to stabilise banks at the Eden Project and railway banks.

Thatch

Anyone proposing to use thatch would be unwise not to consult a thatcher in the early stages of planning. If, however, one is undertaking the first essay into a roof of thatch this chapter provides basic data for preliminary calculations, such as the weight of reed and thatching straw, their R and U values and life expectancy. The attractive appearance of thatch roofs needs no comment, and their ecological advantages obvious, the only disadvantage of thatch is its cost and fire risk

In addition to the case study of the Haverhill Houses above there are four other case studies. They describe the sustainable building materials used in the refurbishment of an existing Victorian villa, those used at the Visitor Centre at Glencoe, the insulation of a loft at Leeds Metropolitan University, and the houses at the Toll House Gardens, Perth.

Most of the products described in the Handbook are disposable by composting or burning, and both of these methods could pose problems if the products are used on a large scale, for composting takes time and burning can cause a nuisance. But the advantage of using them is that most buildings last for a great many years and the use of organic building materials that recycling CO2, is a way of helping to slow down global warming and their eventual disposal will reduce the volume of landfill building material.

This is a very good argument for using sustainable building materials, but there are problems. The Leeds Metropolitan University Case Study describes how the Health and Safety of the maintenance staff was improved by the decision to insulate the loft space with wool, but it is pointed out elsewhere that the total UK. wool production is about only one tenth of possible insulation requirements. Again the use of farm waste such as straw is attractive, but straw boards and walling have been used in several forms in the past without success. However there are products for which the Handbook makes a good case such as the use of plant dies for paints and finishes. Why are they not used more?

The Handbook suggests that further research is needed into the performance of sustainable building materials to asses if they are as efficient or even superior to conventional materials. For example as many inorganic insulating materials require a vapour barrier to keep them dry, and as speed is often the essence in building, small gaps can inadvertently be left in the vapour barrier. So how much is it worth to use the more expensive organic insulating materials that can retain moisture without loss of efficiency compared with the cost of inorganic materials?

In addition to research into performance of these materials the book champions a need for more basic research. Could Bio Polymers be developed to replace the inorganic polymers made from oil based materials to make plastics used in buildings from light switches to gutters, not to mention the millions of polythene bags used daily or the plastic used to wrap silage bales. Again resins can be produced from corn starch and plant oils from sunflowers or oil seed rape. Why not use natural fibres in construction to replace glass fibres? What about new materials?

The Handbook is well researched and comprehensive. It is easy to read and it is easy to find information about a product. It is designed to bring to the notice of the building industry the advantages of crop and animal based building materials, the use of which could give UK. farmers alternative crops to those they now grow.

Does the Handbook achieve these objectives? This it suggests depends on "a significant backer". Such a backer would be one who would be prepared to "chance his arm" or one who saw there was a market waiting to be filled. So how will such a market arise? There are many pressure groups such as those objecting to planning proposals or to GM crops or to encourage the growing and consumption of organic foods where it has been shown that sections of the public are willing to pay extra for what they consider a superior product. Thus more publicity given to the use of these materials could raise public awareness and stimulate demand. However there is no significant backer and political lobbying is non-existent at present.

It is concluded that publicity could stimulate demand for sustainable building materials and that research and development into performance and the development of new products would satisfy that demand, and that should be encouraged and financed either by Industry or from Government sources or both.

If the Handbook increases awareness in the building industry and the public of the benefits of sustainable building materials RIDBA can take credit for doing its part.

The book runs to 112 pages and includes 15 tables, 75 figures and four pages of references and sources. The book package includes a CD-Rom disk consisting of two files and a copy of Adobe Reader 6 to open the first file which is in pdf format. The second file is a Powerpoint presentation. The inclusion of the digitised files facilitates the taking of notes and hardcopy from the data provided.

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On the 24th February I attended the Construction Health and safety Summit as the RIDBA's representative, where I was advised how the big clients, major contractors, reputable trade associations such as RIDBA and others working in construction sites are constantly improving the health and safety of construction. With the statistics showing that the hard work over the last couple of years is beginning to pay off, with fewer accidents. So the effort has been worthwhile and it must continue.

It was though disappointing that the line from the HSE was that there was little they could do it was all up to industry to put its own house in order.

In my view they do have a lot to do. As things are moving at present the quality contractors are putting more effort into improving health and safety, but whatever the HSE might say this comes at an increased cost for the job, which is no bad thing, but it does mean that the differential cost between using a good contractor and one that ignores health and safety is expanding. Many Clients find this differential too high and are falling back on the poor contractor.

However much the HSE talks to the Major Clients they are not reaching the normal building client and so they are in danger of all the hard work by the competent contractors being wasted.

It was also disappointing that although the theme was Ownership, Leadership & Partnership, one of the recent successes, which represents all three of these themes, the Advisory Committee on Roofwork (ACR) was almost ignored, although our thanks must go to the Construction Products Association who did talk of the success of the ACR.

Chris Pearce a Council Member of RIDBA is the Chairman of the ACR and has written the following article, which many will find of interest.