

Report 154

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# Polymers in Building and Construction

*S.M. Halliwell*

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Source of original article	→	<i>Item 1</i> <b>Macromolecules</b> 33, No.6, 21st March 2000, p.2171-83	
Title	→	<b>EFFECT OF THERMAL HISTORY ON THE RHEOLOGICAL BEHAVIOR OF THERMOPLASTIC POLYURETHANES</b> Pil Joong Yoon; Chang Dae Han	← Authors and affiliation Akron, University
		The effect of thermal history on the rheological behaviour of ester- and ether-based commercial thermoplastic PUs (Estane 5701, 5707 and 5714 from B.F.Goodrich) was investigated. It was found that the injection moulding temp. used for specimen preparation had a marked effect on the variations of dynamic storage and loss moduli of specimens with time observed during isothermal annealing. Analysis of FTIR spectra indicated that variations in hydrogen bonding with time during isothermal annealing very much resembled variations of dynamic storage modulus with time during isothermal annealing. Isochronal dynamic temp. sweep experiments indicated that the thermoplastic PUs exhibited a hysteresis effect in the heating and cooling processes. It was concluded that the microphase separation transition or order-disorder transition in thermoplastic PUs could not be determined from the isochronal dynamic temp. sweep experiment. The plots of log dynamic storage modulus versus log loss modulus varied with temp. over the entire range of temps. (110-190C) investigated. 57 refs.	← Abstract
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# **Polymers in Building and Construction**

**S.M. Halliwell**

*(BRE)*

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## **1 Introduction**

Polymers have become increasingly important as engineering materials. Their range of properties and applications is at least as broad as that of other major classes of materials, and ease of fabrication frequently makes it possible to produce finished items very economically. Some important industries such as those for fibres, rubbers, plastics, adhesives, sealants and caulking compounds are based on polymers.

Polymers, together with metals and ceramics, represent the essential engineering materials in the construction of buildings, vehicles, engines, household articles of all kinds, etc. The rapid growth of these new engineering materials during the last four decades is due to the following main factors:

- The availability of basic raw materials for their production, e.g., coal, oil, wood, agriculture and forestry wastes
- The ensemble of technical properties specific for polymers such as light weight, chemical stability, elasticity, etc.
- Easy, efficient and flexible processing methods such as extrusion, thermal forming, injection moulding, calendering, casting, etc.

The purpose of this review is to outline the nature, culture and trends of the construction industry, introduce the main types of polymers used in building and construction, highlight the properties which make them a suitable choice of material and present several examples of their application. The report also introduces the main regulatory constraints on the industry.

## **2 The Building and Construction Industry**

The building and construction industry is second only to packaging in its importance as a market for polymers in Europe, accounting for about 20% of European plastic consumption – over five million tonnes annually. Yet polymers, despite being the fourth major class of building material used after steel, wood and cement, still represent a relatively small proportion of the total volume of building materials used (approximately 1%).

The construction industry is very cautious about changing well-tryed methods, and justifiably requires materials to have long, proven track records. It is also strictly regulated – although levels of regulation vary from country to country – so it has not been easily persuaded to switch to new materials. Sometimes, however, the benefits of polymers are too great to be ignored, and in a growing number of areas they are making a big impact.

The most obvious of these is perhaps the use of PVC profiles for double glazed windows, doors and conservatories, but far more examples exist ‘under the skin’, and sometimes even under the ground.

The construction and building industry faces major challenges in the next millennium, and polymeric materials provide cost effective solutions to many of these including:

- Resolve the common defects in construction such as seepage, chemical and environmental erosion and corrosion, floor pits, sagging, blistering, warpage, etc.
- Production of energy efficient materials and components
- Minimise the cost of construction
- Make the building structure portable
- Improve the thermal and sound insulation of the building structure
- Use environmentally friendly building materials
- Reinforce historical structures and monuments.

The need for a high strength to weight ratio, modern living styles and houses of high quality architectural features are also some crucial reasons for replacing conventional materials by polymeric materials.

### **2.1 Industry Overview**

In the European Community the construction market is around £400 billion in size representing around £1200 per head of population and 8.5% gross domestic product (GDP). This value compares with roughly similar figures for Japan and US markets, but lower per capita spend and a smaller share of GDP.

### **2.1.1 Recent Market Trends**

In Europe, construction activity growth has continued at around 1% per annum over the last few years with building growth in both new residential, repair and maintenance plus private sector non-residential activity. The drop in public sector building has slowed compared with the mid 1990s and the long term decline in civil engineering activity has now been reversed.

Public non-residential building has remained low with commercial and industrial work now improving in most countries. The private housing sector has been recovering in a patchy manner. Civil engineering, particularly transport-related schemes, having performed very well at the end of the 1980s and early 1990s declined sharply in the mid 1990s, but is now slowly recovering; the financing of projects is no longer the sole prerogative of the public purse. Private investment is encouraged more and more into schemes for the future.

Investment in transport, such as rail, is forecast to rise sharply over the next few years.

### **2.1.2 Regulations**

Although various EU regulations such as the Public Procurement Directives and others on liability, health and safety impinge heavily on the industry, the two of particular relevance in the UK are the Construction Products Directive and The Building Regulations. These regulations are covered in detail in Section 9 of this report.

On a global basis, each country has its own building regulations that must be adhered to. In addition, in the US regulations may vary from state to state – each state has its own ‘State Building Code’ - and so it is essential to check the relevant codes and standards. Information on relevant regulations can be obtained from National Government web sites.

### **2.1.3 Distinct Technologies**

Modern buildings and structures make use of a multitude of specialised technologies. In recent years, there has been rapid technological progress in the industry with respect to better construction methods and the manufacture of construction products. However, the need to repair, maintain and alter the existing built environment means that the industry

needs to retain a competence in older technologies as well. Consequently, the construction industry’s technologies range from traditional labour intensive, site based crafts to sophisticated technologies in, for example, intelligent buildings.

Many construction firms specialise in one technology or in a small group of technologies. Because many clients require heavily one-off designs, projects tend to bring together specialised firms to form a unique project team. Therefore, in addition to individual specialised technologies, the industry uses general contractors, with or without independent design consultants, to create an overall design and management framework for individual projects.

Specific technology trends are affecting the construction industry; for example, computer aided design (CAD) systems are gradually integrating traditionally fragmented processes. Prefabrication is moving work away from construction sites into factories. Electronic control and communication systems are providing a basis for intelligent buildings and infrastructures that are linking the industry’s products with its processes in ways that were previously impossible. The industry is also developing answers to the challenges of new environmental criteria and providing solutions for the repair of environmental damage.

### **2.1.4 Environment Issues**

The construction sector faces very great challenges and market opportunities from the emphasis on protecting and improving the environment. In response, the industry is providing solutions to environmental problems by developing new services and products, which have passive contributions, i.e., have little or no negative effect on the environment.

Energy conservation remains a priority issue, as about half of Europe’s energy consumption is related to buildings. Designers and contractors are responding to the need for more energy efficient buildings, including the use of passive thermal techniques to measure the thermal performance of buildings, which, in some countries, are required by law. The existing stock of buildings has potential for refurbishment to conserve energy. There is also likely to be increased use of materials, which require less energy in production. These changes will be accelerated if energy prices are increased through a carbon tax or other fiscal energy conservation measures.

In some parts of Western Europe there is growing concern over the availability of natural resources for construction and the consequences of trying to meet future demand. This focuses attention on making more effective use of materials. Waste management and the recycling of construction materials are now the subjects of extensive R&D. This is slowly leading to a change in site practices and design principles, to minimise the use of materials which are potentially damaging or cannot be recycled, and to facilitate ultimate demolition and recycling in the future.

The built environment epitomises to a large extent our cultural heritage and conservation projects are becoming a major task for the construction industry.

### **2.1.5 Outlook in the EU**

Construction demand depends on the availability of investment capital and so on the economic growth of the EU. Public expenditure and private sector activity are both governed by such requirements. A recent EU sector strategy study showed that social and economic changes as well as the upgrading of environmental standards were generating a greater need for construction activity. Overall, there are enormous needs for infrastructure investment in Europe. In most areas there is a problem of housing quality or a lack of housing stock, which should point to a growth area for the future. Commercial property is seen as an area of weaker demand.

Polymeric materials offer solutions to many of the issues posed, for example prefabrication, cleaner construction technologies, improved energy efficiency of buildings and design for re-use and recycling.

## **3 Key Properties**

There are several key properties to consider when specifying polymers for construction applications – some of these are unique to the type of use, others are common to all industries.

### **3.1 Mechanical Properties**

The mechanical properties of polymers are of key importance in all applications where polymers are used as structural materials. However, the prime consideration in determining the utility of a polymer

is its mechanical behaviour, that is, its deformation and flow characteristics under stress. The stress-strain test is probably the most widely used mechanical test for engineering materials and thus can be used to characterise the stress-strain behaviour of polymers:

- Modulus – the resistance to deformation as measured by the initial stress divided by the elongation/initial length
- Ultimate strength or tensile strength – the stress required to rupture the sample (maximum stress that a material can withstand)
- Ultimate elongation – the extent of elongation at the point where the sample ruptures (maximum strain that a material can withstand)
- Elastic elongation – the elasticity as measured by the extent of reversible elongation

Polymers vary widely in their mechanical behaviour depending on their structure. Depending on the particular combination of properties, a specific polymer will be used as an elastomer (rubber-like products), rigid or flexible plastic, or as a fibre.

### **3.2 Thermal and Insulating Properties**

If a polymer is heated to a sufficiently high temperature reversible and irreversible changes in its structure will occur. These changes may either be undesirable or they may be useful. The thermal stability of a polymer is defined by the temperature range over which it retains its useful properties.

Thermal expansion of polymers is relatively large, they tend to expand or contract more with temperature changes than metals. This must be considered in the design and use of polymer components, particularly when employed in conjunction with other engineering materials.

The thermal conductivity (K factor) of polymers is very low and thus the materials have found application as insulators. Polymers may also have outstanding electrical insulation properties. At ambient temperature unfilled polymers have conductivities in the range of 0.15-0.13 W/m°C, and expanded polymers (foams) have even lower values, for example 0.03 W/m°C in the case of polystyrene foam. This can be compared with the thermal conductivity of aluminium which is about 240 W/m°C and that of copper is about 385 W/m°C.

### 3.3 Weathering

The durability of a polymer and its resistance to weathering determine whether it is suitable for external construction applications and which families of additives need to be incorporated into its formulation. Weathering and ageing of polymers depends on the following factors:

- Chemical environment, which may include atmospheric oxygen, acidic fumes, acidic rain, moisture
- Heat and thermal shock
- Ultraviolet light
- High energy radiation

The resistance to weathering depends on the type of polymer, its composition and structure, and on the synergistic effect of the conditions of exposure.

Although each component of weather affects any polymer exposed to it, the more serious weathering problem is the synergistic effect of these components. The first signs of changes due to weather appear on the surface of the material, but with continued exposure these changes extend into the material under the surface layer. These changes may be in surface colour, the gradual formation of cracks, a decrease in transparency, blisters, minor changes in shape or size, or changes in the mechanical or electrical properties, or in the solubility. The course of these changes characterises each polymer and its stability. **Figure 1** shows the brown discolouration of inadequately stabilised PVC rooflights due to chemical reactions within the polymer.



**Figure 1**

Discolouration of rooflights (inadequately stabilised)

Complete inhibition of the degradation caused by weather is not possible, but the life of a polymeric material can be extended by choice of processing stabiliser, pigmentation and light stabiliser. Indeed the general world trend to an increase in the use of polymers in external applications has resulted from the introduction of a wide variety of types of polymer, with complex mixtures of basic polymer and various additives, to give the required stability of properties in such applications, i.e., service life.

### 3.4 Permeability

Polymers are often used as protective coatings, vapour barriers, sealants, caulking compounds and proof against gases and vapours; for this reason, their permeability, i.e., ability to allow gases and vapours to pass through them is a very important property.

Gas permeability depends both on the nature of the polymer and the nature of the gas. Diffusion through a polymer occurs by the small gas molecules passing through voids and gaps between the polymer molecules. The diffusion rate will thus depend to a large extent on the size of the small molecules and the size of the gaps.

### 3.5 Flammability

Given sufficient oxygen and heat, all organic polymers burn. All organic polymers evolve toxic products of combustion when burned, if only carbon monoxide. Absolute fire safety of organic polymers does not exist. Yet millions of tonnes of synthetic (plastics) and natural (wood and wool) polymers are used annually without presenting an unmanageable fire safety problem.

Most synthetic polymers burn in a manner different to that of wood, for example. Some synthetics burn faster, some slower; some give off more smoke, some less; a few evolve more toxic gases, some less; and some melt and flow while others char over extensively. However, the general magnitude of combustibility is of the same order for both synthetic and natural polymers. Both burn yet both can be used safely without undue risk.

Basically two types of behaviour can be observed during the combustion of organic polymers. With thermoplastics, such as polyolefins, polystyrene and acrylics, thermal decomposition of the polymer leads to the formation of relatively large amounts of combustible volatile products, which subsequently mix with the surrounding air and burn in the gas phase above the polymer, giving rise to so-called flaming



combustion. On the other hand, with some thermosetting polymers (phenolics and polyethers) the initial step in the combustion process is generally the splitting off of water or other non-combustible species to leave a loose carbonaceous matrix which then reacts with gaseous oxygen to give rise to non-flaming or smouldering combustion.

It is possible to retard burning by the use of suitable additives, although these generally generate smoke and, under non-burning conditions, have a negative effect on the mechanical and other properties.

The reasons for the differences in combustion between polymers are various but in particular two factors should be noted:

- The higher the hydrogen to carbon ratio in the polymer the greater is the tendency to burn
- Some polymers while burning emit blanketing gases that suppress burning.

Flammability is expressed in terms of the limiting oxygen index (LOI), which is the minimum percentage of oxygen in the surrounding atmosphere which will support flaming combustion of a substance. The most common route to improve the non-flammable behaviour of polymer foams is the addition of flame-retardants.

Besides the LOI, other fire characteristics need to be known such as :

- Smoke generation
- Toxic gas emissions
- Flaming drips.

Although polymers tend to have a higher ignition temperature than wood and other cellulose, some are easily ignited with a small flame and burn vigorously. The burning of some polymers is characterised by the generation of large amounts of very dense, sooty, black smoke. Additives used to inhibit the flammability of the polymer may increase smoke production. Smoke generation from a polymer may vary depending on the nature of the polymer, the additives used, whether fire exposure was flaming or smouldering, and what ventilation was present.

Building codes determine the required properties of a polymer (or indeed any material) for each application type, for example a foamed polymer used as interior wall insulation must be covered by a thermal barrier or another method used which reduces

the risk of ignition and the subsequent flash-fire propensity. The use of foamed polymers in the cavities of hollow masonry walls, such as perimeter insulation around the foundation of a building, as insulation under concrete slabs on the ground and for roof insulation under certain conditions, is generally without thermal barrier protection.

When used as interior wall and ceiling finish, polymeric materials other than foamed polymer generally are not subject to any special requirements. As for any other material, plastics are subject to limitations on surface spread of flame and often on the smoke generated, as measured by standard test procedures. These or special limitations may be applied to plastics used as diffusers in lighting fixtures where it is often acceptable to have a polymer which deforms and drops out of the fixture at an elevated temperature still well below its ignition point. Plastic laminates for countertops, kitchen cabinets, table tops, etc., are not usually included in the definition of interior finish, as regulated by building codes. However, even when it is not regulated by local code, the flammability level should be limited to that encountered when natural products are used in these applications.

### **3.6 Environmental Impact**

There is still a widespread notion that products made from renewable raw materials generally have less environmental impact than those of industrially manufactured materials. The environmental relevance of products and services is assessed by means of eco-balances. The Swiss material testing and research institute (EMPA) prepared extensive environmental assessments for windows (aluminium, wood, PVC-U) and pipes (high density polyethylene, PVC-U, cast iron, stoneware). These studies concluded that the environmental impact for the manufacture, use and disposal are the same for the aforementioned polymeric construction products as they are for products made of traditional materials.

An eco-balance comparing various floor coverings reached the conclusion that, from an environmental point of view, polyolefins, synthetic rubber and PVC-P are equal, not only to one another but also to parquet and linoleum flooring, made largely from renewable resources.

The environmental impacts that can be saved by the recycling of waste materials are booked on the credit side of the balance sheet. European legislation on domestic waste will ensure that from 2005 recycling of post-consumer construction products will become more economically attractive.

## 4 Applications of Bulk Polymers

Polymers have successfully found their way into a range of applications including pipes and fittings, foundations, roofing, flooring, panelling, roads, insulation, cable sheathing and ducting as illustrated in **Table 1**.

They have brought many benefits to builders, designers and building owners. First and foremost is their resistance to environmental elements – they neither rot nor rust, require very little maintenance, and remove the need for painting. Timber-clad houses painted white are appealing, but maintaining the finish by renovating and painting can become almost a full time job. Today, there is a whole range of polymeric building

components, including window frames, fascia boards, garage doors and even roofs, which can be coloured during manufacture and require no painting or maintenance, as illustrated in **Figures 2 and 3**.

Windows, primarily manufactured from PVC-U, represent one of the largest markets for polymers in the European construction sector and one of the largest single markets for bulk polymers. In fact, PVC-U accounts for over 90% of polymer extrusions in the profile and tube products area for Europe. **Table 2** summarises properties of window profile manufactured from a variety of materials. The properties highlight the reasons why polymeric profile accounts for such a large proportion of this industry sector. The table also shows why revision of Part L of the building regulations

**Table 1 Estimated polymer consumption in the building and construction industry in Europe 2000/2001 (ktonnes)**

Application	LDPE	HDPE	PVC	EPS	PUR	ABS/PS	Other	Total
Pipe and conduit	166	617	1447			25	30	2285
Wire and cable	46	22	175				10	253
Profile			950					950
Insulation				505	300		210	1015
Flooring			305				280	585
Film/sheet	300		100					400
Other			140		50	115	180	485
Total	512	639	3117	505	350	140	710	5973



**Figure 2**

PVC weatherboarding



**Figure 3**

PVC window frame

**Table 2 Relative property comparison for window profile materials**

Property	Fibre-reinforced plastics (FRP)	Wood	Aluminium	PVC-U	Steel
Tensile strength (longitudinal) (MPa)	410	6	138	45	207
Tensile strength (transverse) (MPa)	69	4	138	45	207
Modulus of elasticity (longitudinal) (GPa)	24	0.9	69	2.4	207
Thermal conductivity (W/m/°C)	0.3	0.1	174	0.2	52
Corrosion resistance	excellent	good	fair	excellent	poor
Resistance to weathering	good	poor	good	good	good
Linear thermal expansion ( $\times 10^{-6}$ ) (m/m/°C)	3.1	0.94	7.2	21	3.9
Maintenance	low	high	medium	low	high

for England and Wales (see Section 9.2), demanding higher insulation values, favours polymeric options for windows and doors.

PVC-U dominates the UK domestic replacement window market and is the material of choice for most homeowners – approximately 80% of replacement windows are PVC-U. Over 80% of the windows being replaced are timber, with approximately 8% and 10% being aluminium and steel respectively. In the new-build market, the larger house-builders use predominantly PVC-U (80%), whilst the smaller ones still prefer timber.

Penetration into the commercial market is harder to define. For simple replacement windows where the windows are installed into an aperture, the penetration of PVC-U is high. For more complex buildings, such as those involving curtain wall types of structures, PVC-U has made little impact. The need for PVC-U to have reinforcement and supporting structures means that aluminium systems still dominate, however, the very recent introduction of fibre-reinforced polymer (FRP) profiles could change this.

In addition to property benefits, the rising cost of some traditional materials – wood for instance – now means that polymeric building products are often a lower cost option. They are also versatile, making it easier to form complex profiles and shapes, which gives architects more freedom in their designs. **Figure 4** shows a PVC swimming pool roof. The roof forms a 4-sided pyramid, each side of which comprises over 100 3-D tinted PVC pyramidal sections. The design and material were chosen to offer optimum light transmission and energy efficiency of the structure. They often simplify



**Figure 4**

Swimming pool roof

construction methods, reducing both the amount of on-site work and the level of skill required to carry it out. They can be tailor-made for specific construction projects thereby saving time and cutting down on waste.

Polymeric materials have excellent strength to weight ratios. Expanded polystyrene foam (EPS) for example, is extremely light but still capable of withstanding heavy loads. It can be used as a substitute for heavier materials to lighten the overall weight of major constructions.

Weight is a key factor, both in the transportation of materials to building sites, and the handling of them when they arrive. Polymeric products are easily transported and many jobs which once required heavy plant and machinery can now be carried out without it. For example, long lengths of polymeric piping can be carried around a site by hand – unlike the equivalent concrete or clay pipes.

Polymeric materials have other special beneficial features. Rigid polyurethane and expanded polystyrene foams have excellent physical, thermal and acoustic properties for building insulation applications. Used as insulation in buildings they deaden noise as well as helping to reduce heat loss and, as a result, energy consumption and heating costs.

According to the Association of Plastics Manufacturers in Europe (APME), one kilogram of oil used in the manufacture of EPS thermal insulation will save the equivalent of 75 kilograms of oil during every 25 years the house or building is standing. This is a very effective example of energy and environmental conservation.

Products based on foams are playing an increasingly important role in helping to meet European energy conservation regulations for new buildings. The foams can also be sandwiched between facing materials, such as steel, to produce complete building panels. They combine lightness, strength and insulation, are easy to transport and simple to assemble. **Figure 5** depicts polymer foam cavity wall insulation.

Boards of rigid polyurethane foam are used to insulate the roofs of buildings. Once laid, they can be covered in the traditional method with roofing felt, which in turn may be sealed with bitumen containing a thermoplastic elastomer. The use of an elastomer (rubbery polymer) improves the flexibility of the felt, and increases its resistance to cracking, particularly at low temperatures.

Thermoplastic elastomers, together with polyurethanes and epoxy resins are the critical ingredients in a wide range of adhesives, sealants and coatings used throughout the building and construction industry, providing strength, flexibility, weather resistance and

binding properties. Resins have been very successful in the renovation of large concrete or stone constructions. Their low viscosity enables them to fill deep cracks and crevices, yet they set to form an extremely tough, water resistant repair.

Pipes and pipefittings, an integral part of any building, have been transformed through the use of polymeric materials. Pipes made from PVC, polypropylene, polyethylene and polybutylene are now widely used to carry domestic and mains water, sewerage, gas and even underfloor heating. Plastic pipes have high corrosion resistance to the fluids and chemicals they have to carry (including water), can be used above ground, and are easily manufactured in a range of shapes and sizes. **Figures 6, 7 and 8** illustrate the range of piping available.

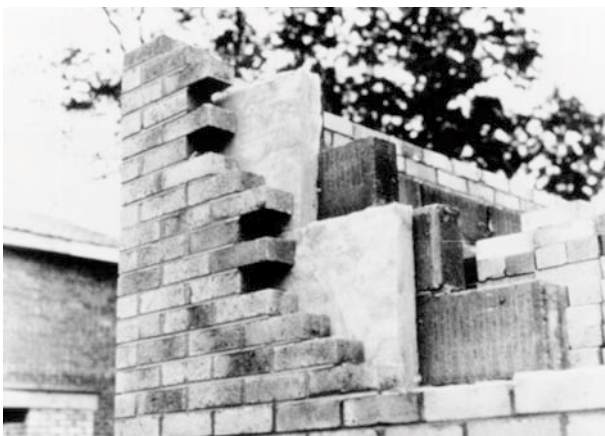
Rigid polyurethane foam is used to insulate steel pipes, enabling them to carry hot water supplies for district heating systems efficiently, while modern techniques also allow deteriorating underground pipes made from clay or concrete to be replaced or repaired using polymer-based resins, without having to dig up the road.

On a wider scale, plastics will not significantly reduce our demand for bricks, mortar and concrete, but it is clear that as the construction industry gains confidence in new materials, their influence is likely to spread.

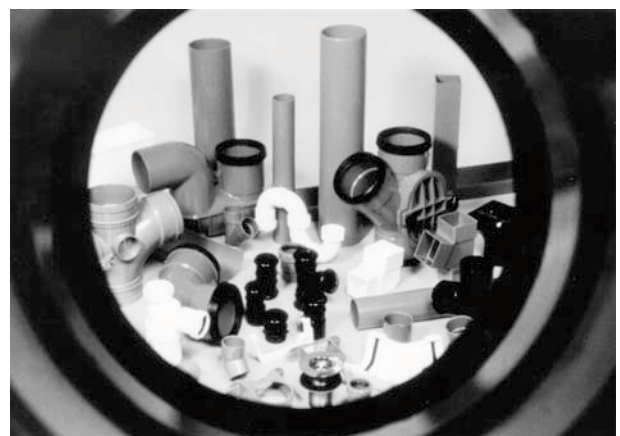
The benefits of polymers can be summarised as follows:

(1) Cost

- Long service life
- Simpler methods of construction
- Require less on-site machinery



**Figure 5**  
Cavity wall insulation



**Figure 6**  
Plastic drainage pipes



**Figure 7**

Flexible hose to overhead piping system in office block refurbishment  
(Reproduced with permission from Pipex Ltd.)



**Figure 8**

Polypropylene pipework  
(Reproduced with permission from Pipex Ltd.)

## 5 Polymer Foams

(2) Resistance to the elements

- Do not rot or rust
- Require low maintenance
- Do not require painting or priming

(3) Versatility

- Ease of design/manufacture
- Tailor-made properties
- Wide range of applications

(4) Special properties

- Sound and thermal insulation
- Strength to weight ratio
- Loadbearing capacity
- Chemical resistance

Polymer foams, also known as cellular polymers, cellular plastics or expanded polymers, are multiphase material systems that consist of a polymer matrix and a fluid phase, usually a gas. Most polymers can be expanded into cellular products, but only a small number have been exploited commercially with polystyrene, PVC, phenol-formaldehyde and polyurethane being the most widely used in Europe for insulation purposes. Engineering structural foams have also been developed for load-bearing applications – the polymers used include polyolefins, polycarbonate and ABS. In some cases an additional solid phase such as fibres or spheres (syntactic foams consist of hollow glass, ceramic or plastic microspheres dispersed throughout a polymer matrix) may be added to the foam. **Figures 9 to 11** illustrate the construction uses of polymer foams.



**Figure 9**

PU foam sprayed onto windows  
(Reproduced with permission from RIBCO Inc.)



**Figure 10**

PU foam insulation on tank  
(Reproduced with permission from RIBCO Inc.)



**Figure 11**

Syntactic foam insulation on pipework  
(Reproduced with permission from Cuming Corporation)

### 5.1 Special Foams

Some special types of foam are:

- Structural foam
- Syntactic foam
- Reinforced foam.

The term ‘structural foam’ designates components possessing full-density skins and cellular cores, similar to structural sandwich constructions, or to human bones, whose surfaces are solid, but cores are cellular. For structural purposes they have favourable strength to weight ratios, because of their sandwich type configuration. Frequently, they can provide enhanced structural performance at reduced cost of materials.

Structural foams may be manufactured by high or low pressure processes. High pressure processes produce denser, smoother skins with greater accuracy of fine detail of a mould – fine wood detail, for example, is used for simulated wood furniture and beams. Almost any thermoplastic or thermosetting foam can be formulated into a structural foam.

Syntactic foams employ preformed bubbles of glass, ceramic or other compound embedded in a matrix of polymer instead of a blowing agent. In multi-foams such preformed bubbles are combined with a foamed polymer to provide both kinds of cells. Synthetic ‘wood’ for example is made with a mixture of polyester and small hollow glass spheres.

Polymer foams may also be reinforced, usually with short glass fibres, and also other reinforcements such as carbon black. The reinforcement is usually introduced into the basic components and is blown along with them, to form part of and to reinforce the cells. In these cases, it is not unusual to obtain increases in mechanical properties, especially in thermosets of 400-500% with glass fibre content up to 50% by weight. The main advantages of reinforcement, in addition to increased strength and stiffness, are:

- Improved dimensional stability
- Improved resistance to extremes of temperature
- Improved resistance to creep.

However, reinforced foams are heavier, may be more abrasive to moulds and machinery, and are likely to be more costly than plain foams.

### 5.2 Application of Foams

#### 5.2.1 Polystyrene

Polystyrene (PS) foams are the most used foams of the thermoplastic polymers. For the main types of construction PS foams the following technologies are used:

- Moulded bead foam
- Extrusion.

Extruded foam has a simple, more regular structure than moulded bead foam, and also better strength properties and higher water resistance.

PS foams have poor outdoor weathering; they resist moisture well but deteriorate when exposed to direct sunlight for long periods of time – this results in yellowing of the polymer. PS foams are used in construction as insulation, in particular perimeter insulation, roof insulation and masonry wall insulation. The requirements of perimeter insulation, applied below ground level along the edges of a concrete foundation, are relatively high thermal resistance for a given thickness, good moisture resistance and good compressive strength. The product for roof insulation should have good dimensional stability and high flexural and compressive strength, and should preferably be of a fire retardant grade. Masonry buildings can be easily insulated by placing foam board between exterior and interior walls or by bonding the foam directly to the wall.

### 5.2.2 PVC

The greatest use of polyvinyl chloride (PVC) foam is where low flammability is a key requirement. It can be produced either by a mechanical blowing process or by one of several chemical blowing techniques. It has almost completely closed cell structure and therefore low water absorption. PVC foams are produced in rigid or flexible forms. Rigid PVC foam is generally used in sandwich panel structures, whereas flexible PVC foam is used widely as the foam layer in coated fabric flooring. Some of the most important properties of PVC foam are:

- High tensile, shear and compressive strength
- Does not crumble under impact or vibration
- Low thermal conductivity
- Low water vapour permeability
- Resistance to termites and bacterial growth
- Good chemical resistance.

### 5.2.3 Polyurethane

The most commonly used techniques for producing rigid PU foams include:

- Foam-in-place
- Spraying
- Continuous slabbing.

Foaming-in-place is a useful method for filling irregular voids or cavities, it is especially suited to high-rise applications and gives good uniformity in density and foam structure. The spraying technique allows thin layers of PU foam to be built up on large surface areas and additional layers can be applied almost immediately in consecutive passes to form a slab. The slab produced after the slabbing process can be cut after curing, or formed to a specific shape and size.

Chemically, rigid PU foams are the most complex of all foams – this is because a considerable number of additives are used, such as blowing agents, catalysts, surfactants, etc. The main advantages of PU over other foams lie in its:

- Low thermal conductivity (0.02 W/m°C)
- Good thermal resistance (up to 120 °C)
- Low vapour permeability
- Light weight and strength
- *In situ* foamability.

The behaviour of the foam in fire is not good, although flame retardant grades are available by adding halogenated compounds at the time of preparation.

Rigid PU foams are used as thermal insulation over a wide range of temperatures. Applications include use as perimeter insulation, wall and roof insulation, curtain wall panels, low temperature insulation and insulation of industrial pipe and storage tanks. PU foam used in roof deck insulation has an additional advantage over PS in that it can be hot mopped with bitumen without damage to its structure. It is also a very good core for sandwich panels and some structural components.

### 5.2.4 Phenol-formaldehyde

Phenol-formaldehyde (PF) foam has:

- Good chemical and thermal resistance
- High resistance to water transmission and water uptake
- Good dimensional stability
- High strength to weight ratio
- Less flammability than most foams.

However, because of its high open-cell content it has relatively low thermal resistance. Thermal insulation efficiency can be improved by the application of a skin of hot bitumen or other suitable material.

PF foams achieve the highest classification as the result of fire tests and produces optical smoke obscuration of less than 5%, compared with 50-90% for most commercial grades of PS or PU foam.

### 5.2.5 Urea-formaldehyde

The basic chemistry of the urea-formaldehyde (UF) polymer is the same as that for other applications, except that foams must cure at room temperature within the first few minutes, as compared to adhesives or mouldings which cure at high temperatures.

In the application of UF foam, its compatibility with adjoining materials must be considered. UF foam can be easily peeled from PVC, PE, PS and polyesters and behaves as an inert material from the chemical point of view. It sticks to butyl rubber but peels off asphalt papers, used in roofing or foundation waterproofing. Aluminium is discoloured but is not

corroded by UF foam, however copper noticeably tarnishes, zinc-plated steel corrodes slightly, and steel is considerably rusted when brought into prolonged contact with UF foam. Other additives have been used to modify and tailor-make UF foam structures to give specific characteristics such as very low density, flexibility, etc.

UF foam deteriorates at a moderate to rapid rate so it has a short life compared with other building materials. The rate of deterioration depends on the conditions to which it is exposed. In residential applications, the factors most likely to accelerate degradation are high temperatures and high humidities. Temperatures such as those encountered in a roof space on a summer day cause rapid deterioration. High humidity resulting from the flow of warm humid air from the living spaces into insulated cavities also causes accelerated degradation. UF foams have a high water absorption and a high water vapour permeability.

Deterioration of the foam leads to breakage of the cell walls and shrinkage of the insulation, decreasing the foam's ability to resist heat and air flow. It has a tendency to undergo shrinkage on drying. Formaldehyde gas is produced and may be carried into the living space by air infiltration and, at a slower rate, can diffuse through the wall materials. When subjected to elevated levels of formaldehyde for extended periods, occupants can react to the gas and may develop health problems. The severity of the reaction (eye, nose and throat irritation) depends on the formaldehyde concentration, the duration of the exposure and the sensitivity of the individual. Most people are unaffected at concentrations below 0.25 ppm – most people can detect the smell of the gas at 0.1 ppm.

Although the cancer risk of formaldehyde remains controversial, UF foam usage is now banned in building applications.

### **5.2.6 Epoxy**

The technology of epoxy foam is similar to that of PU foams, except that epoxies need the addition of a foaming agent.

Epoxy foams have very good chemical stability, moisture resistance and thermal insulating properties, but because of the high cost their use in building construction is limited.

## **6 Fibre Reinforced Polymeric Materials (FRPs)**

FRP materials consist of two or more distinct physical phases, one of which, the fibrous, is dispersed in a continuous matrix phase. FRPs offer the designer a combination of properties not available in traditional materials. It is possible to introduce the fibres in the polymer matrix at highly stressed regions in a certain position, direction and volume in order to obtain the maximum efficiency from the reinforcement, and then, within the same member to reduce the reinforcement to a minimal amount at regions of low stress value. Other advantages offered by the material are lightness, resistance to corrosion, resilience, translucency and greater efficiency in construction compared with the more conventional materials.

### **6.1 Materials Used**

Thermosetting resins are most widely used in the construction industry, the most common being the polyesters and the epoxides.

A wide range of amorphous and crystalline materials can be used as the fibre. In the construction industry the most common fibre used is glass fibre (there are 4 classes of glass fibre: E-glass, AR-glass, A-glass and high strength glass). Carbon fibre, of which there are 3 types (Type I, II, III) can be used separately or in conjunction with the glass fibre as a hybrid to increase the stiffness of a structural member or the area within a structure, so that the stiffness exceeds the value possible using only glass fibre. Aramid fibres can be used instead of glass fibres to give increased stiffness to the composite.

Bundles of filaments are called strands and these are usually combined to form thicker parallel bundles called rovings. Assembled rovings are used in processes involving chopping of the fibres during the production of a composite, e.g., sheet moulding compound (SMC), spray-up and continuous sheet manufacture. Rovings are also manufactured by a direct technique in which all the filaments needed in the final roving (up to 4800) are all drawn simultaneously from one bushing. These rovings are called direct rovings and are used in weaving, pultrusion and filament winding. Strands may also be twisted to form several types of yarn; rovings or yarns may be used either individually or in the form of a woven fabric.



For structural applications it is mandatory to achieve some degree of flame retardance. Fire retardants are usually incorporated in the resin itself or as an applied gel-coat. Fillers and pigments are also used in resins for a variety of purposes, the former principally to improve mechanical properties and the latter for appearance and protective action.

## 6.2 Key Properties of FRP Materials

FRPs have many advantages in indoor, outdoor and infrastructure applications. First they are very strong and rigid, offering an outstanding strength-to-weight ratio. Secondly, they exhibit a high creep resistance in the long term, excellent resistance to weathering and temperature changes (no softening or brittleness), a good resistance to UV radiation, humidity and atmospheric pollution, and a high impact strength. Moreover, these materials exhibit a low flammability (depending on choice of resin), a good dimensional stability and a good thermal resistance. Users benefit from a wide range of possibilities in terms of colour and aspect – including natural colours for renovation works – and from great design flexibility. The construction sector can use lightweight, easy to carry prefabricated elements, which are easily and rapidly assembled with no need for special handling equipment.

One of the advantages of using FRP materials is the ability to define the final material properties by selecting a unique combination of matrix materials, reinforcing fibres and fibre directions to suit a particular application. This enables the laminates to be optimised, in order to produce economic and lightweight structures. Fibres can be placed in the most advantageous positions and orientations to carry the applied loading and different fibres may be used in different locations.

The benefits of FRPs are:

- Lightweight
- Good specific mechanical properties
- Good durability in most environments
- Readily formed into complex shapes
- Modularisation
- Low thermal conductivity
- Ability to tailor the mechanical properties by fibre choice and direction
- Aesthetics

### 6.2.1 Fire Performance

Given careful design and the right choice of resins, additives and fillers, FRPs can be used to make structures with better fire resistance than almost any other material. As an example, phenolics are used within firewalls. FRPs generally are poor thermal conductors, so they do not help the heat of a fire to spread in the way that can occur with metals. The smoke from fire can be a concern, and so careful choices need to be made for internal applications. Fire testing is frequently performed. **Figure 12** illustrates the excellent fire properties of glass fibre reinforced plastic. In this fire test a cladding panel shows charring.



**Figure 12**

Fire test on a FRP cladding panel

As with all issues in design there is always a compromise to be struck between the different material properties needed for a project. If fire resistance is absolutely critical then FRP can often be the most cost-effective solution.

### 6.2.2 Vandal Resistance

High strength combined with low weight is one of the major advantages of FRP materials. This is derived from two constituents:

- Glass or carbon fibre reinforcement which binds together and spreads any load over a wide area
- Thermosetting resins cannot be softened or made malleable by the application of heat. Consequently, composites resist well the impact damage of mindless vandalism and do not readily distort or ignite, like thermoplastics, when attacked with a heat gun or incendiary device.

This makes composites ideal in a hostile or severe environment, where structural integrity needs to be preserved without requiring an overtly large structural design, as would be the case with any other material.

### 6.2.3 Durability

FRP materials have been used successfully over the past 50 years in a wide range of applications in the marine and civil engineering sectors in a diverse range of applications that include pipes, tanks, slabs, walkways, bridge decks, gratings, column reinforcing wraps and reinforcing bars for concrete. In many of these applications FRPs are exposed to one or more of the influences noted earlier. All FRP materials are durable inasmuch as they are water resistant, thermally stable and cannot rust. Applications such as those listed are predicated in more stringent tests of durability. In this respect, particular grades of high durability (5-20 year lifetime) FRP materials are available for particular applications. For example, FRPs for concrete reinforcing bars (known as re-bars in the industry) incorporate alkali resistant glass fibres in order to resist fibre attack by pore water, while composites for marine applications incorporate a chemical bond at the fibre/matrix interface in order to resist water penetration. In almost all applications, the durability of a FRP material may be enhanced by imposing a conservative safety factor (2-4) on the design, and in many such cases additional durability may be achieved by the use of a protective coating and/or the incorporation of light stabilisers and antioxidants.

### 6.2.4 Chemical Resistance

A surprising number of reinforced plastics applications involve occasional or prolonged contact with chemicals. Many reinforced plastics articles are routinely placed in contact with detergents, cleaning solvents, acids, alkalis, strong oxidising agents, bleach, cleaning and degreasing agents, fuels, hydraulic and brake fluids, de-icers, paint strippers (methylene chloride based ones are known to be particularly damaging), lubricants, etching chemicals, flue gases, or food and drink.

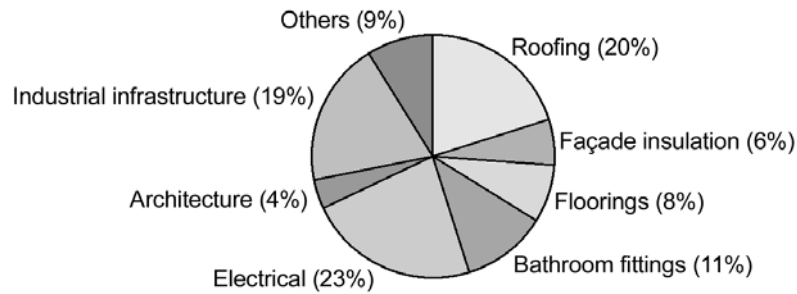
It must be stressed that the resistance of reinforced plastics to highly reactive chemicals is generally very good. This explains their widespread use in the chemical process equipment industry, where it is often difficult to find any other affordable, processable materials capable of withstanding the very harsh conditions. It is rare for reinforced plastics articles to be attacked as rapidly as some common metals are when placed in contact with acids. A few chemicals that are handled in chemical factories, such as powerful oxidising agents, strong caustic alkalis, bromine and wet chlorine still pose severe problems for general purpose organic matrix resins. Otherwise, the well-informed selection of materials, in consultation with the suppliers and after reference to the relevant data banks, means that complete disaster is a very rare occurrence.

## 6.3 Fabrication

A wide range of different processes have developed for moulding of FRP parts ranging from very simple manual processes such as hand lay to very sophisticated highly industrialised processes such as SMC moulding. Each process has its own particular benefits and limitations making it applicable for particular

**Table 3 Fabrication**

Processing route	Typical components
Open moulding – hand and spray lamination	Cladding panels, radomes, garage doors, caravan parts
Vacuum infusion	Strengthening of components, masts
Pre-pregs	Architectural mouldings, infrastructure repair
Compression moulding of SMC	Electrical cabinets, sectional water storage panels, modular components
Pultrusion	Standard sections, access ladders, reinforcement bars, roof trusses, space frames, window profiles
Filament winding	Pipes, wrapping of columns
Continuous sheeting	Cladding, roofing
Centrifugal casting	Pipes, tanks, masts, poles



**Figure 13**

FRP use in the construction industry

applications. The choice of process is important in order to achieve the required technical performance at an economic cost.

The main technical factors that govern the choice of process are the size and shape of the part, the mechanical and environmental performance and aesthetics. The main economic factor is the number of identical parts required or run length. This is because FRP parts do not generally come as standard components but are custom designed for a particular application. Pultrusion and continuous sheeting are exceptions but most processes will have an initial investment or set up cost that must be amortised over the length of the project. This is a major factor in the choice of process and is one of the reasons for the proliferation in processing methods.

**Table 3** summarises the types of component produced from common manufacturing processes.

### 6.3.1 Procurement

There are certain composite parts such as pultrusions, pipes and continuous sheeting that are available in standard sizes so that, once manufacturers have been located, specification and procurement is relatively straightforward. The vast majority of FRP parts are, however, custom designed and moulded to meet the needs of a particular application. There is a very wide range of different manufacturing processes and very often companies will specialise in one or two processes. It is rare to find a company that possesses every process and material combination and with more than 2000 FRP moulders in the UK alone, procurement can be a challenge. A useful source of information and advice can be the raw material suppliers, particularly the resin and reinforcement companies, who will often be willing to advise on the choice of process and sometimes recommend suitable moulders.

## 6.4 Application of FRPs in Construction

According to the Association of European glass-fibre producers (APFE) statistics, building and construction applications represent 30% of Europe's overall FRP market. The applications of FRP in the construction industry are outlined in **Figure 13**, together with an indication of market share.

Fibre reinforced polymers (FRP) were first developed during the 1940s, for military and aerospace applications. Considerable advances have been made since then in the use of this material and applications developed in the construction sector. FRPs have been successfully used in many construction applications including load bearing and infill panels, pressure pipes, tank liners, roofs, and complete structures where FRP units are connected together to form the complete system in which the shape provides the rigidity.

In the last decade, FRPs have found application in the construction sector in areas such as bridge repair, bridge design, mooring cables, structural strengthening and stand-alone components. These FRPs are materials often referred to as advanced composites and have properties considerably superior to those of earlier materials. In advanced composites, fibres with high strength and stiffness are used in relatively high volume fractions, whilst the orientation of the fibre is controlled to enable high mechanical stresses to be carried safely. The major advantage of these materials lies in their anisotropic nature. The reinforcement can be tailored and oriented to follow the stress patterns in the component, leading to much greater design economy than can be achieved with traditional isotropic materials.

FRPs offer several important advantages over traditional materials for construction projects:

- Time saving – low weight for fast construction in time tight projects
- Durability – able to survive, especially in harsh environments
- Repair – allow repair of structures *in situ*
- Strengthening – strengthening of structures *in situ*
- Tailor-made properties – where especially high performance is needed in one direction
- Appearance – where a particular colour, shape or texture is required
- Blast/fire – where blast or fire resistance is required
- Radio transparent
- Low maintenance – in conditions where difficult access makes maintenance hard

The main current areas of application of FRPs in construction are:

- Architectural features, i.e., non-structural elements (**Figure 14**)
- Bridges (**Figure 15**)
- Cladding (**Figure 16**)
- Column wrapping
- Domes
- Enclosures (**Figure 17**)
- Fencing
- Masts
- Pipes
- Refurbishment/strengthening existing structures (**Figure 18**)
- Roofing
- Seismic retrofitting – strengthening of a structure with FRP to withstand earthquake activity
- Structures – including modular (**Figure 19**)
- Tanks
- Towers



**Figure 14**

Architectural features  
(Reproduced with permission from Lindman  
Fibre-Craft™)



**Figure 15**

FRP bridge  
(Reproduced with permission from FaberMaunsell)



**Figure 16**

FRP cladding



**Figure 17**

FRP swimming pool lining



**Figure 18**

Strengthening with carbon fibre  
(Reproduced with permission from Mouchel)



**Figure 19**

FRP modular structure

## 7 Polymer Concrete

As the world's needs for housing, transportation and industry increase, the consumption of concrete products is expected to increase correspondingly. At the same time, prudent management of energy and natural resources demands ever higher levels of performance. Although Portland cement concrete is one of the most versatile construction materials, a clear need is perceived for the improvement of properties such as strength, toughness, ductility and durability. One approach is to improve the concrete itself; another is to combine technologies in order to make new composites based on cement.

Polymers containing large amounts of filler, such as polymer mortars and polymer concretes are increasingly being used in buildings and other structures. Polymer mortars are mainly used as protective coatings on concrete, reinforced concrete, and rarely on steel, while polymer concretes represent a new type of structural material capable of withstanding highly corrosive environments.

Some polymers are relatively cheap and completely resistant to alkali attack by cement paste. They offer hope in overcoming one of the main problems of fibre reinforced concrete, which is the lack of ductility. The material tends to crack rather than bend under relatively modest loads. Apart from polymers, which are only now being developed, interest is being shown in natural and synthetic fibres, mainly to produce asbestos-cement substitutes.

The development of concrete-polymer composite materials is directed at both improved and new materials by combining the well known technology of hydraulic cement concrete formation with the modern technology of polymers.

A wide range of concrete-polymer composites is being researched, although only some of them are being applied. The most important are:

- Polymer impregnated concrete (PIC)
- Polymer-cement concrete (PCC)
- Polymer concrete (PC)
- Fibre-reinforced concrete
- Fibre-reinforced polymer concrete

PIC is precast and cured hydrated cement concrete which has been impregnated with a monomer, which is subsequently polymerised *in situ*. This type of cement

composite is the most developed of polymer-concrete products. PCC is a premixture of cement paste and aggregate to which a monomer is added prior to setting. PC is an aggregate bounded with a polymer binder. This product may be produced on site. It is called a concrete because according to the general definition, concrete consists of any aggregate bound with a binder. The last two products are based on natural, metallic or synthetic fibres as reinforcing agents. Fibre reinforced polymer concrete comprises a polymer/concrete blend reinforced with FRP.

### 7.1 Polymer Impregnated Concrete

The largest improvement in structural and durability properties has been obtained with this composite system. In the presence of a high polymer phase, the compressive strength can be increased four times or more, water absorption is reduced by 9%, the freeze-thaw resistance is enormously improved, and, in contrast to conventional concrete, PIC exhibits essentially zero creep properties.

The ability to vary the shape of the stress-strain curve presents some interesting possibilities for tailoring desired properties of concrete for particular structural applications.

PIC is generally prepared by impregnating dry precast concrete with a liquid monomer, and polymerising the monomer *in situ* by thermal, catalytic or radiation methods. Some of the most widely used monomers for polymer concrete systems include:

- Methyl methacrylate
- Styrene
- Butyl acrylate
- Vinyl acetate
- Acrylonitrile
- Methylacrylate

These monomers may be used alone or in mixtures. Unsaturated polyester-styrene is a very common system for polymer-concrete composites. PICs based on epoxy polymers are more expensive although their properties are superior.

#### 7.1.1 Applications

The most important applications of PIC are:

- Bridge decking
- Tunnel lining support systems
- Pipes – PIC supports about twice as much hydrostatic pressure as impregnated pipe
- Desalting plants
- Beams – ordinary reinforced beams and post-tensioned beams
- Underwater habitats
- Dam outlets, offshore structures, underwater oil storage vessels, ocean thermal energy plants

PIC must be considered a new complex material with specific characteristics, which place it in a position, from the viewpoint of quality and cost, between traditional concrete and other groups of engineering materials such as metals and ceramics.

### 7.2 Polymer-Cement Concrete

Mixing various organic compounds with concrete results in relatively modest improvement of strength and durability. Common monomers such as methyl methacrylate or styrene either interfere with the hydration process of the cement paste or are degraded because of the alkalinity of some of the cement components. Polyester-styrene systems or epoxies can be effective, though fairly high proportions are usually required if mechanical properties are to be improved. Under the best conditions, compressive strength improvements over conventional concrete of about 50% are obtained with relatively high polymer concentrations of about 30%. The incentive to attain improved premix concrete materials is that they can be cast in place for field applications whereas PIC requires a precast structure.

Most of the PCC composites are based on different kinds of latices. A latex is a stable dispersion of fine polymer particles in water, also containing some non-polymeric constituents. The properties of the latex formed and of the polymer or copolymer are very dependent on how the various constituents are put together. Latex type PCC possesses excellent bonding to steel reinforcement and to old concrete, good ductility, resistance to penetration by water and salt, and excellent durability under freeze-thaw cycling. The properties of PCC are thus dependent on the type of polymer and/or its amount.

### 7.3 Polymer Concrete

PC may be considered as an aggregate filled with a polymeric matrix. The main technique in producing PC is to minimise the void volume in the aggregate mass so as to reduce the quantity of the relatively expensive polymer necessary for binding the aggregate. A wide variety of monomers, prepolymers and aggregates have been used to produce PC, including epoxy, polyester-styrene systems, methyl methacrylate and furane derivatives. The polymer matrix enables some of the drawbacks of conventional concrete to be overcome:

- Formation of internal voids when alkaline Portland cement is used
- On freezing, can readily crack due to water being entrapped
- Alkaline cement can be chemically attacked and deteriorated by acidic substances.

Bond strengths to substrates are usually high, and in spite of high cost, PC is particularly useful for maintenance and repairs, especially when it is important to avoid delay and inconvenience.

By carefully grading the aggregate, it is possible to wet the aggregate and fill the voids by the use of as little as 7-8 wt% (~14-16% volume) polymer. With high degrees of packing, high compressive strength can be obtained. Typical comparative properties are given in **Table 4**.

<b>Table 4 Typical properties of polymer concrete composites</b>			
	<b>PCC</b>	<b>PIC</b>	<b>PC</b>
Compressive strength (MPa)	35	138	131
Tensile strength (MPa)	2.4	10.3	9.6
Shear strength (kPa)	861	-	>4481
Young's modulus (MPa × 10 <sup>-3</sup> )	24	41	34
% water absorption	5.5	0.6	0.6
Freeze-thaw resistance	700/25	3500/2	1600/0
Acid resistance improvement	-	10×	>20×
Benefit/cost	1	2	4

Flexural strengths, though much higher than for plain concrete, are limited by the aggregate-matrix bond strength and by disparities of the aggregate surfaces, which can induce stress concentrations.

### 7.4 Fibre Reinforced Concrete

The use of fibrous reinforcement to improve the strength and deformation properties of concrete is well established. The concept of fibre reinforcement is to use the deformation of the matrix under stress to transfer load to the fibre. Substantial improvements in static and dynamic strength properties can be achieved if the fibres are strong and stiff, and loaded to fracture, provided there is a minimum fibre volume fraction.

Fibres currently used in fibre-concrete composites can be broadly classified into two types:

- Low modulus, high elongation, e.g., polyamide, polypropylene, polyethylene
- High strength, high modulus, e.g., steel, glass, asbestos, carbon, graphite

The characteristics of the fibre influence the properties of the fibrous composite.

Among the synthetic fibres, polypropylene (PP) is one of the cheapest. PP exhibits fairly good mechanical properties, a relatively high melting point (165 °C), a low density (0.91 kg/dm<sup>3</sup>), and good chemical stability. In the case of chemical attack on PP reinforced concrete composite, the matrix will be destroyed long before PP is affected. PP-cement composite has potential for many end-use applications such as:

- Planking, now served by wood
- Cladding and light walling, where aluminium or PVC are most popular at present
- Rainwater goods
- Non-pressure pipes in use for drainage and sewage
- Pressure pipes
- Permanent shuttering.

## 8 Adhesives and Sealants

Animal and vegetable glues have been used as adhesives since the beginning of history – they supply a good bond under dry conditions but fail if the joint becomes wet. In addition they bond only certain materials such as wood and paper. The introduction of casein and blood glues was a marked improvement, but it was the development of polymeric adhesives and sealants that produced a significant advance.

Adhesives and sealants are used in almost every phase of the building industry. The use of adhesives in construction began with the finishing trades – flooring materials, wallpaper and roofing cements were the first volume applications. Paralleling the growth of certain wall constructions has been the increase of a whole family of higher-performance speciality sealing compounds – sealants. The term sealant was first used to differentiate these new polymer based compounds from the older oil-based caulks. Modern usage, however, has extended the meaning of the word, so that the term is now used to include all types of weatherproofing joint materials currently in use. Polymer sealants are designed to prevent the passage of moisture, air and heat through all the joints and seams of a structure.

### 8.1 Adhesives

In recent years there has been a rapid development of adhesive bonding as an economic and effective method for the fabrication of various components and assemblies. The use of adhesives offers advantages in comparison with traditional techniques such as welding, riveting, bolting, etc. Some of the advantages are:

- The ability to join thin sheets, or dissimilar materials
- An increase in design flexibility
- An improved stress distribution in the joint which leads to an increase in fatigue resistance of the bonded component
- A convenient and cost effective technique.

When all the applications of adhesives are taken into account, adhesive bonding must be considered as the most widely used method of holding various materials together.

There exists a considerable number of different types of adhesives which are currently used, however, there is no single system of classification for all products. The adhesives industry has generally employed classifications based on end-use, such as metal-to-metal adhesives, paper and packaging adhesives, general purpose adhesives, etc.

#### 8.1.1 Thermoplastic Adhesives

- Polyvinyl acetate (PVAc) is not affected by low temperatures or in sunlight and is unaffected by bacteria, fungi or insects. However, the adhesive will not sustain prolonged stress, particularly at elevated temperatures. It swells slightly and becomes opaque on long immersion in water, but recovers on drying.
- Polyvinyl alcohol is commercially available in several types, the most common being the partially hydrolysed grades, and the completely hydrolysed grades. The completely hydrolysed grades are soluble in hot water and have good film-forming characteristics as well as good general adhesive properties.
- Polyvinyl acetals – predominantly polyvinyl formal which is used for electrical insulation and polyvinyl butyral which is used for fabrication of safety glass laminate.
- Polyvinyl chloride (PVC) is not affected by alkalis or aqueous solutions. PVC is often co-polymerised with other monomers to produce adhesives, e.g., vinyl acetate-vinyl chloride copolymers which are used in packaging and for fixing PVC to other materials such as paper, wood, leather or another plastic.
- Acrylics have outstanding outdoor durability, high clarity and excellent light transmission.
- Polyamides provide adhesives with good rust resistance. Strong and versatile protective adhesives and coatings are produced by mixing solutions of some polyamides with epoxy resins. The coatings are hard, tough, flexible and strongly adhering to a wide range of surfaces such as wood, concrete, steel and many plastics.
- Polycarbonates are sometimes used in hot melt adhesives but are mostly used in the joining of materials which themselves are polycarbonates.



- Polyurethane adhesives are most widely used for bonding elastomers, fabrics and thermoplastics – they are excellent for bonding rubber to metal.
- Cellulose is the principal component of nearly all forms of plant life. Cellulose nitrate is a general adhesive, a pigment binder waterproof finish and lacquer; it deteriorates when heated and is highly flammable.

### 8.1.2 Thermoset Adhesives

- Phenolic adhesives were originally developed for the bonding of wood at room temperature. They have since been used in the bag moulding industry and in the manufacture of laminated wood beams and other types of wooden articles. They can be used for metal bonding once the metal surface has been prepared with an adhesive primer.
- Epoxies bond well to metals, wood, glass and ceramics.
- Polyaromatics, polybenzimidazoles in particular, are used for bonding metals and also for bonding honeycomb sandwich type metal assemblies used in the aircraft industry.

### 8.1.3 Structural Adhesive Bonding

There is no generally accepted definition of a structural adhesive. Structural adhesives can be considered as adhesives with high modulus and high strength between relatively rigid adherends, so that a load bearing joint is formed, for example, in the case of timber beams used as primary structural members. They have also been used in the manufacture of prefabricated panels where brick slips, or other decorative facings, are bonded to epoxide resin 'concrete' backings. On-site application of the technique has generally been unsuccessful since the substrate preparation is vital and the length of time that the adhesive requires to attain its full strength is dependent on the temperature. At low temperatures it may never reach its maximum strength.

## 8.2 Sealants

Modern sealants are composed of pigmented or unpigmented synthetic elastomeric polymers, which, in the non-cured state, constitute pourable or easily

extrudable putty-like mastics. In the cured state, these sealants become transformed into elastomeric materials.

Sealant is the name now given to the materials that have replaced putties and caulks. They contribute significantly to keeping out rain, air and dust, and even improve the thermal performance of a wall. Sealants are developing in conjunction with the construction industry's increasing use of large panels. Movements of these units caused by changes in temperature and humidity necessitate new types of putties, as the old ones are not able to cope with the larger joint movements, especially after long periods of service. Sealants have to provide material continuity between building elements while the joint may change in dimension by as much as 50% as it opens in winter and closes in summer. **Figure 20** illustrates joining of panels with sealant.

Sealants are marketed in three main forms:

- Putty-like mastics
- Non-cured tapes
- Cured gaskets.

The sealants in mastic form are employed in one- and two-component formulations. The main advantage of one-component sealants are that they require no mixing before application, and have an extended pot life. Curing of the sealant depends on the moisture content of the atmosphere; during dry periods the curing process may be slowed down. When applied, the sealant forms a skin in a few hours and cures to a rubbery elastomeric material within several days.



**Figure 20**

Joining of panels with sealant

From the perspective of the rubber chemistry, there is a natural inclination to classify sealants in terms of their chemical composition or physical properties. Thus, the following sealant groups emerge:

- Silicones
- Polyurethanes
- Polysulphides
- Polymercaptans
- Chlorosulphonated polyethylenes
- Polyacrylics
- Polychloroprenes
- Butyl rubbers
- Halogenated butyl rubbers
- Polyisobutylenes
- Polybutylenes
- Drying and non-drying oil based caulks.

The most significant classification is based on the balance of properties that the architect or design engineer would consider, separately and in combination, when specifying the requirements for a particular joint. These are:

- Joint movement
- Durability
- Cost.

The shape and dimensions of the seal cross-section are of primary importance in determining the movement induced stresses and strains on the sealant and on the substrate. The optimal geometry of a seal is twice as wide as it is deep, but a ratio of one is more commonly used in practice to reduce the frequency of failure. Elastic sealants must be bonded on only two opposite sides of the joint, allowing the bottom surface to deform freely. The height and mass of the structure, wind loads, moisture absorption, amount of shade, ambient temperature and colour of substrate dictate the movement that building joints must undergo. The higher the variation of load in the joint, the more elastic the joint must be.

The properties, and thus performance, of the sealant are based on its components. Rubbery sealants that have high recovery also have lower tear resistance. Deformable sealants have instantaneous elasticity under short-term loads, but will creep or flow under long-term loading. These sealants include

polysulphides, polymercaptans, butyls, solvent based acrylics and latex caulks. Preformed gaskets are high recovery elastomers that are precompressed into the joint, hence the seal is dependent on the force exerted on the joint by the gasket. As the joint opens, due to substrate contraction, the gasket may fall out once compression is reduced to zero. Adhesives may be used to allow gasket operation under tensile loading. Tapes can be high recovery (cured) or low recovery (uncured), and the stresses under load vary according to the type of tape being used.

Failure of sealants depends on the type of sealant used, the installation and the service conditions. Adhesive failure, which is the loss of bond between the sealant and its substrate is most common in mastic type sealants. Mastic sealants are also subject to cohesive failure, which is denoted by failure within the body of the sealant, and spalling failure, where the overall strength of the sealant exceeds the cohesive strength of the substrate. Deformable sealants can fail with a change in sealant shape due to flow. Failure can also occur if there is a large joint movement before the sealant is fully cured.

Sealants can fail due to ageing and weather exposure. This type of failure is often characterised by discolouration and crazing and/or stiffening of the sealant surface and is a result of the individual or combined effects of solvent evaporation, ozone attack, migration of plasticisers, UV radiation, etc. Failure can be prevented by introducing certain additives such as adhesion promoters, fillers, pigments, plasticisers, etc.

Fillers such as carbon black and calcium carbonate can improve the physical properties of the sealant. Plasticisers lower the modulus of elasticity and increase ultimate elongation. Pigments such as carbon black and titanium dioxide can be used to match the colour of the sealant to the substrate, but they can change the sealants' properties. Primers provide better adhesion of the sealant to the substrate – the more elastic the sealant the greater the need for a primer.

## **9 Legislation**

The construction industry is heavily regulated and is governed by many different standards and bodies. The two most important controls in the UK are the EU Construction Products Directive and the Building Regulations.

## **9.1 The Construction Products Directive**

The primary function of the Directive is to ensure the safety of constructions in all countries of the European Economic Area. The Directive lays down certain essential performance criteria for buildings under six general headings:

- Mechanical resistance and stability
- Safety in case of fire
- Hygiene, health and the environment
- Safety in use
- Protection against noise
- Energy economy and heat retention

The Directive is different from other New Approach Directives in that the performance requirements apply to the construction as a whole and not simply to each individual component. This adds a considerable layer of complexity to the process of creating product standards, since it is first necessary to produce a series of documents outlining the performance of the buildings themselves, before it is possible to draft a series of standards which can be used to define the performance characteristics of individual components.

In practice, the definition of building performance has been encapsulated in a series of Eurocodes which provide detailed guidance on the design methodology for structures. The Eurocodes cover all aspects of the design of structures and contain formulae and data that can be used to calculate the key dimensions and other design variables for any proposed construction. At the time of writing the programme of creation of the Eurocodes is pretty well complete although several of the codes have so far only been published in draft form.

Member countries of the EU are free to decide the legal status of the Eurocodes within their own territory to some extent. Adoption of the codes as part of the national building regulations is optional, but countries are required to recognise structures built to the codes as having been adequately designed. In practice, of course, this means that a series of standards have to be produced so that manufacturers have proper benchmarks against which to judge their designs.

The Directive actually permits three methods of compliance:

- Manufacture in compliance with Harmonised European Standards (referred to in the Regulations

as ‘relevant national standards’ and otherwise known as ‘Euronorms’

- European Technical Approval (ETA)
- Manufacture in compliance with a recognised national standard.

### ***9.1.1 Harmonised European Standards***

At the time of writing no Harmonised European Standards actually exist, although approximately 2000 such standards are in preparation.

### ***9.1.2 European Technical Approval***

A number of bodies have been notified by EU member states for the purposes of being able to perform European Technical Approvals. In the UK, UKAS is recognised as the sole body for the accreditation of certification, testing and inspection bodies to the EN45000 standards. Those bodies in turn certify, test and inspect companies’ systems and products. UKAS also accredits laboratories involved in the calibration of measuring equipment. UKAS is licensed by the UK Department of Trade and Industry (DTI) to use and confer the national accreditation marks that symbolise Government recognition of conformity assessment services. Information on UKAS and accredited organisations is available from the UKAS website. UKAS accredited certification bodies and companies registered by UKAS accredited certification bodies are listed in the UK Register of Quality Assessed Companies published by The Stationery Office (TSO).

UKAS accredited certification, testing, calibration and inspection reduces the need for suppliers to be assessed by each of their customers. UKAS’ involvement in international groups provides for mutual recognition, further reducing the need for multiple assessment of suppliers and consequently helping to reduce trade barriers.

Because of the current state of flux in the relevant standards, technical approval by the British Board of Aggrement (BBA), certification by BRE or by one of the other bodies appointed by a member state to the European Organisation for Technical Approvals (EOTA) is at present the only straightforward means of complying with the requirements of the Directive. This will change as harmonised standards are issued and, eventually, EOTA will only become necessary in cases where there is no relevant harmonised standard.

There is no separate Eurocode for polymer structures, as there is for timber, concrete, masonry and aluminium. The relevant Eurocode for the polymer industry is:

**Eurocode 1 Basis of design and actions on structures**

Part 1 Basis of design

Part 2-1 Densities, self-weight and imposed loads

Part 2-2 Actions on structures exposed to fire

Part 2-3 Snow loads

Part 2-4 Wind actions

Part 2-5 Thermal actions

Part 2-6 Construction loads and deformities imposed during construction

Part 2-7 Accidental actions

Part 2-xx Actions on structures, actions from currents and waves

Part 3 Traffic loads on bridges

Part 4 Actions on silos and tanks

Part 5 Actions induced by cranes and machinery

## **9.2 UK Building Regulations**

Building regulations are the legal and technical requirements laid down by Parliament for controlling the construction of building and building works in England and Wales. Scotland and Northern Ireland have their own sets of Building Codes. They apply when building works are carried out, unless the works are specifically exempt (usually minor operations). These Regulations are framed as basic performance standards. The level of safety and standards acceptable are set out as guidance in the Approved Documents. Compliance with the detailed guidance of the Approved Documents is evidence that the Regulations themselves have been complied with. Alternate ways of achieving the same level of safety are also acceptable.

The Great Fire of London (1666) prompted the government of the time to issue bye-laws to prevent the spread of fire between buildings. Later Acts expanded their scope to deal with sanitation and public health. In 1965 these building bye-laws were replaced by National Building Regulations which exist to this day. The regulations cover the erection of new buildings, the extension and alteration of existing buildings and the provision of controlled services such

as drainage and ‘heat-producing appliances’. They also apply to certain changes-of-use of buildings, such as the conversion of a single dwelling to flats. Some minor building works such as installation of replacement windows are exempt from the Regulations. Building work requiring approval includes:

- The erection of a new building or re-erection of an existing building
- The extension of a building
- The ‘material alteration’ of a building
- The ‘material change’ of use of a building
- The installation, alteration or extension of a controlled service or fitting to a building.

The Approved Documents are published separately in booklet form called ‘Parts’. They deal with specific subjects:

- Part A Structural stability.
- Part B Fire Safety. The Regulations consider aspects of fire safety in the construction of buildings. Other aspects such as the management of a premises may be dealt with under different legislation.
- Part C Site preparation and resistance to moisture.
- Part D Toxic substances. Cavity Insulation.
- Part E Resistance to passage of sound.
- Part F Ventilation.
- Part G Hygiene.
- Part H Drainage and Waste Disposal.
- Part J Heat producing appliances.
- Part K Stairs, ladders, ramps, guards, etc - Protection from falling, collision and impact.
- Part L Conservation of fuel and power.
- Part M Access and facilities for disabled people.
- Part N Glazing - materials and protection.

Different parts are significant for different applications – for example, Part L has recently been revised and now favours polymer window frames and doors which have excellent insulation properties compared to those from ‘traditional’ materials.

Details of each document and how it applies to specific products and materials can be found at: [www.safety.odpm.gov.uk/breg/brads.htm](http://www.safety.odpm.gov.uk/breg/brads.htm).

### **Abbreviations and Acronyms**

ABS	acrylonitrile-butadiene-styrene terpolymer	EU	European Union
APFE	Association of European glass-fibre producers	FRP	fibre-reinforced plastics
APME	Association of Plastics Manufacturers in Europe	GDP	gross domestic product
BBA	British Board of Aggrement	HDPE	high density polyethylene
CAD	computer aided design	LDPE	low density polyethylene
DTI	UK Department of Trade and Industry	LOI	limiting oxygen index
EMPA	Swiss material testing and research institute	PC	polymer concrete
EOTA	European Organisation for Technical Approvals	PCC	polymer-cement concrete
EPS	expanded polystyrene foam	PE	polyethylene
ETA	European Technical Approval	PF	phenol-formaldehyde
		PIC	polymer impregnated concrete
		PP	polypropylene
		PS	polystyrene
		PUR	polyurethane
		PVAc	polyvinyl acetate
		PVC	polyvinyl chloride
		PVC-P	plasticised polyvinyl chloride
		PVC-U	rigid polyvinyl chloride
		SMC	sheet moulding compound
		TSO	The Stationery Office
		UF	urea-formaldehyde



## Abstracts from the Polymer Library Database

*Item 1*

**Adhesives Age**

45, No.7, July 2002, p.46

**CONSTRUCTION ADHESIVES: WHAT THE FUTURE HOLDS**

Lohman R J

Chemquest Group Inc.

New housing starts have maintained their number of builds in contrast to many other industry sectors. Estimates for 2002 are between 1.5 and 1.6 million units with single family units predicted at 1.27 million. This is the fifth straight year that single family units will have stayed between 1.23 and 1.30 units being built. Additionally, the medium size house today is 15% larger than ten years ago, but is built on a lot approximately 11% smaller. These factors, plus the expanding rehab and remodelling markets, have pushed construction adhesives usage to more than 1.4 billion US dollars annually. Over the years, the use of adhesives has increased, construction mastics and foamed adhesives in particular. Part of this growth has resulted from constraints of lumber supplies, which in turn initiated the gluing of sub-flooring to the joists. This construction technique has allowed for longer spans without increasing the depth of the joist in more recent years, the shortage of longer sizes of wood has led to the development of various engineered wood laminated glued trusses for floor joists that are now finding increasing use. However, there are far more profound changes occurring in the emerging construction methods that are not as apparent to the layman since the house exterior appearance shows no change. It is forecast that the trend towards factory-built housing as well as the use of other construction systems will continue to increase the use of adhesives within the construction industry, allowing it to grow faster than GDP.

USA

Accession no.866703

*Item 2*

Shawbury, Rapra Technology Ltd., 2002, pp.113, 29 cm, 63Bu.

**POLYMERS IN BUILDING AND CONSTRUCTION. A RAPRA MARKET REPORT**

Cousins K

Rapra Technology Ltd.

Trends in the use of polymers in building and construction are discussed, with particular reference to European and North American markets. The market report reviews the ever-increasing role played by plastic and rubber components in building and construction and also in other civil engineering sectors, where they contribute advantages in terms of durability and low cost installation. Construction applications include pipe, windows, doors,

glazing, profiles, roofing, sealants and adhesives, cement, insulation, flooring and building panels. Civil engineering applications include membranes, road surfaces, building reinforcement and bridge building. An economic overview of world markets is included, and the future outlook for polymers in the Third Millennium concludes the report.

EUROPE-GENERAL; NORTH AMERICA

Accession no.864194

*Item 3*

**China Plastic & Rubber Journal**

No.8-9, Aug.-Sept.2002, p.22/6

**DEVELOPMENT OF PLASTIC CONSTRUCTION MATERIALS IN CHINA**

Construction material is one of the largest consumers of plastic products, including a large variety of applications such as doors and windows, pipes, seals, thermal insulation materials, furnishing and decorative materials. During the "10th Five-year Plan" period, it is estimated that plastic pipes and plastic doors and windows for various construction applications will have an average market share of 45% and 20% respectively throughout China. The total demand for plastic pipes and plastic door/window bar sections will hit 1 million tonnes. In addition to furnishing and decorative materials, thermal insulation materials and other constructional plastic products, the total demand will hit 4 million tonnes.

CHINA

Accession no.864054

*Item 4*

**Rubber India**

54, No.6, June 2002, p.35-7

**EPDM MEMBRANE - A MATERIAL FOR IMPROVING WATERPROOFING SYSTEM**

Banerjee B

Bihar Rubber Co.Ltd.

The properties of EPDM, such as crack resistance, water resistance and temperature resistance, which make it an ideal material for roofing applications, are described and compared with those of other roofing materials. Methods of installing EPDM on roofs by ballasting, cold adhesive bonding and mechanical fastening are outlined and the suitability of EPDM for lining effluent treatment plants, canals, ponds and gutter and as garden roof systems is briefly discussed.

INDIA

Accession no.862258

*Item 5*

**Journal of Industrial Textiles**

31, No.3, Jan.2002, p.205-17

**USE OF HIGH PERFORMANCE TEXTILES IN CONSTRUCTION PROJECTS**

Isley F  
Hexcel Schwebel

A niche in the textile industry provides high strength, high modulus textile fabrics to the construction industry as a potential replacement for more traditional building materials such as wood, concrete, masonry and steel. The mechanical properties of fabrics made of aramid, carbon and glass fibres lend themselves to the needs of the design engineer by providing high strength to weight, high stiffness to weight and extreme flexibility in use and design. Combined with crosslinking resin systems to form a composite, the fabrics are being widely accepted by the civil engineers serving the construction trades. Thousands of structures around the world have been repaired, retrofitted or built of such fabrics in the past ten years. 7 refs.

USA

*Accession no.860983*

*Item 6*

***Applied Composite Materials***

9, No.4, July 2002, p.221-47

**APPLICATIONS OF COMPOSITES, OPTICAL FIBRE SENSORS AND SMART COMPOSITES FOR CONCRETE REHABILITATION: AN OVERVIEW**

Lau K-T; Zhou L-M; Tse P-C; Yuan L-B  
Hong Kong, Polytechnic University;  
Harbin, Engineering University

Much research and developments in the field of concrete rehabilitation and repair by using fibre reinforced plastic (FRP) materials have been successfully carried out in the last decade. There is no doubt that these materials have been used to replace conventional steel reinforcements for concrete structure with providing excellent structural durability and margin of safety. Until the last few years, researchers from diverse disciplines have made vigorous efforts to develop a structure able to measure its own structural condition by using embedded optical fibre. These structures are termed 'smart structures'. However, smart structures have not yet been adopted for civil engineering applications. A brief review on the applications of FRP and optical fibre sensor in concrete repair and structural health monitoring, respectively, is given. Further discussions on the potential use of smart composites for civil engineering applications are also addressed. 80 refs.

CHINA; HONG KONG

*Accession no.860847*

*Item 7*

***Plastics in Building Construction***

25, No.11, 2001, p.8-9

**VERSATILE VINYL: NEW FABRICATION**

**TECHNIQUES OFFER EVEN MORE ATTRACTIVE VINYL APPLICATIONS**

Forbis J T  
Kroy Building Products Inc.

In the past decade, products manufactured from PVC have accounted for an ever-growing share of the exterior building products market. While rising lumber prices during the period contributed to this growth, the more fundamental reason was the inherent advantage of vinyl products in terms of greatly reduced maintenance costs, long life and durability. Those who had the foresight to recognise these advantages, and who acted on the opportunity, were rewarded with a very successful decade of sales and revenue growth. Today, a similar opportunity is presenting itself in the next major area of growth for vinyl products: fencing, railing and decks. Like vinyl siding, windows and accessories before them, these vinyl products are poised to make dramatic gains in market share over the next few years. In this instance, however, the growth is being fuelled by a number of additional factors, including new extrusion and bending technologies that enable fabricators to duplicate just about any design that can be created with traditional materials such as wood. These technologies, coupled with new and more cost-effective distribution systems, will translate into an exciting opportunity for those who recognise the potential they offer. Details are given.

USA

*Accession no.860472*

*Item 8*

***Composites Part B: Engineering***

33B, No.4, 2002, p.255-61

**STRENGTH AND DURABILITY PERFORMANCE OF CONCRETE AXIALLY LOADED MEMBERS CONFINED WITH AFRP COMPOSITE SHEETS**

Toutanji H; Yong Deng  
Alabama, University

The performance of concrete columns wrapped with aramid fibre-reinforced polymer composite sheets was studied. The confined and unconfined (control) specimens were loaded in uniaxial compression. Axial load and hoop strains were measured in order to evaluate stress-strain behaviour, ultimate strength, stiffness and ductility of the wrapped specimens. The results obtained showed that the external confinement of concrete by fibre-reinforced polymer composite sheets could significantly enhance strength, ductility and energy absorption capacity. An analytical model developed earlier to predict the entire stress-strain response of concrete specimens wrapped with FRP composite sheets was applied. The performance of the wrapped concrete specimens under severe environmental conditions such as wet-dry and freeze-thaw cycles was also studied. 12 refs.

USA

*Accession no.858453*



*Item 9*

**Scrap Tire News**

16, No.6, June 2002, p.12

**RECYCLED RUBBER PRODUCTS REVIEW.  
RECYCLED RUBBER ROOF TILES: AN  
ALTERNATIVE TO SLATE**

Monarity A

The Ecostar/Carlisle line of rubber roofing tiles uses recycled scrap tyres to produce a lightweight and durable alternative to shingle or slate. Examples of installations are described.

ECOSTAR/CARLISLE; BRADCO SUPPLY CORP.  
USA

*Accession no.857875*

*Item 10*

**Engineer**

291, No.7605, 14th June 2002, p.22-3

**POWER CUT**

Johnsson E

The focus of this article is the push towards developing houses that are more energy efficient, as well as environmentally sound, and affordable. It highlights developments in the UK and Sweden, and discusses various actions and initiatives which are aimed at conserving electricity and protecting the environment.

US,ENERGY INFORMATION ADMINISTRATION;  
UK,ENERGY SAVING TRUST; UK,GOVERNMENT;  
CARBON TRUST; UK,NATIONAL ENERGY  
FOUNDATION; UK,NATIONAL ENERGY ACTION;  
NORDIC TRABYGG; INTEGER  
EUROPEAN COMMUNITY; EUROPEAN UNION;  
SCANDINAVIA; SWEDEN; UK; USA; WESTERN EUROPE;  
WORLD

*Accession no.857834*

*Item 11*

**Reinforced Plastics**

46, No.6, June 2002, p.40-3

**SHAIRCO - PROMOTING FRP IN SAUDI  
ARABIA**

Sundaram S

The widespread use of GRP pipes in the Middle East in general, and the Kingdom of Saudi Arabia in particular, is well known, but GRP lighting poles, airport check-in counters and immigration desks are also popular in the Kingdom. The pioneer in this field is Saudi firm SHAIRCO, a GRP processor with a turnover of 7m US dollars in 2001. The company's major breakthrough in airport passenger handling systems came in 1981 when it supplied in excess of 9000 modular GRP seating systems for pilgrims in the Haj terminal complex at King Abdul Aziz International Airport at Jeddah. SHAIRCO ventured into GRP lighting poles made by the centrifugal casting process in 1981. The company's order book for lighting poles for 2002 is already full.

SHAIRCO FIBERGLASS

SAUDI ARABIA

*Accession no.857817*

*Item 12*

**Journal of Composite Materials**

36, No.5, 2002, p.521-36

**FRP STRENGTHENED MASONRY BEAMS. I.  
MODEL**

Kiss R M; Kollar L P; Jai J; Krawinkler H

Budapest,Technical University; Stanford,University

A simple model is presented to predict the load-deflection curve of a fibre-reinforced plastic (FRP) reinforced masonry beam subjected to bending mid axial loads. Delamination growth is modelled by a balance approach. It is shown that continuously growing delamination results in highly non-linear behaviour. 15 refs.

EASTERN EUROPE; HUNGARY; USA

*Accession no.856957*

*Item 13*

6th World Pultrusion Conference: A Stronger Profile for the Future. Proceedings of a conference held Prague, 4th-5th April 2002.

Leusden, EPTA, 2002, Paper 15, pp.8, 29cm, 012

**HALOGEN-FREE FLAME RETARDANT  
PULTRUSION PROFILES FOR BUILDING AND  
PASSENGER TRAINS**

Knop S; Hoerold S; Sommer M; Schoewe H  
Clariant GmbH; BYK-Chemie GmbH; Exel  
(European Pultrusion Technology Assn.)

A report is presented of the development, as the result of a joint project between the above companies, of new formulations for flame-retarding pultrusion profiles for use in building and public transport applications. The formulations include aluminium trihydrate and/or polyphosphates to achieve high flame retardancy with acceptable glass loadings. It is shown that, with selection of suitable fillers and the best additive combinations, several formulations are available to fulfil standards for these applications. The parts are pigmented and exhibit good coverage of the fibres and very good mechanical properties.

EUROPEAN COMMUNITY; EUROPEAN UNION; GERMANY;  
WESTERN EUROPE

*Accession no.856333*

*Item 14*

**Adhesives Age**

45, No.4, April 2002, p.40-1

**BUYER BEWARE**

Klosowski J; Yarosh K; Shingledecker R  
Dow Corning Corp.

Sealant-related phenomena affecting building aesthetics, including fluid migration in cured sealants and dirt pick-

up, are discussed and guidelines are presented to aid in the selection of a particular sealant for individual needs. Several recent studies, which conclude that the look of a sealant on a building is dependent on the specific brand, product formulation and its behaviour in a particular environment, are cited, which serve to emphasise the importance of such factors when selecting a sealant capable of providing the required aesthetic finish. 6 refs.

USA

Accession no.854634

*Item 15*

*Journal of Thermal Envelope & Building Science*

25, No.4, April 2002, p.255-74

**PROTECTION OF FOAM PLASTIC THERMAL INSULATION IN LOW SLOPED ROOFING SYSTEMS**

Booth R J; DeRushie C; Liu K

Hansed Booth Inc.; CANMET; Canada, National Research Council

A discussion is presented on the protection of foam plastic thermal insulation in roofing, the reasons why this protection is required and what happens if the foam is not protected. Foam insulation systems considered include unfaced PS and faced polyisocyanurate and phenolic rigid foam systems having a range of densities. Studies of galvanised steel deck and fastener plate corrosion in roofs with and without condensation protection in Canada are presented and a comparison is made of the corrosion of galvanised steel roof deck in contact with polyisocyanurate and phenolic foam roof insulations. 18 refs.

CANADA

Accession no.853543

*Item 16*

*Polymer Composites*

23, No.2, April 2002, p.153-63

**PROTOTYPES FOR BUILDING APPLICATIONS BASED ON THERMOPLASTIC COMPOSITES CONTAINING MIXED WASTE PLASTICS**

Xanthos M; Dey S K; Mitra S; Yilmazer U; Feng C

New Jersey, Institute of Technology

Low density PE was melt blended with either automotive shredder residue, carpet backing residue or mixtures thereof and prototype blocks intrusion moulded therefrom. These blocks were evaluated as a wood substitute in the building industry by conducting tests to determine their short-term and long-term mechanical properties, flammability, thermal conductivity and heavy metal and total organic carbon leaching behaviour. The performance of these prototypes was compared with that of wood and the composites containing carpet residue found to be favourable as replacements for wood thermal barrier components in a steel-based stud assembly. 11 refs.

USA

Accession no.853502

*Item 17*

PVC 2002: Towards a Sustainable Future. Proceedings of a conference held Brighton, 23rd-25th April 2002. London, IOM Communications Ltd., 2002. Paper 17, p.186-91, 21cm, 012

**NEW GENERATION OF STABILISER SYSTEMS FOR PVC PROFILES**

Schiller M; Fischer W; Cockett S

Chemson Group

(Institute of Materials)

Polyvinyl chloride window profile formulations containing organic-based and calcium-zinc stabilisers were produced and the performance of the stabilised PVC compounds compared. Properties evaluated included rheological properties, heat stability, colour, gloss, mechanical properties, recyclability, plate-out and artificial weathering. 6 refs.

EUROPEAN COMMUNITY; EUROPEAN UNION; UK; WESTERN EUROPE

Accession no.852753

*Item 18*

PVC 2002: Towards a Sustainable Future. Proceedings of a conference held Brighton, 23rd-25th April 2002. London, IOM Communications Ltd., 2002. Paper 16, p.179-85, 21cm, 012

**RELATIONSHIPS BETWEEN MELT FLOW AND MECHANICAL PROPERTIES OF EXTRUDED PVC PROFILES FOR WINDOW APPLICATIONS**

Cora B

Rohm & Haas European Laboratories

(Institute of Materials)

The effect of the type of impact modifier on the melt flow of a PVC window profile formulation as a function of shear rates encountered during extrusion was investigated and the relationship between the melt flow and mechanical properties of the profiles evaluated. A Rheoplast Capillary Rheometer with a pre-shearing device was employed to investigate the melt viscoelastic properties of the formulations and the performance of the formulations in terms of post-extrusion shrinkage, surface gloss and enthalpy relaxation discussed. 2 refs.

EUROPEAN COMMUNITY; EUROPEAN UNION; FRANCE; UK; WESTERN EUROPE

Accession no.852752

*Item 19*

PVC 2002: Towards a Sustainable Future. Proceedings of a conference held Brighton, 23rd-25th April 2002. London, IOM Communications Ltd., 2002. Paper 15, p.166-77, 21cm, 012

**STRUCTURE-IMPACT STRENGTH RELATIONSHIPS OF PVC WINDOW PROFILES**

Hajji P; Marchand F; Gerard P; Gauthier C

ATOFINA; Lyon, Institut National des Sciences

Appliquees

(Institute of Materials)

Polyvinyl chloride window formulations containing, as impact modifiers, a novel acrylic resin, chlorinated PE or an acrylic resin/chlorinated PE blend, were extruded at different melt temperatures and the performance of these impact modifiers compared in terms of processing window and intrinsic impact strength. The morphological properties of the extruded window profiles were determined before and after impact testing by means of SEM and atomic force microscopy and the relationship between the morphological properties and impact strength of the profiles evaluated. 11 refs.

EUROPEAN COMMUNITY; EUROPEAN UNION; FRANCE; UK; WESTERN EUROPE

*Accession no.852751*

*Item 20*

PVC 2002: Towards a Sustainable Future. Proceedings of a conference held Brighton, 23rd-25th April 2002. London, IOM Communications Ltd., 2002. Paper 12, p.147-50, 21cm, 012

**THE CHALLENGES AHEAD**

Guerin J M

Heywood Williams Group PLC

(Institute of Materials)

The market challenges and opportunities facing the PVC window industry are considered in the areas of product development, new marketing areas, environmental concerns and the generation of a sustainable industry structure.

EUROPEAN COMMUNITY; EUROPEAN UNION; UK; WESTERN EUROPE

*Accession no.852748*

*Item 21*

PVC 2002: Towards a Sustainable Future. Proceedings of a conference held Brighton, 23rd-25th April 2002. London, IOM Communications Ltd., 2002. Paper 11, p.133-46, 21cm, 012

**FACTORS INFLUENCING THE WEATHERING OF TiO<sub>2</sub>-PIGMENTED RIGID PVC TEST SPECIMENS**

Schmelzer J; Haug C

Kronos International Inc.

(Institute of Materials)

The results are reported of an investigation into the contribution made by titanium dioxide pigments, such as Kronos 2220 and Kronos 2222, to preserving the quality of rigid PVC window profiles subjected to accelerated and outdoor weathering. The effects of TiO<sub>2</sub> pigment grade and type of stabiliser on weather resistance, of processing on initial tristimulus values and of TiO<sub>2</sub> pigment grade and pigment concentration on tristimulus values and chalking behaviour of the profiles are discussed and a comparison is made between artificial and outdoor weathering data.

EUROPEAN COMMUNITY; EUROPEAN UNION; GERMANY; UK; WESTERN EUROPE

*Accession no.852747*

*Item 22*

PVC 2002: Towards a Sustainable Future. Proceedings of a conference held Brighton, 23rd-25th April 2002. London, IOM Communications Ltd., 2002. Paper 10, p.124-32, 21cm, 012

**PVC WINDOW PROFILE MARKET IN CHINA**

Fuji K; Ikenaga A; Makepeace S

Kaneka Corp.; Kaneka Belgium NV

(Institute of Materials)

A brief overview of the PVC window profile market in Asia and China is presented followed by statistics on the market for PVC window profiles in this region with emphasis on China. Statistics are given on the supply/demand balance in China from 1998 to 2005, estimated window profile material share in China for 2001, estimated growth of Chinese PVC window manufacturer capacity distribution for 2001 and trend in impact modifier addition level.

ASIA; BELGIUM; CHINA; EUROPEAN COMMUNITY; EUROPEAN UNION; UK; USA; WESTERN EUROPE

*Accession no.852746*

*Item 23*

PVC 2002: Towards a Sustainable Future. Proceedings of a conference held Brighton, 23rd-25th April 2002. London, IOM Communications Ltd., 2002. Paper 6, p.85-94, 21cm, 012

**THE MARKET FOR PVC-U WINDOW AND FOAM PROFILES - AN ANALYSIS OF SOME KEY ISSUES AFFECTING COMPANY PERFORMANCE**

Rigby M; Arnold G H

Rigby M.,Associates; Arnold G.,Associates

(Institute of Materials)

The current market for PVC windows in Western Europe is examined, paying particular attention to the UK market, and the main issues facing the industry, particularly environmental issues, are discussed. Future developments affecting the industry are also considered.

EUROPEAN COMMUNITY; EUROPEAN UNION; UK; WESTERN EUROPE

*Accession no.085274*

*Item 24*

**Adhesives & Sealants Industry**

9, No.2, March 2002, p.56

**SILICONE SEALANT PLAYS KEY ROLE IN IMPACT-RESISTANT GLAZING SYSTEMS**

Dow Corning 995 Silicone Structural Sealant, a silicone sealant with high tensile and shear strengths and excellent adhesion to glass and common window frame materials, is reported to be playing a key role in laminated glass

designs, which are helping to reduce potential injury to occupants of buildings and passers by. The window systems also exhibit dramatically increased protection from hurricanes and tornadoes, criminal trespass and bomb blasts.

USA

Accession no.852265

Item 25

**Plast' 21**

No.106, Nov.2001, p.43

Spanish

**SECONDARY PROCESSES IN THE EXTRUSION OF PROFILES: AN IDEAL COMPLEMENT FOR GUARANTEED QUALITY**

The BEX 2-92-28V/2 twin-screw extruder and different items of post-extrusion equipment developed by Battenfeld Extrusionstechnik for the production of plastics window frame profiles are described.

BATTENFELD EXTRUSIONSTECHNIK GMBH  
EUROPEAN COMMUNITY; EUROPEAN UNION; GERMANY;  
WESTERN EUROPE

Accession no.851774

Item 26

**Plast' 21**

No.106, Nov.2001, p.40

Spanish

**COMPOSITES IN THE REPAIR OF CONCRETE STRUCTURES**

An account is given of a study carried out by Universidad Politecnica de Madrid in the use of carbon fibre-reinforced epoxy resin composites in place of steel plates for the repair of concrete structures. Stresses in the composites and the composite/concrete interface were monitored using optic fibre and Bragg sensors.

MADRID, UNIVERSIDAD POLITECNICA  
EUROPEAN COMMUNITY; EUROPEAN UNION; SPAIN;  
WESTERN EUROPE

Accession no.851773

Item 27

**Plast' 21**

No.106, Nov.2001, p.37-9

Spanish

**BUILDING THE FUTURE**

Applications of plastics in building and related sectors are examined, and reference is made to developments by a number of companies. Particular attention is paid to PVC, unsaturated polyester resins and composites, PS and PU foams and polycarbonate and PMMA sheeting. The market for plastics in building applications in Spain is reviewed, and statistics are presented for Spanish consumption of plastics in this sector in 2000.

BASF AG; BAYER AG; GE STRUCTURED

PRODUCTS; KRAUSS-MAFFEI AG; ATOGLAS;  
CENTRO ESPANOL DE PLASTICOS  
EUROPEAN COMMUNITY; EUROPEAN UNION; FRANCE;  
GERMANY; SPAIN; USA; WESTERN EUROPE

Accession no.851772

Item 28

**Kunststoffe Plast Europe**

92, No.1, Jan. 2002, p.31-3

**ROOFS OF LIGHT**

Benz V W

Makroform GmbH

The extraordinary properties, which make polycarbonate, such as Makrolon, particularly suitable for transparent roofing, and the reasons for the success of polycarbonate sheets in roof construction are considered. The regulations and standards, including those pertaining to fire behaviour, which polycarbonate must satisfy to be used in roofing applications, are also discussed. (Kunststoffe, 92, No.1, 2002, p.80-3)

EUROPEAN COMMUNITY; EUROPEAN UNION; GERMANY;  
WESTERN EUROPE

Accession no.850984

Item 29

Emerging Technologies for the New Millennium. SPE Topical Conference held Montreal, Canada, 20th-21st. Sept. 2001.

Brookfield, Ct., 2001, 27 cms., paper 8, p.51-6. 012

**WOOD COMPOSITES IN DECKING STRUCTURES**

Quarmley J

Principia Partners

(SPE; INDUSTRIAL MATERIALS INSTITUTE)

The US market for wood composites in decking structures is discussed, with market data from Principia Partners. The market for building materials used in decks, verandas and porches is reported to have reached 5.4 billion US dollars in 2000, representing a 6% increase over the 1999 market value. These materials were used to build, repair or replace an estimated 3.2 million decks, porches, verandas and balconies in the USA. The wood composite portion of the market is relatively young, and is growing rapidly at the expense of traditional materials despite their initial high cost. Wood composites account for over 4% of market volume related to deck boards and railing systems. Forecasts for consumption of decking materials are included and amongst the plastic deck board alternatives, wood composites will experience the greatest growth, followed by vinyl decking, it is claimed.

USA

Accession no.847428

Item 30

**Adhesives & Sealants Industry**

9, No.1, Feb. 2002, p.36

**COMPOSITE WALL SYSTEMS ASSEMBLED WITH STRUCTURAL ADHESIVE**

Araldite 2015 epoxy resin structural adhesive is supporting the fast assembly of durable glass-reinforced plastic sandwich construction wall systems at Norway's Marine Composites AS. The self-supporting walls are used in the manufacture of hygienic hospitals and buildings used by food processing, electronic and pharmaceutical industries. Araldite 2015 from Vantico was chosen for the project because of its ease of handling and performance characteristics, which include the ability to produce resilient bond lines that can withstand exposure to corrosive marine environments as well as extremes of temperature. Brief details are given of the project and the use of structural adhesives.

VANTICO INC.; MARINE COMPOSITES AS  
NORWAY; SCANDINAVIA; USA; WESTERN EUROPE  
*Accession no.847414*

*Item 31*

**Reinforced Plastics**

46, No.2, Feb.2002, p.50-1

**COMPOSITES AID RENOVATION OF RUSSIAN CITY**

Borisovitch K S; Nikolaevitch U V

This article relates in detail the story of how the Russian company Stoic Ltd. has developed composite street furniture (such as traffic lights and lamp-posts) over the last five years for the sympathetic renovation of the city of St. Petersburg. The company has mostly used glass-reinforced unsaturated polyester.

STOIC LTD.; SIEMENS  
EUROPEAN COMMUNITY; EUROPEAN UNION; GERMANY;  
RUSSIA; WESTERN EUROPE

*Accession no.845701*

*Item 32*

**Adhesives Age**

45, No.1, Jan. 2002, p.16-8

**HOUSE PARTY**

Schwartz J

An analysis is made of the building industry market in the USA and its effect on the adhesives industry. Representatives from a number of companies involved in the adhesives industry give their views on the current state and future outlook for adhesives in their particular sectors.

USA

*Accession no.845252*

*Item 33*

Flame Retardants 2002. Proceedings of a conference held London, 5th-6th Feb. 2002.

London, Interscience Communications Ltd., 2002, Paper 23, p.217-26, 24 cm, 012

**COMPARATIVE RESEARCH ON THE REACTION-TO-FIRE CLASSIFICATION OF BUILDING PRODUCTS USING CURRENT NATIONAL AND FUTURE HARMONISED EUROPEAN TEST METHODS**

Briggs P

Warrington Fire Research Centre Ltd.  
(BPF; Interscience Communications Ltd.)

A description is given of new European reaction-to-fire test methods and performance criteria, which will replace current national methods required by building regulations. A comparison is also made of British and European classifications for 60 building products, including roof assemblies. 17 refs.

EUROPEAN COMMUNITY; EUROPEAN UNION; UK;  
WESTERN EUROPE

*Accession no.845176*

*Item 34*

Retec 2001. Hot Colors, Cool Plastics. Conference proceedings.

Marco Island, Fla., 23rd-25th Sept.2001, p.162-72

**SHADING WITHOUT SHADE: NEW INTERFERENCE PIGMENTS ALLOW A WAVELENGTH SELECTIVE REFLECTION AND TRANSMISSION**

Rosenberger S; Aumann S  
Merck KgaA; EM Industries Inc.  
(SPE,Color & Appearance Div.)

Shading of transparent surfaces is becoming more and more important due to increasing energy costs for air conditioning and lighting. In speciality glazing there is now spectral-selective material available which can help to both reduce these costs and conserve energy. It is also often desirable to prevent solar heat from transmitting, while admitting as much daylight as possible. These are often contradictory requests. In plastics, additives - pigments, dyestuffs and metals - are currently used for shading purposes. These shading additives are compared for their effectiveness. A wavelength selective system for plastic is required, which allows most of the visible light to get through, while most of the IR portion of the sunlight is reflected. Recent developments in new multi-layer pigments allow a spectrally selective translucent glazing for plastic applications. These additives/pigments can be used inexpensively and conveniently. An overview of these new developments is presented.

EUROPEAN COMMUNITY; EUROPEAN UNION; GERMANY;  
USA; WESTERN EUROPE

*Accession no.845060*

*Item 35*

**Modern Plastics International**

31, No.11, Nov.2001, p.44-5

**GROWTH IS STEADY IN THIS MAMMOTH END-MARKET**

Defosse M

Among plastics end-markets, the size of the building and construction market is topped only by packaging. An estimated 23 to 27% of all plastics is used in a construction application. Plastics are used for many reasons, but chief among them are long life and the low cost of installation, use and maintenance. According to the American Plastics Council, total sales and captive use of plastics in the building and construction market in the US grew by 8%/yr between 1995 and 1999, a rate higher than even those in packaging and medical. That rate is due to increase, as strength in US housing starts continues to confound experts awaiting a steep drop in home starts amid the slow economy. In Western Europe, plastics use in construction topped 8.3 million tonnes last year. The European Plastics Converters' association notes that compared to other materials, plastics often fare better in environmental assessments. Most plastic building products can be easily recycled, as the majority are single-material applications such as pipe and window frames. Details are given.

AMERICAN PLASTICS COUNCIL; BAYER AG;  
VINYL INSTITUTE; VKE; HT TROPLAST; GE  
STRUCTURED PRODUCTS; SOLVAY  
USA

Accession no.840720

Item 36

**European Plastics News**

28, No.6, June 2001, p.53-4

**HIGH PROFILE MANUFACTURING**

Vink D

HT Troplast of Germany has, through a series of acquisitions, become Europe's largest plastic window profile manufacturer. Following its purchase of KBE in 1999, it acquired Kommerling in October 2000. It now boasts a 23% share of the European window profile market through its KBE, Knipping, Kommerling and Trocal brands. Despite a poor year for the German construction market, and rising raw material prices, the company announced a turnover of 676 million euros in 2000, of which more than half came from outside Germany. Troplast has steadily reduced its reliance on the home market. Germany is still responsible for around a quarter of business, but five years ago it accounted for 70%. Some company information is presented, including details of a non-PVC (PP) window frame.

HT TROPLAST

EUROPEAN COMMUNITY; EUROPEAN UNION; GERMANY;  
WESTERN EUROPE

Accession no.840706

Item 37

**Adhesives Age**

44, No.10, Oct. 2001, p.45

**THROUGH THE ROOF**

Kraton D-KX220 polymer and Kraton D-1184 polymer

are being used by Isoltema in its Elotene waterproofing Strips and Ekobit waterproofing and sealing tapes. D-KX220 has been used by Isoltema in the development of roofing products for the Colonial Stadium in Australia.

ISOLTEMA SPA

EUROPEAN COMMUNITY; EUROPEAN UNION; ITALY;  
WESTERN EUROPE

Accession no.836854

Item 38

**Canadian Plastics**

59, No.8, Aug.2001, p.16/8

**CONSTRUCTION BOOM**

Macdonald C

This article discusses the booming demand in North America for wood alternatives (plastic lumber), for construction applications such as decking, and other outdoor structures. It reports that there appears to be unlimited opportunity and very few hurdles for both veterans and new-comers to the segment, and that phenomenal market growth is forecast over the coming four years.

PLASTIC LUMBER TRADE ASSOCIATION;  
CASCADES RE-PLAST INC.; PLASTIVAL;  
SUPERWOOD CANADA INC.; CANADIAN  
PLASTIC LUMBER; CPI PLASTICS GROUP LTD.;  
ROYAL GROUP TECHNOLOGIES INC.; GSW  
THERMOPLASTICS CO.; BRITE  
MANUFACTURING INC.; NEXWOOD  
INDUSTRIES LTD.; POLYMER SHEET  
APPLICATIONS INC.; PULTRONEX CORP.; PENN  
STATE UNIVERSITY; ASTM; TREX  
CANADA

Accession no.836817

Item 39

**Popular Plastics and Packaging**

46, No.11, Nov.2001, p.71-4

**SUSTAINABLE DEVELOPMENT OF PLASTICS  
AS CONSTRUCTION MATERIALS**

Srivastava A; Aggarwal R K; Singh P

Sant Longowal, Institute of Engineering & Technology;  
Punjab, University

The recent earthquake and the subsequent population shift has invited the attention of technocrats and engineers to seek a readily constructible building material as an alternative to conventional materials to provide shelters to disaster victims. The present hue and cry from environmentalists about massive deforestation, stringent guidelines on health hazards from the dust pollution for construction workers, and extra cost of secondary operation on decoration and finishing are the supporting factors for new materials to replace cement, timber and iron. The large demand of makeshift post boxes, temporary research laboratories, survey camps, traffic booths, transit accommodation, office accommodation,

refreshment booths, cyber cafes, toiletries and vaccination booths are increasing the need for a structural material of high strength and low weight ratio, and high class decorative value. The prevailing challenges could possibly be resolved through manmade plastics. In the present scenario, they have already been accepted as a construction material in structural, non-structural, coating, finishing and decorative applications. The present development of plastics as construction materials are discussed. 21 refs.

INDIA

Accession no.835658

*Item 40*

**Adhesives & Sealants Industry**

8, No.4, May 2001, p.48-53

**US SEALANT STANDARDS IN BUILDING CONSTRUCTION. CURRENT STANDARDS AND DEVELOPMENT ACTIVITY**

Clutter E T

Schnee-Morehead Inc.

Details are given of the US standards regarding sealants in the construction industry. Mention is made of standards developed by the American Society for Testing and Materials, and the American Architectural Manufacturers Association.

USA

Accession no.835549

*Item 41*

**Plastics Additives & Compounding**

3, No.11, Nov. 2001, p.32-4

**AEI PUTS TECHNOLOGY BENEFITS IN THE PIPELINE**

The range of specialised products developed by AEI Compounds for the building industry is described. These products include insulation and sheathing for electrical power and communication cables, flexible sheathing for construction site cabling and specialised compounds for the manufacture of hot water pipe and fittings for plumbing and heating systems.

AEI COMPOUNDS LTD.

EUROPEAN COMMUNITY; EUROPEAN UNION; UK; WESTERN EUROPE

Accession no.834948

*Item 42*

**Plasticheskie Massy**

No.9, 2000, p.38-41

Russian

**LOW-TEMPERATURE CURING MATERIALS BASED ON ALKOXYSILOXANES**

Osipchik V S; Olikhova Yu V

The possibility was studied of using products based on alkoxy siloxanes as low-temperature curing materials for

the purpose of repairing historically important stone buildings and monuments. Data are given on the properties of the original and restored stone. 10 refs. Articles from this journal can be requested for translation by subscribers to the Rapra produced International Polymer Science and Technology.

Accession no.833359

*Item 43*

**Injection Molding**

9, No.10, Oct. 2001, p.42-3

**MARKET SNAPSHOT. BUILDING & CONSTRUCTION**

Chitwood A

An analysis is made of the US building and construction market and statistics are presented on the outlook through to 2010 for new housing units, which are expected to decline by about 5% this year but rebound by 3% in 2002, according to the National Association of Home Builders. Trends in resins exhibiting higher heat resistance materials and products requiring little or no maintenance are identified but do not take into account the impact of the events of September 11 on the US economy.

US, NATIONAL ASSOCIATION OF HOME BUILDERS

USA

Accession no.833144

*Item 44*

**Revue Generale des Caoutchoucs et Plastiques**

78, No.793, March 2001, p.86-7

French

**RUBBER PROFILES PLAY THE SEALING CARD**

Muret B

SNCP

Applications of rubbers and thermoplastic elastomers in extruded sealing profiles for the building industry are examined, and French standards relating to such seals are reviewed.

AFNOR

EUROPEAN COMMUNITY; EUROPEAN UNION; FRANCE; WESTERN EUROPE

Accession no.831348

*Item 45*

**Adhesives Age**

44, No.9, Sept.2001, p.s7-8

**EASIER DOES IT**

Valero G

Home builders and professional building trades want quality construction adhesives sold at competitive prices, are easy to install and will not delay any finishing work. Experts say adhesives offer better assembly than traditional mechanical methods because the load of the joint is evenly distributed rather than on just a few

fastening points. Adhesives for drywall and floor coverings are the most widely used products in the housing market. Prompted by environmental regulations, manufacturers continue to squeeze VOCs, a contributor to smog, out of their products.

USA

Accession no.829673

*Item 46*

**Adhesives Age**

44, No.9, Sept.2001, p.s6

**BACK TO THE DRAWING BOARD**

Valero G

Builders and contractors are reluctant to abandon traditional solvent-based adhesives and sealants. Nonetheless, glue makers say they are developing new, environmentally friendly formulations that either equal or exceed solvent-containing adhesives in such areas as bonding and quick-tack ability. High-solids are replacing solvent-based products in those instances where water-based products do not work. PU technology is starting to replace some solvent-based products because it offers excellent adhesion strength, flexibility, green grab, a long working time and is VOC-compliant.

USA

Accession no.829672

*Item 47*

**Journal of Vinyl and Additive Technology**

7, No.3, Sept.2001, p.138-41

**NEW OPPORTUNITIES WITH WOOD-FLOUR-FOAMED PVC**

Patterson J

Rohm & Haas Co.

A major disadvantage of composites of wood with thermoplastics materials is a relatively high specific gravity compared with those of many natural wood products. A PVC-wood composite, for example, has a specific gravity of about 1.3 g/cc. The manufacture of cellular PVC-based wood composites was studied and the properties that were achieved as the foam density was reduced were examined. Overall, even with densities as low as 0.6 g/cc, the physical properties should be adequate for many wood replacement applications. The composites also exhibited the aesthetics of wood and economics that were favourable compared with those of both rigid and cellular PVC. 6 refs.

USA

Accession no.829656

*Item 48*

**Journal of Vinyl and Additive Technology**

7, No.3, Sept.2001, p.134-7

**PVC WOOD: A NEW LOOK IN CONSTRUCTION**

Chetanachan W; Sookkho D; Sutthitavil W;

Chantasatrasamy N; Sinsermuksakul R

Thai Plastic & Chemicals

The use of PVC wood, which includes PVC foam and PVC/wood flour composite, as an alternative to wood and wood-like products is discussed. Compared with traditional products, the PVC wood is shown to exhibit improved termite resistance and weathering resistance, lower moisture absorption and ease of installation. It is demonstrated that PVC wood can be nailed, screwed, sawed, cut and bonded like wood by conventional tools without any special skills being required. The bending strength of PVC wood is lower, but it can still be used for decorative applications, i.e. cornices, doors and siding. 5 refs.

THAILAND

Accession no.829655

*Item 49*

Antec 2001.Conference proceedings.

Dallas, Texas, 6th-10th May, 2001, paper 566

**DEVELOPMENT OF HOLLOW STRAND PLASTIC FOAM**

Grinshpun S; Schaller M

Dow Chemical Co.

(SPE)

The production and potential applications of a novel extruded foam structure are described. A polymer gel containing a dissolved blowing agent is extruded through an array of annuli forming hollow strands or tubes, which expand and coalesce to form a hollow strand structure. In comparison with solid foam structures of similar composition, the hollow strand foam exhibits excellent compressibility and recoverability. In addition, by combining hollow strand foam with solid strand material, the properties may be varied. Applications include impact energy absorbers; high impact packaging with built-in drainage; levelling insulating board for concrete surfaces; combined thermal and acoustic insulation; and the ability to produce foams from polymers which are otherwise difficult process. 3 refs.

USA

Accession no.829403

*Item 50*

**Composites Part A: Applied Science and Manufacturing**

32A, No.9, 2001, p.1345-55

**DEVELOPMENT OF DESIGN RULES FOR RETROFITTING BY ADHESIVE BONDING OR BOLTING EITHER FRP OR STEEL TO RC BEAMS OR SLABS IN BRIDGES AND BUILDINGS**

Oehlers D J

Adelaide,University

Bonding plates to reinforced concrete (RC) structures is a mechanically efficient form of retrofitting that is also



inexpensive and unobtrusive. However, bonding plates to RC structures is an extremely complex engineering problem, as research has shown that bonded plates are prone to about 30 mechanisms of failure. The various techniques of plating now available for retrofitting are described, some of the various failure mechanisms that can occur and the development of their design rules are illustrated, and the choices between adhesive bonding and bolting, and between steel and FRP plating, are discussed. 10 refs.

AUSTRALIA

Accession no.829098

*Item 51*

**Composites Part A: Applied Science and Manufacturing**

32A, No.9, 2001, p.1339-43

**FIBRE COMPOSITE BRIDGE DECKS - AN ALTERNATIVE APPROACH**

Davey S W; Van Erp G M; Marsh R  
Southern Queensland, University

Initial results of a study into the structural behaviour of a new type of fibre composite bridge deck are presented. The deck, which uses a particulate filled resin core, can be produced at costs similar to steel and concrete decks. The manufacturing method is suitable for both small- and large-scale production runs, and does not require large up-front investments. Aspects of the design and method of manufacture are presented together with test results for two different size decks. 8 refs.

AUSTRALIA

Accession no.829097

*Item 52*

**Composites Part A: Applied Science and Manufacturing**

32A, No.9, 2001, p.1329-38

**DEVELOPMENT OF PULTRUDED COMPOSITE MATERIAL HIGHWAY GUARDRAIL**

Bank L C; Gentry G R  
Wisconsin-Madison, University; Georgia, Institute of Technology

FRP composite materials are being used to develop products for use as highway appurtenances, such as sign supports, luminaire supports and guardrails (crash barriers). These structures, located alongside highways and roads, are subjected to vehicular impacts and must be designed to be 'crashworthy' to ensure the safety of the driving public. An ongoing ten-year research and development programme funded by the US Federal Highway Administration and the US Department of Transportation (DOT) to produce a crashworthy composite material highway guardrail system is reviewed. An overview of the research and development to a patented pultruded composite material guardrail is provided. 25 refs.

USA

Accession no.829096

*Item 53*

**Reinforced Plastics**

45, No.7/8, July/Aug.2001, p.44/50

**USE OF COMPOSITES IN CIVIL ENGINEERING INFRASTRUCTURE**

Garden H

Taylor Woodrow Construction Ltd.

Composites have successfully been used in the rehabilitation of concrete, cast iron and steel elements. This article discusses how composites have been used to meet programme and site working constraints in restoration work and also looks at some new build applications. One example is CFRP strips used to reinforce a crack in a boiler cell/duct cell wall of a power station. A number of cast iron beams were in need of strengthening in a garage structure beneath a residential housing development. A rehabilitation scheme was designed based on CFRP strips bonded to the tension flanges of the beams.

EUROPEAN COMMUNITY; EUROPEAN UNION; UK; WESTERN EUROPE

Accession no.828523

*Item 54*

**Cellular Polymers**

20, No.3, 2001, p.211-29

**RESEARCH INTO THE CAUSES OF FIRE - SEARCHING FOR NEW INSIGHT OR CONFIRMING OLD PREJUDICES?**

Prager F H; Sasse R H

Bayer AG; RWTH

The course of the 1996 fire at Dusseldorf airport is discussed with reference to the report by the expert commission. Polymeric materials involved included expanded PS and PVC. A detailed analysis of the report reveals that there is reason to doubt the conclusions reached concerning ignition risk and the initial phase of the fire. In addition, there are marked inconsistencies between material-specific and test-based knowledge on the one hand and the conclusions and recommendations arrived at on the other. The role of the insulation in the suspended ceiling (interlevel) area, classified as non-combustible, was incorrectly assessed in practically every respect. A risk-focussed identification of the potential origin of the fire is considered and the relevance of purely material-specific data is highlighted. 36 refs.

EUROPEAN COMMUNITY; EUROPEAN UNION; GERMANY; WESTERN EUROPE

Accession no.827368

*Item 55*

**Journal of Vinyl and Additive Technology**

7, No.2, June 2001, p.61-6

**ENHANCED WEATHERABILITY OF EXTERIOR PVC BUILDING PRODUCTS**

Girois S; Schipper P S

ATOFINA Chemicals Inc.

The development of a new generation of organotin maleate heat stabilisers is discussed. The improved lachrymatory behaviour of the new technology compared with standard organotin maleates is described and the good weathering performance in PVC capstock compared with the conventional organotin mercaptide during natural ageing is considered. The economics of a pure PVC capstock solution are reported. 8 refs.

USA

Accession no.825287

*Item 56*

**Polymer Plastics Technology and Engineering**

40, No.4, 2001, p.407-21

**MODELING RECYCLED POLYMERIC MATRIX COMPOSITES: A SOCIAL-ENVIRONMENTAL SOLUTION**

Avila A F

Minas Gerais, Universidade Federal

The potential use of fully recycled melt-blended matrices in polymeric matrix composites was assessed, together with their application in the construction of low cost housing for developing countries. A two-step homogenisation process was proposed. The melt-blended matrix was homogenised by applying the concentric spheres model under weak interface conditions and the linear function of transformation. The overall composite effective properties were estimated from the composite cylinder assemblage model under weak interface condition for each lamina. Finite element simulation of beam problem was performed to evaluate the possible application of recycled polymeric matrix composites in the construction of low cost housing. The results were compared with those for conventional materials. 22 refs.

BRAZIL

Accession no.824994

*Item 57*

UTECH 2000. Proceedings of a conference held The Hague, Netherlands, 28th-30th March 2000.

London, 2000, Construction Session, Paper 3, pp.3, 012

**CONTINUING GROWTH OF URETHANE CORED SANDWICH PANELS**

Trew P

EPIC

(Crain Communications Ltd.; European Isocyanate Producers' Association)

The rapid growth in the use of PU cored sandwich panels in the UK and the reasons for this growth are discussed. The role of EPIC in the rapid rise in the use of these sandwich panels and the main challenges facing the sandwich panel industry, namely environmental and fire performance, are examined. The effect of European harmonisation on the industry and the future of the industry are also considered.

EUROPEAN COMMUNITY; EUROPEAN UNION; NETHERLANDS; UK; WESTERN EUROPE

Accession no.824821

*Item 58*

UTECH 2000. Proceedings of a conference held The Hague, Netherlands, 28th-30th March 2000.

London, 2000, Construction Session, Paper 2, pp.2, 012

**BUILDING WITH COMPOSITE PANELS: THE ARCHITECTS VIEWPOINT**

Bronsvort A

Architektenburo Bronsvort

(Crain Communications Ltd.; European Isocyanate Producers' Association)

A discussion is presented on how to bridge the gap between what the building industry can do and what does the architect want and the need for direct consultation between the architect and the building industry. A practical example of how a sandwich panel met the requirements of the architect and the building industry is presented and the dependence of the future of modern architecture on the capabilities of the building industry is briefly considered.

EUROPEAN COMMUNITY; EUROPEAN UNION; NETHERLANDS; WESTERN EUROPE

Accession no.824820

*Item 59*

**European Plastics News**

28, No.7, Jul./Aug. 2001, p.37

**BUILT TO LAST**

Sall K

The building industry is reported to be benefiting from technology transfer in the use of composite technology. Key industries such as telecommunications, aerospace, marine and offshore industries have all contributed to developments within the construction industry. From the telecommunications industry, the use of radome self-supporting spherical structures, has led to developments in modular temporary accommodation such as that required for research in wilderness areas, and for the construction of mosque domes and other unsupported roofing structures. The marine and offshore industries have lent technology relating to fire performance and corrosion resistance, whilst the aerospace industry has contributed radar absorbing materials which are used in cladding applications in the construction industry.

WESTERN EUROPE

Accession no.824419

*Item 60*

**Plastics News(USA)**

13, No.18, 2nd July 2001, p.1/23

**NEW YORK PIPE PLAN CLOGGED**

Toloken S

Disputes between legislators, plumbers' unions and state agencies in New York are reported regarding the

use of plastic pipes in buildings. Plumbers' unions and some legislators are arguing that plastic pipe is dangerous and toxic, and are advancing legislation that would restrict its use even more than the current code. On the other hand, the state agency that writes New York's building codes favours allowing much more plastic pipe to be used. Fears centre on the fire hazard problem and smoke toxicity which inhibits fire fighting.

USA

Accession no.824359

*Item 61*

**FIRE HAZARDS, TESTING, MATERIALS AND PRODUCTS.** Proceedings of a conference held Shawbury, UK, 13th March 1997.

Shawbury, 1997, paper 8, p.1-5, 012

**FIRE HAZARD AND MODELLING**

Chitty R

Fire Research Station

(Rapra Technology Ltd.)

Deterministic models for the movement of smoke, namely zone models and computational fluid dynamics/field models used in the design of fire safety systems in buildings are described and some of the principle zone and field models are listed. Some of the potential pitfalls, which may be encountered when using these models, are highlighted and some guidelines on solution procedures are presented. Model validation/verification is also briefly considered. 22 refs.

EUROPEAN COMMUNITY; EUROPEAN UNION; UK; WESTERN EUROPE

Accession no.822908

*Item 62*

**FIRE HAZARDS, TESTING, MATERIALS AND PRODUCTS.** Proceedings of a conference held Shawbury, UK, 13th March 1997.

Shawbury, 1997, paper 5, p.1-8, 012

**FIRE BEHAVIOUR OF VARIOUS CONSTRUCTION MATERIALS**

van de Weijert J C A

TNO

(Rapra Technology Ltd.)

Several features relating to fire safety are explained in order to throw some light on the behaviour of construction materials during fires and measures to increase fire safety are outlined. Tentative fire tests for GRP beams and pipes exposed to standard fire conditions and GRP panels exposed to hydrocarbon fire conditions are described and some requirements for the application of GRP in building applications are summarised. 15 refs.

EUROPEAN COMMUNITY; EUROPEAN UNION; NETHERLANDS; UK; WESTERN EUROPE

Accession no.822904

*Item 63*

**Composite Structures**

52, Nos.3-4, April 2001, p.467-74

**VIBRATION CHARACTERISTICS OF A FIBRE-REINFORCED POLYMER BRIDGE SUPERSTRUCTURE**

Aref A J; Alampalli S

Buffalo, State University of New York; New York

State, Department of Transportation

Dynamic response of the first fibre-reinforced polymer composite bridge built in the US is studied using experimental modal tests and validated finite element models. This slab bridge was manufactured with a longitudinal joint, in the form of a shear-key, and was connected in the field using epoxy resins. Long-term performance of such joints is critical for future applications of similar designs. At the same time the shear-key details are not visible, once joined, and cannot be inspected using routine inspection procedures. Hence, experimental modal analysis is used to evaluate the integrity of the longitudinal joint. A finite element model validated with field test data is developed to further study the effect of the longitudinal joint degradation on vibration characteristics of the structure. The finite element analysis is also used to evaluate the modal-based techniques for future inspections. Results indicate that the longitudinal joint is performing as intended, and only high degradation of the joint can be detected using the measured vibration characteristics of the bridge. 18 refs.

USA

Accession no.822835

*Item 64*

**Plastics in Building Construction**

25, No.6, March 2001, p.10-2

**AAMA AND VINYL WINDOWS**

Walker R

American Architectural Manufacturers' Assn.

The PVC window certification programme and standards operated by the American Architectural Manufacturers' Association, which require mandatory testing of air infiltration, water penetration, structural performance to windload and forced entry resistance, are described. Statistics on the U.S. housing market are presented and the threat to increased growth for vinyls from competitive materials and from environmental activists is discussed.

USA

Accession no.821762

*Item 65*

**Modern Plastics International**

31, No.6, June 2001, p.54-5

**WOOD COMPOSITES IN DECKING. THE VIEW FROM PRINCIPIA**

Key findings are reported from a market study by Principia on wood composites in decking structures, and

from discussions with Principia's director, Jim Morton. Details include market size, growth rate, key applications, materials substitution trends, consumption data, number of producers, and forecasts for the industry.

PRINCIPIA  
USA

Accession no.820151

Item 66

**Modern Plastics International**

31, No.6, June 2001, p.45-7

**IT'S ONE HOT MARKET FOR PROFILE EXTRUDERS**

Mapleston P

The North American market for wood-filled composites is discussed, with reference to market size and growth rates, applications, processing considerations and equipment developments. The wood composite profile business for building and construction is put at 320,000 tonnes last year in North America alone, the leading market, and volume is expected to more than double by 2005, with decking representing over 60% of demand.

NORTH AMERICA

Accession no.820149

Item 67

**Adhesives & Sealants Industry**

8, No.5, June/July 2001, p.48-9

**NEUTRAL SILICONE SEALANT SYSTEMS SUPPORT ADVANTAGES IN PROCESSING AND END PRODUCTS**

Schmidt A

Wacker Silicones Corp.

Wacker Silicones Corp. has developed a range of neutral-cure alkoxy systems, a new generation of silicone sealants that release an alcohol (methyl or ethyl) as they cure. They have been designed for use in the building sector, where their advantages in processing and performance make them suitable for use in high-tech applications such as window construction and for sealing both indoor and outdoor joints. Product characteristics and performance advantages are discussed.

USA

Accession no.820127

Item 68

**Plastics in Building Construction**

25, No.7, Apr. 2001, p.9-12

**USING RECYCLED AND COMPOSITE MATERIALS IN INSULATING CONCRETE FORMS**

Ragsdale T J; Boser R

Illinois, State University

The market for insulating concrete forms for poured-in-place concrete walls in the USA is briefly discussed and

the advantages, particularly to the environment, of alternative insulating concrete forms, which use recycled foam or composites of Portland cement, over conventional insulating concrete forms are considered. The types of insulating concrete forms available are described, with emphasis on the Rastra building system, which is composed of planks or panels made of a composite of cement and Thastyron, a 85 to 86% recycled post-consumer PS waste and cement. Finally, the advantages and disadvantages of using recycled PS foam and composite materials of Portland cement and recycled plastics in insulating concrete forms are examined and characteristics of both systems outlined. 10 refs.

RASTRA USA

USA

Accession no.818701

Item 69

**British Plastics and Rubber**

Nov.2000, p.42

**GERMAN COMPANIES DOMINATE PVC BUILDING PROFILES**

It is explained here that, at present, German companies are dominating the PVC building profiles industry, with other major players tending to be Belgian or UK-based. This article examines the PVC building profile industry as a whole, and looks at the current and recent activities of some of the key players within it.

VEKA; HT TROPLAST; APPLIED MARKET INFORMATION; KOEMMERLING; DECEUNINCK; HEYWOOD WILLIAMS; FORBO HELMITIN; ALUPLAST; LAPEYRE GROUP; ERG-PROFIL; BOWATER WINDOWS; LB PLASTICS; PLASTMO LTD.; ROYAL EUROPA SP.Z.O.O.; REHAU; SCHUCO INTERNATIONAL AG; THYSSEN POLYMER; TESSENDERLO GROUP; ACTUAL AUSTRIA; BELGIUM; EASTERN EUROPE; EUROPE-GENERAL; EUROPEAN COMMUNITY; EUROPEAN UNION; FRANCE; GERMANY; HUNGARY; POLAND; UK; WESTERN EUROPE

Accession no.818312

Item 70

**Composites Part B: Engineering**

32B, No.4, 2001, p.309-22

**STRENGTHENING STEEL BRIDGE SECTIONS USING CFRP LAMINATES**

Sen R; Liby L; Mullins G

South Florida, University

The feasibility of using carbon fibre-reinforced epoxy resin laminates to repair steel composite bridge members was investigated. Six specimens, each consisting of a 6.1m long W8 X 24 wide flange A36 steel beam acting with a 0.114m thick by 0.71m wide reinforced concrete slab, were first loaded past yield of the tension flange to simulate severe service distress. The damaged specimens

were then repaired using 3.65mm lengths of 2 or 5mm thick CFRP laminates bonded to the tension flange (with a two-part epoxy adhesive FR 1272) and tested to failure. The results indicated significant ultimate strength gains but more modest improvement in the elastic response. Non-linear finite element analyses were in good agreement with the experimental results. The results showed that it was feasible to strengthen steel composite members using CFRP laminates. 13 refs.

USA

*Accession no.817889*

*Item 71*

**Plastics News International**

July 2001, p.31

**DECORATIVE LATTICE MAKES USE OF RECYCLATE**

Viscount Plastics has released a range of new plastic lattice products for domestic and commercial applications. The lattice, which carries the EcoScreen brand name, is designed for use in gardens and outdoor structures. EcoScreen is manufactured using a combination of selected recycled and new materials. The benefits of the plastic lattice compared to traditional timber lattice include superior strength and durability, as well as resistance to mildew and insect attack.

VISCOUNT PLASTICS

AUSTRALIA

*Accession no.816928*

*Item 72*

**Plastics News(USA)**

13, No.11, 14th May 2001, p.1/10

**STANDARDS SET FOR LUMBER**

ASTM has formally approved a standard for recycled plastic lumber decking. The Standard Specification for Polyolefin-Based Plastic Lumber Decking Board covers plastic lumber that is greater than 50% resin by weight. Of the 70-90m US dollars decking market, plastic lumber now accounts for a 30-40% market share. Test methods are now specified for compressive qualities, density, flexural and shear properties, thermal expansion, creep and fastener withdrawal.

AMERICAN SOCIETY FOR TESTING AND MATERIALS

USA

*Accession no.816772*

*Item 73*

**Plastics News(USA)**

13, No.7, 16th April 2001, p.5

**HARVARD STUDY: REMODELLING HOLDS ITS OWN**

DeRosa A

The 180bn US dollars remodelling market in the US is expected to surpass new construction in terms of dollars

spent during the next decade. Remodelling grows at about 2-3% per year. However, with current economic conditions, remodelling activity has eased this year. Replacement products such as vinyl siding and windows are in favour this year because of rising energy costs.

HARVARD UNIVERSITY

USA

*Accession no.816645*

*Item 74*

**Polimeri**

22, No.1, 2001, p.5-13

Croatian

**APPLICATION OF PLASTICS IN BUILDING AND CIVIL ENGINEERING**

Jelcic Z

MAPIT

A review is presented of the use of plastics in building and civil engineering applications. Plastics and traditional building materials can be used to complement the performance of each other, providing energy efficient solutions. In particular, the use of expanded polystyrene in civil engineering applications is examined, where its high strength, rigidity and heat distortion temperature is improved by the use of cement or concrete layers. 151 refs.

CROATIA

*Accession no.815363*

*Item 75*

ACS Polymeric Materials Science and Engineering.

Volume 75. Conference Proceedings.

Orlando, Fl., Fall 1996, p.290-1

**SEALANT RHEOLOGY AND ITS PRACTICAL MEASUREMENTS**

Malik T

Goodrich B.F.

(ACS, Div. of Polymeric Materials Science & Engng.)

Studies were carried out on the dynamic mechanical behaviour of different polyurethane and silicone construction sealants. The effect of accelerated weathering was correlated with the sealant performance by monitoring the changes in their storage and loss moduli. The results revealed that different sealants were much stiffer than most of the polyurethanes at low temperatures. Some of the polyurethane sealant displayed decomposition and reversion at higher temperatures and stiffness at lower temperatures after 1000 hours of UV weathering. It was demonstrated that dynamic mechanical analysis is a very good method for characterising the sealants and could be used to predict the performance of the sealant. 0 refs.

USA

*Accession no.815232*

*Item 76*

**Focus on Plastics Additives**

No.32, Dec.2000, p.7

**BUILDING AND CONSTRUCTION PROVIDES CUSTOMERS FOR ADDITIVES**

This article speculates on the future of additives within the building and construction industry, forecasting that one day the industry will embrace reinforced plastics in a big way, and there will be more opportunities for the additives business as a result.

RHONE-POULENC

EU; EUROPEAN COMMUNITY; EUROPEAN UNION; NORWAY; SCANDINAVIA; SWEDEN; UK; WESTERN EUROPE; WESTERN EUROPE-GENERAL

*Accession no.813111*

*Item 77*

Vinyltec 2000. Conference proceedings.

Philadelphia, Pa., 11th-12th Oct.2000, p.137-46

**TWIN SCREW EXTRUDERS - APPLICATIONS IN THE FENESTRATION, FENCING, DECKING AND RAILING MARKETS**

Brown T

ExtrusionTek Milacron

(SPE, Vinyl Div.; SPE, Philadelphia Section)

Profiles are reported to be the fastest growing US plastics processing sector during the 1990s, and of the many different extruders currently available, the counter-rotating intermeshing twin-screw extruder is the most commonly used for rigid PVC extrusions, it is reported. Extruder technology is being driven by developments in vinyl materials such as solid vinyl, cellular PVC and woodflour/plastic composites, where increased output rates and the ability to process a wider variety of custom formulations is required. The design and operation of counter-rotating intermeshing twin screw extruders is described, with reference to the advantages it affords in growth markets such as windows, decking, fencing and railing. 15 refs.

USA

*Accession no.811303*

*Item 78*

**Composites International**

Nos.43/44, Jan./April 2001, p.54/60

English; French

**COMPOSITES PENETRATE THE MARKET**

It is now commonly accepted by architects, engineers and interior decoration designers in the building industry that the mechanical strength and characteristics of composite materials make them first-class materials. Their design flexibility, along with almost non-existent maintenance requirements are winning over structural and infrastructural designers as well as those in charge of decorative components, trim and fittings for residential buildings. Several types of application are representative of these developments.

REICHHOLD CHEMICALS INC.;

CALIFORNIA, UNIVERSITY; COMPOSITE SOLUTIONS INC.

USA

*Accession no.811013*

*Item 79*

**Plastics and Rubber Weekly**

13th April 2001, p.14

**WOOD AND METAL NO LONGER IN THE FRAME**

Bagshaw S

Both the pipe and window construction sectors have profited from the boom in house construction and increased use of plastics as a replacement for both wood and metal. BPF's Pipes Group says it is challenging copper in the hot and cold water sector and has a current market share of 35-40%. Omnico says it has seen its business grow by over 40% in the last four years. A major part of that has come from the flat plastic sector such as fascia boards, soffit boards and cladding. Environmental concerns inevitably dog the construction sector. The PVC windows business is combating this through increasing the use of recycled plastics.

EUROPEAN COMMUNITY; EUROPEAN UNION; UK; WESTERN EUROPE

*Accession no.810139*

*Item 80*

**Adhesives Age**

44, No.2, Feb.2001, p.15-8

**HOUSE OF BLUES?**

Schwartz J

The US National Association of Home Builders reports that 2000 housing starts were approximately 1.5 million, down 200,000 from the previous year and the lowest figure in three years. ChemQuest Group attributes the decline to high interest rates, but it is possible that the recent decision by the Federal Reserve to cut interest rates from 6.5 to 6% could stimulate more buying activity. Adhesives and sealants formulators are keeping a close eye on the US builder market as it represents approximately 17% of adhesive sales in that country. Industry members offer mixed opinions over how much the sluggish economy will affect sales to this key sector. Details are given.

US, NATIONAL ASSN. OF HOME BUILDERS; CHEMQUEST GROUP INC.; OSI SEALANTS INC.; FREEDONIA GROUP

USA

*Accession no.809477*

*Item 81*

**Kunststoffe Plast Europe**

91, No.2, Feb.2001, p.35-6

English; German

**SOLID SURFACE MATERIALS**

Reimer H U  
DuPont de Nemours GmbH

The invention of solid surface materials made of minerals and acrylic-acid ester has had a lasting impact on the world of design: such was the conclusion reached by a recent study carried out by a design association. According to the study, solid surface materials rank number three, directly behind personal computers and the internet. Emphasis is placed on DuPont's Corian material, which is said to offer architects, interior designers and interior fitters an unusual combination of aesthetic, practical and technical advantages, enabling them to implement even highly unusual design concepts. (Translated from *Kunststoffe* 91, 2001, 2, p.78/82).

EUROPEAN COMMUNITY; EUROPEAN UNION; GERMANY;  
WESTERN EUROPE

*Accession no.809456*

*Item 82*

*Advanced Materials & Composites News*

23, No.5, 5th March 2001, p.1-3

**AMBIENTE PURSUES DISASTER RESISTANT HOUSING**

Ambiente Housing is developing composite panel homes for enhanced disaster resistance. The Ambiente Housing System, winner of the top ACE Award at the CFA 2000 Show in Las Vegas last September, is a panellised modular building system, which combines high technology materials with advanced engineering to create an environmentally conscious product of superior architectural design and detail. The company is part of the Abersham Technology Group in Norwich, Norfolk, England which has been pursuing the technology for these houses for over ten years. Details are given.

AMBIENTE HOUSING SYSTEMS; ABERSHAM  
TECHNOLOGY GROUP

EUROPEAN COMMUNITY; EUROPEAN UNION; PUERTO  
RICO; UK; WESTERN EUROPE

*Accession no.809334*

*Item 83*

FRC 2000. Conference proceedings.

Newcastle upon Tyne, 13th-15th Sept.2000, p.90-5

**USE OF PULTRUDED POLYMER BASED FIBRE REINFORCED PROFILES IN CIVIL ENGINEERING**

Knudsen E S

Fiberline Composites AS

(Institute of Materials; Newcastle,University;  
Institution of Mechanical Engineers)

As production methods have developed and raw material prices of especially carbon fibres have decreased, the use of complex composite materials in applications like bridges and buildings has increased. The pultrusion process offers a production method that enables polymer based composite profiles with a sufficiently high material

quality at an affordable price to be used in various applications within building industries. The pultrusion process is explained in general, and some features of the material are shown. The need for standardised construction methods and materials is discussed. The use of pultruded profiles in large load carrying constructions like bridges and multi-storage houses is shown. The different possibilities of connections are also discussed, and the use of pultrusion within a novel bridge decking system is shown.

DENMARK; EUROPEAN COMMUNITY; EUROPEAN UNION;  
SCANDINAVIA; WESTERN EUROPE

*Accession no.807698*

*Item 84*

*Plastics News(USA)*

12, No.51, 19th Feb.2001, p.4

**SIDING MAKERS KEEP SHAKY MARKET COVERED**

DeRosa A

In the US PVC siding sector, excess capacity exists and consolidation will continue in this maturing market. Owens Corning acquired FibreBoard and Amerimark in 1997 and, in early 2000, streamlined operations by closing the main production plant for the OC brand of siding. The company now has an estimated 323m US dollars in extrusion sales. Vinyl siding currently represents 50% of the entire siding market. Alcoa Building Products is relaunching its injection moulded siding. CertainTeed has introduced Millennium siding with a SmartWall System that adjusts to seasonal temperature changes.

USA

*Accession no.807015*

*Item 85*

*Plastics News(USA)*

12, No.51, 19th Feb.2001, p.4

**SIPS HOMES HELP RISING ENERGY COSTS SLIP**

DeRosa A

A Southern colonial home costs just 85 cents per day to heat and cool, thanks to its unusual structure: moulded expanded PS sandwiched between two oriented strand boards. Otherwise known as Structural Insulated Panels, or Sips, the product is gaining popularity quickly, thanks to skyrocketing energy costs. Great Lakes Insulspan manufactured the panels for use in the walls, roof and first floor of the Atlanta show home. The ease of building Sips homes addresses the construction industry's current labour shortage.

GREAT LAKES INSULSPAN

USA

*Accession no.807014*

*Item 86*

*Plastics News(USA)*

12, No.51, 19th Feb.2001, p.1/31

**COMPOSITES GET ALL DECKED OUT**

Bregar B

North American demand for wood/plastic composites, pegged at 700 million pounds in 2000, should more than double by 2005. Decking accounts for about 60% of the total. The driver for composite decks is the demand for lower-maintenance exterior products that look good. The composite decking market is expected to grow 25% this year to about 225m US dollars. Waste wood fibres are combined with plastic, usually PE, PVC or PP, to make the weatherproof "lumber". Recycled or virgin plastic can be used.

NORTH AMERICA

Accession no.807006

Item 87

**Asian Plastics News**

March 2001, p.15

**TIPCO'S NATURAL APPROACH**

Rambhia A

Tipco has developed a jute-phenolic composite for doors and windows. The new product, Tipwood, is a pultruded composite which features heat resistance, flame retardance, high strength-to-weight ratio, and resistance to fatigue, corrosion, water, UV and termites. The company supplies Tipwood in long stocks of various cross sections and can also supply ready-made doors, door frames and pallets. Tipco has recently come up with another concept of modular furniture from Tipwood.

TIPCO INDUSTRIES LTD.

INDIA

Accession no.807001

Item 88

**Kunststoffe Plast Europe**

91, No.1, Jan.2001, p.42-4

**HEAT MANAGEMENT**

Albus S

The importance to the economy and ecology of rigid PU foam as thermal insulation in building applications is discussed and illustrated by its constructional and physical benefits when employed in pitched roofs, flat roofs, walls, window frames and flooring. (Kunststoffe, 91, No.1, 2001, p.97-101)

EUROPEAN COMMUNITY; EUROPEAN UNION; GERMANY;  
WESTERN EUROPE

Accession no.806705

Item 89

ACS Polymeric Materials: Science and Engineering.

Fall Meeting 2000. Volume 83.

Washington, D.C., 20th-24th Aug.2000, p.21-2

**RUBBER MODIFIED DIMETHACRYLATE  
ADHESIVES**

Harris L A; Riffle J S

Virginia, Polytechnic Institute & State University

(ACS, Div. of Polymeric Materials Science & Engng.)

There has been a dramatic increase in fibre reinforced polymeric composites in infrastructure and construction designs. Adhesive design and characterisation for such applications are described. Load bearing adhesives are desirable because mechanical fasteners can create stress concentrations that diminish the strength and lifetime of polymeric composite structures. Structural civil adhesives should display properties such as low viscosities for in situ application at construction sites, reduced volatiles to ensure worker safety; Tgs high enough to avoid creep under environmental conditions, moisture resistance; good adhesion to substrates and cyclic deformation durability that meets the requirements necessary for structural applications. Rubber-toughened thermosets are described comprised of methacrylate functionalised PPO oligomers and vinyl ester resins containing less styrene than normally used. 7 refs.

USA

Accession no.802799

Item 90

**Composites International**

No.42, Nov./Dec.2000, p.70-7

English; French

**CARBON-FIBRE STRUCTURAL  
REINFORCEMENT**

For the maintenance of civil engineering structures, carbon fibre fabrics are an alternative to standard techniques involving bonded sheet metal. A research project carried out within the framework of the building and civil engineering industry involved the development of a special composite called TFC, multidirectional carbon-fibre fabric. The epoxy resin component in TFC plays a double role as the matrix coating the carbon fibre and as the bonding adhesive. The fabric can be applied by a single operator, who unwinds the desired length from a roll. Once the fabric has been placed over the resin, it is roller-pressed. TFC was first used in November 1996 for the repair of prefabricated prestressed concrete beams that are part of an overpass on the A10 motorway between Paris and Chartres.

FREYSSINET INTERNATIONAL

EUROPEAN COMMUNITY; EUROPEAN UNION; FRANCE;  
WESTERN EUROPE

Accession no.802205

Item 91

**Composites International**

No.42, Nov./Dec.2000, p.65-9

English; French

**CARBON FIBRE IS A NATURAL CHOICE IN  
BUILDING AND CIVIL ENGINEERING  
ACTIVITIES**



The use of carbon fibre in the building and civil engineering industry is growing. Projects in the US involving the use of carbon fibre for the repair and maintenance of bridges have burgeoned. Cables made from carbon fibre composite perfected by Tokyo Rope have been used to suspend the deck of a bridge located at Herning in Denmark's Jutland area. A recent Restructuration Corp. project in the US demonstrates the use of carbon fibre to reinforce structures already extant within buildings. In Japan, a three-dimensional roof structure has been made using carbon fibre composite cylindrical tie rods that are linked together by spherical joints made of a light alloy.

WORLD

Accession no.802204

Item 92

*Modern Plastics International*

30, No.12, Dec.2000, p.62/6

**WOOD-FIBRE COMPOSITES BUILD PROMISING ROLE IN EXTRUSION**

Leaversuch R D

The extrusion of profiles in which a plastic is used to encapsulate wood fibre is entering a new and promising stage. On the polymer side, the long-preferred material of choice, reclaimed PE, is now being supplemented by virgin PE, PVC and PP. Additive technology is also being utilised in more ambitious ways. Wood-fibre composites are spawning novel construction profiles including decking, fencing, railing, window, corner post and framing. Most processors have depended heavily on conical, twin-screw counter-rotating extrusion equipment supplied by ExtrusionTek Milacron. A shift in processing methods is now likely to affect some key sectors. This involves inline or direct extrusion of wood-plastic composite profiles and dispenses with pre-drying of wood.

WORLD

Accession no.801783

Item 93

Cranbury, N.J., 1998, pp.6. 27 cms. 2/1/01

**RHODIA, INNOVATIVE CHEMICAL TECHNOLOGIES FOR THE CONSTRUCTION INDUSTRY**

Rhodia Inc.

The range of additives from Rhodia Inc. for use in mortars, concrete and civil engineering applications is described. Characteristics and applications are described for the Rhoximat PAV series of redispersible latex polymers for use in cement or plaster-based mortars; Rhoximat additives for concrete, which include grades CS 60 SL a nanometric silica slurry for precast and pumped concrete, and RH 90 XL liquid biopolymers for use as anti-settlement agents in concrete; Rhoximat H-224 organo silicone water repellents; Rhodoline defoamers and

dispersants; and Rhoca Jet liquid accelerators for shotcrete applications and Rhoca Stab soil stabilisation systems.

USA

Accession no.801427

Item 94

*Popular Plastics and Packaging*

46, No.1, Jan. 2001, p.62-7

**BUILDING MATERIALS BASED ON POLYMERS - AN OVERVIEW**

Srivastava A; Aggarwal R K; Singh P

Sant Longowal, Institute of Engineering & Technology; Punjab, University

This overview of building materials based on polymers examines the properties of plastics and the advantages that they afford over traditional building materials in the construction industry. Particular benefits examined include their weight/strength ratio, insulative properties, cost reduction, corrosion and moisture resistance, and durability. The use is discussed of polymer concrete, PVC as a substitute for wood, acrylic glazing, epoxy and PU coatings, and composite materials. 34 refs.

INDIA

Accession no.801403

Item 95

*Revue Generale des Caoutchoucs et Plastiques*

77, No.786, May 2000, p.33-6

French

**PLASTICS AND BUILDING: POTENTIAL FOR CONCRETE GROWTH**

Forest J P

The economic position of the French building industry is examined, and statistics are presented for consumption of plastics in this sector and for trends in the prices of building materials. Some factors limiting the use of plastics in building are discussed.

BENETEAU; THERMOPLASTIQUES COUSIN-TESSIER; FEDERATION FRANCAISE DU BATIMENT; CSTB

EUROPEAN COMMUNITY; EUROPEAN UNION; FRANCE; WESTERN EUROPE

Accession no.800883

Item 96

Antec 2000. Conference proceedings.

Orlando, Fl., 7th-11th May, 2000, paper 406

**PROPERTIES AND APPLICATIONS OF SANDWICH PANELS BASED ON PET FOAMS**

Xanthos M; Dhavalikar R; Tan V; Dey S K; Yilmazer U  
New Jersey, Institute of Technology (SPE)

Poly(ethylene terephthalate) (PETP) foams of density 0.2-1.0 g/cu cm, produced by extrusion from virgin and recycled material using physical or chemical blowing

agents, were evaluated as the low density core in sandwich panels with impregnated M/F paper or extruded sheets of glass fibre-reinforced PETP as facings. The flexural and shear stiffness of the laminates was determined by variable span three-point bending. The thermal and moisture stability of the panels were also determined and compared with competitive sandwich constructions. The bending properties were comparable to those of wooden panels, whilst having superior water resistance and good thermal stability. The panels are comparable to competitive rigid foam products, and have building and construction applications. 11 refs.

USA

Accession no.799921

*Item 97*

**Adhesives Age**

43, No.11, Nov.2000, p.35/9

**BUILDING MATERIALS**

Shah S

ChemRex Inc.

The construction market is very important for the adhesives and sealants industry. Sealants based on polymeric materials like PU, silicones, modified silicones and polysulphides dominate this sector. Movement capability is the most important property for sealing modern construction materials. Property data are presented. 1 ref.

USA

Accession no.799046

*Item 98*

**Insulation Journal**

Nov./Dec.2000, p.20-2

**COOLEST OF CUSTOMERS?**

Heath P

Kingspan Insulation Ltd.

The House Builders Federation has issued statements criticising the UK Government's proposed upgrading of standards of insulation and energy efficiency for new homes as contained in two Building Regulations/Standards consultation papers. This article discusses wall, roof and floor insulation, and examines the reasons behind the frosty reception of housebuilders.

EUROPEAN COMMUNITY; EUROPEAN UNION; UK; WESTERN EUROPE

Accession no.797110

*Item 99*

Berlin, 2000. NALOAN

**DIN 18195 (PT1). WATER-PROOFING OF BUILDINGS - PART 1: PRINCIPLES, DEFINITIONS, ATTRIBUTION OF WATERPROOFING TYPES**

Deutsches Institut fuer Normung ev

DIN 18195 (PT1)

Version 2000. Photocopies and loans of this document are not available from Rapra.

EUROPEAN COMMUNITY; EUROPEAN UNION; GERMANY; WESTERN EUROPE

Accession no.794058

*Item 100*

**Advanced Materials & Composites News**

22, No.19, 2nd Oct.2000, p.1-3

**MARIN COUNTY CIVIC CENTER REHABILITATION UNDERWAY WITH FRP COMPOSITES**

Details are presented in connection with the structural strengthening of Marin County Civic Centre in California (originally completed in 1962). The building is being made more resistant to potential seismic damage, with the use of fibre-reinforced composites.

SIKA CORP.; HEXCEL CORP.

USA

Accession no.792022

*Item 101*

**Journal of Advanced Materials**

32, No.4, Oct.2000, p.16-23

**PRINCIPLES AND ANALYSIS OF CONCRETE-FILLED COMPOSITE TUBES**

Mirmiran A; Naguib W; Shahawy M

Cincinnati,University; Florida,Dept.of Transportation

An alternative to conventional reinforced and prestressed concrete is proposed that consists of FRP tube filled with concrete. The tube is a pour form, protective jacket and reinforcement for concrete. The principles and characteristics of the system and its design issues are described. A fibre element model is developed and compared favourably with test results. The parametric study shows that full confinement, high strength concrete and thick jackets increase the sectional capacity. It is also shown that the system with an equivalent reinforcement ration of only 1.4% performs better than a 6% reinforced concrete section or than a prestressed concrete section with 33% more concrete area. 8 refs.

USA

Accession no.791443

*Item 102*

**Polymer International**

49, No.10, Oct.2000, p.1232-55

**TOXIC PRODUCT YIELDS AND HAZARD ASSESSMENT FOR FULLY ENCLOSED DESIGN FIRES**

Purser D A

BRE Ltd.

Fires in multi-compartment buildings often occur in enclosed spaces or in enclosures opening into other rooms

or corridors. Where such fires occur in relatively small enclosures, with limited external venting, the growth of the fire itself remains restricted. If large vents are present opening into large enclosed spaces or to the outside, flashover may occur. In either case these fires are likely to become oxygen vitiated, producing large amounts of smoke and toxic products. Fire-retarded (FR) and non-FR materials behave differently in these situations from the well-ventilated conditions in most standard tests, with smaller differences in toxic product yields. The main hazard to building occupants is the rapid contamination of building spaces by toxic smoke. Visual obscuration and irritancy of smoke impedes escape efficiency, affecting escape behaviour and slowing travel speeds. This may be followed by incapacitation, primarily due to exposure to asphyxiant gases (mainly CO and HCN) and death. A series of full-scale fire tests conducted in enclosed test rigs and buildings is reported, in which detailed measurements of smoke, heat, toxic gases and time to detection are made, enabling assessment of time to incapacitation using fractional effective dose methodology. Also described are hazard analyses for fires in which an active suppression was used. Results are presented on the relationship between plume oxygen and CO concentrations, and between CO and HCN yields. The effects of interactions between fuel type and load, ventilation and building enclosures are discussed, with their implications for choice of design fires appropriate to different fire scenarios. 21 refs.

EUROPEAN COMMUNITY; EUROPEAN UNION; UK; WESTERN EUROPE

Accession no.791411

*Item 103*

**Plastics in Building Construction**

24, No.9, 2000, p.5-6

**URETHANE PROVIDES SECURE ROOF PENETRATIONS**

Colbert J A

Commercial roofing contractors and building managers that are plagued by the time, labour and ongoing maintenance required to seal roof penetrations - pipes, beams and supports - have found a solution to this problem in a simple system that uses solid PU curbs and a pourable PU elastomer sealant. The ChemCurb System, developed and patented by Chem Link, replaces the use of metal pitch pans and coal tar pitch to seal roof penetrations from water. The system's ChemCurb moulded PU curbs and Pro Pack pourable PU sealant use Mondur MR polymeric MDI and Multranol 9143 polyether polyol from Bayer as the urethane components. Details are given.

CHEMLINK INC.; BAYER AG

USA

Accession no.789954

*Item 104*

**SAMPE Journal**

36, No.5, Sept./Oct.2000, p.18-24

**FRP COMPOSITE REPAIR MATERIALS FOR CONCRETE INFRASTRUCTURE SYSTEMS**

Kliger H S

Kliger H.S.,& Associates Inc.

The various FRP composite repair material systems for concrete infrastructure now in use are described, together with where they are used and what their relative advantages may be, and relating how the material properties may be used by the civil engineering community. Emphasis is placed on composite wet lay-up or precured bond bonding/wrapping to the outside surface of concrete. Composite grids and rebar are also mentioned, but only as they are used as repair materials; most of their use is expected to be in new construction. Repair refers to all supplemental reinforcement. Steel is still the primary internal reinforcement for the concrete structure. Composite supplemental reinforcement either prevents radial deformation (as in the case of seismic retrofit of columns) or increases the load capacity of a structural beam, slab or wall by assuming the added dead or live loads and keeping the stresses in the steel bars below a limit set by the building or highway code. The composite can also bring a deteriorated structure back to original strength. 4 refs.

USA

Accession no.789825

*Item 105*

**Advanced Materials & Composites News**

22, No.17, 4th Sept.2000, p.5

**CERF PANKOW AWARD GOES TO COST-SAVING STEEL TRUSS BRIDGE REHABILITATION PROJECT WITH FRP COMPOSITES DECK**

Details are given of a rehabilitation project for an old steel truss bridge carried out in 1999 in New York State. A 140-foot span, built in 1940, carries state route 367 over Bentley Creek in Chemung County. It had been posted with a 14-ton weight restriction due to excessive dead load and some section loss due to rust where the paint protection had failed. The old pony truss bridge was given new life with the installation of a new fibre reinforced polymer (FRP) composite bridge deck. The scope of the work was limited to deck removal and replacement, minor steel repairs, and cleaning and painting of the structural steel. By replacing the original concrete deck and its numerous courses of asphalt wearing surface with a lightweight glass fibre FRP composite deck, the dead load was reduced by 265 tons. With this burden taken off, the bridge is able to carry any legal load. The state removed all weight restrictions without having to do major steel repair work. A thorough cleaning and painting will protect the steel in future years.

USA

Accession no.787541

Item 106

**Macplas**

25, No.219, June 2000, p.51-4

Italian

**NEW FRONTIERS FOR EPS**

Summaries are given of papers presented at a conference on expanded PS (EPS) held in Milan by AIPE (Associazione Italiana Polistirolo Espanso) on 9th May 2000. Topics covered include techniques for the manufacture of elasticised EPS panels for floating floors, recycling processes, and production control in EPS processing.

AIPE; ASSOCOMAPLAST; AMD; NUOVA

IDROPRESS; PROMASS

EUROPEAN COMMUNITY; EUROPEAN UNION; ITALY;  
WESTERN EUROPE

Accession no.787214

Item 107

**Insulation Journal**

Sept./Oct.2000, p.24-5

**LONGEVITY IS THE KEY**

The results are reported of a research study conducted by the Swedish SP Institute comparing different commercial roofing membranes, which suggests that one of the roofing membranes may prove deficient in the long term. Two types of material, namely flash-spun, microporous nonwovens made from HDPE (Tyvek) and microporous PE films, were exposed to accelerated heat ageing for 12 weeks and to accelerated UV ageing for a further 14 days and their air permeability and water resistance evaluated. The effects of heat and UV ageing on the vapour permeability of Tyvek to determine the impact of exposure time on its breathability were also examined. Tyvek was found to perform better than the microporous film over the long term.

SWEDEN,NATIONAL TESTING & RESEARCH  
INSTITUTE

EUROPEAN UNION; SCANDINAVIA; SWEDEN; WESTERN  
EUROPE

Accession no.787139

Item 108

**Insulation Journal**

Sept./Oct.2000, p.20-1

**USE UP THAT DEAD SPACE**

Vulcanite

The use of Vulcanite's Vulcatherm Foilthane SB insulation to create a warm roof construction, which can transform the dead space in a loft into an extra room, is demonstrated. Roofboards of this insulation, which consist of an aluminium foil autohesively bonded to both sides of a CFC free, rigid PU foam during manufacture, enable heat loss to be reduced to about 8%. An example of the use of these roofboards in the construction of an executive house in Sheffield is given.

EUROPEAN COMMUNITY; EUROPEAN UNION; UK;  
WESTERN EUROPE

Accession no.787138

Item 109

**Insulation Journal**

Sept./Oct.2000, p.20

**FLEECE MEMBRANE**

Stevens Roofing Systems

A membrane (Stevens EP-Fleece), which combines 1.14 or 1.52mm reinforced TPO membrane with a non-woven polyester fleece, has been introduced by Stevens Roofing Systems. The membrane can be mechanically fixed or fully adhered in both new and refurbishment applications and may be installed on a wide variety of substrates. It meets various Factory Mutual windstorm classification ratings, UL Class A fire ratings and EPA Energy Star ratings for reflective roofing materials.

EUROPEAN COMMUNITY; EUROPEAN UNION; UK;  
WESTERN EUROPE

Accession no.787137

Item 110

**Insulation Journal**

Sept./Oct.2000, p.7

**CORROSION SOLUTIONS**

Bullen J

Isothane

The problem of wall tie corrosion in buildings is highlighted and its solution by injecting PU foam into the wall cavity is demonstrated. The benefits of this solution, which include insulation of the property to Building Regulation standards and improved weather resistance, are also indicated.

EUROPEAN COMMUNITY; EUROPEAN UNION; UK;  
WESTERN EUROPE

Accession no.787129

Item 111

**Advanced Materials & Composites News**

22, No.16, 21st Aug.2000, p.4-5

**COMPOSITE SOLUTIONS PUSHES**

**COMPOSITES SEISMIC STRENGTHENING**

**STRATEGY TO HOSPITALS**

Composite Solutions has begun a campaign to educate healthcare administrators on the advantages of FRP composite retrofit solutions, mainly for hospitals. The company licenses CFRP composite technology from the University of California to structurally retrofit major buildings of all kinds to resist seismic events. Tests have shown the benefits of using composite materials to satisfy performance requirements of existing columns and walls, primarily those of reinforced concrete or masonry. Composites retrofitting can typically be implemented at a cost saving of 30-50% compared to the options currently

proposed using traditional material approaches, the company claims.

COMPOSITE SOLUTIONS INC.

USA

Accession no.785048

Item 112

*Adhesives Age*

43, No.7, July 2000, p.18/20

**CONSTRUCTION - BUILDING A FUTURE**

Valero G

Construction is the second-largest industry segment for non-pressure sensitive adhesives, representing approximately 20% of total US volume and growing by over 3%/year. Of the 14 market segments for construction, an estimated two-thirds of total volume is generated from flooring and dry-wall products. The primary formulative technologies for flooring adhesives are low-solvent, waterborne and PU. Because they contain no water, PU adhesives are considered ideal for use with thin flooring materials that may cup when exposed to moisture.

CHEMQUEST GROUP INC.

USA

Accession no.785022

Item 113

*Journal of Industrial Textiles*

30, No.1, July 2000, p.63-82

**UTILISATION OF VINYL COATED POLYESTER FABRICS FOR ARCHITECTURAL APPLICATIONS**

Seaman R; Bradenburg F

Seaman Corp.

The use of vinyl coated polyester fabrics in architectural applications, such as air-supported structures and tension membrane structures, is reviewed and the performance properties of these fabrics for such applications are discussed. Properties considered include tensile strength, uniaxial and biaxial elongation, dimensional stability, coating adhesion, tear strength, weldability, seam strength, non-wicking, UV light and weathering resistance, flame resistance, cleanability, aesthetics and fungus and mildew resistance. Methods of achieving these performance properties by proper selection of the base fibre, fabric weave, coating and coating process are also indicated. (Techtextil North American Symposium 2000, March 22-24, Atlanta, GA).

USA

Accession no.784875

Item 114

*Macplas International*

No.9, Aug.2000, p.35

**WINDOWS AND DOORS**

Life cycle studies have been carried out on three materials used to manufacture doors and window frames: wood,

aluminium and PVC. The research was carried out by three public research bodies in Austria, Netherlands and Germany, and results of each are shown to be substantially in agreement. The results of the Austrian report are discussed with reference to the energy required for manufacture, and pollutants emitted in production and maintenance of window frames. All three studies showed that PVC was not quite the environmental enemy it is often made out to be, and that the environmental impact of wood is not as negligible as previously thought.

WESTERN EUROPE

Accession no.784708

Item 115

*Kunststoffe Plast Europe*

90, No.5, May 2000, p.8-10; p.41-4

English; German

**REACTION OF BUILDING MATERIALS TO FIRE**

Antonatus E

BASF AG

The reaction to fire of building products will soon be classified throughout Europe by standardised test procedures and a uniform classification system. Plastics producers and processors are called upon to help design this new system as it affects plastics and to press ahead with the development of products that satisfy the new demands.

EUROPEAN COMMUNITY; EUROPEAN UNION; GERMANY; WESTERN EUROPE

Accession no.784137

Item 116

*Reinforced Plastics*

44, No.6, June 2000, p.44-5

**HOME SWEET HOME?**

Jacob A

This article examines the concept of the customised composite house - and takes a detailed look at a patented two-storey prototype house-structure manufactured by PDG Domus of the USA to show-case the concept. The construction, the costs, and the benefits are discussed fully.

PDG DOMUS CORP.; ASHLAND

USA

Accession no.783680

Item 117

*Scrap Tire News*

14, No.8, Aug.2000, p.16

**RUBBER USE IN ROOFING PRODUCTS GROWS**

Programmes that give preference in specifications to recyclable building materials, and promote recycling in building construction overall, are increasingly being launched by US national and local government agencies.

EcoStar, an environmental manufacturer of recycled rubber roofing products, uses waste from manufacturers of car hoses, shoes, tyres and several other rubber products, along with industrial waste plastics, to make a proprietary polymer known as Starloy, the main ingredient in EcoStar's Majestic Slate Tile. The tiles, which are 100% recycled content, are injection moulded using a special formula that protects the integrity of the rubber, while producing a lightweight, durable roofing product.

ECOSTAR INC.  
USA

Accession no.782541

Item 118

**Plastics and Rubber Weekly**

No.1845, 14th July 2000, p.10

**COMPOUNDERS GO FOR WOOD**

Smith C

Wood-filled plastics is one of the hottest markets in the building sector. The US lumber industry is currently leading the move towards extruded wood products, driven largely by the construction industry's demand for decking and sidings. Cincinnati Extrusion hopes to become a significant player in this sector and has developed a wood extrusion system of its own, which is claimed to be able to handle composites with wood contents of up to 85%. Davis-Standard has shown a newly developed direct compounding and extrusion line for wood products. Its new Woodtruder technology is said to be able to process a wet wood feed.

USA

Accession no.780132

Item 119

**European Plastics News**

27, No.7, July/Aug.2000, p.27-8

**BUILDING UP THE MARKET**

Warmington A

Plastics offer a wide range of advantages in construction applications, but have not made progress in all applications in all markets. This is partly due to the highly fragmented customer base which also varies greatly from country to country. The construction market is also a conservative one and plastics must show a real, proven benefit over existing materials to succeed in this sector. The pipes and profiles industries are growing at a rate of about 4%/year in Europe and both are facing similar consolidation pressures. Relatively low growth, fluctuating raw material prices and consumer pressure on prices during difficult years for construction have all contributed to squeezing pipe producers' margins.

CORPORATE DEVELOPMENT CONSULTANTS  
LTD.; APPLIED MARKET INFORMATION LTD.  
WESTERN EUROPE-GENERAL

Accession no.780079

Item 120

**Kunststoffe Plast Europe**

90, No.4, April 2000, p.38-40

**COLOURFAST WINDOW PROFILES. HEAT-RESISTANT COMBINATIONS OF ASA AND ABS**  
Hennenberg F

The suitability of ASA and ABS as alternatives to PVC for window profiles is demonstrated. The properties of these styrene copolymers are compared with those of unplasticised PVC as are the costs of profiles made from PVC, ASA and ABS. The extrudability of these styrene copolymers is also considered.

EUROPEAN COMMUNITY; EUROPEAN UNION; GERMANY;  
WESTERN EUROPE

Accession no.779485

Item 121

**Kunststoffe Plast Europe**

90, No.4, April 2000, p.35-7

**POLYPROPYLENE - AN ALTERNATIVE?  
WINDOW PROFILE MATERIAL IN PP  
COMPOUND**

Brenner E

The suitability of PP as an alternative to materials, such as wood, aluminium or PVC, for window profiles is examined. The processability and quality requirements are considered and the properties of a coextruded PP window profile are compared with those of PVC window profiles.

AUSTRIA; EUROPEAN UNION; WESTERN EUROPE

Accession no.779483

Item 122

**Insulation Journal**

May/June 2000, p.14

**NOT TAKING IT FAR ENOUGH**

This article provides information on new UK guidance on fire safety measures that will meet the requirements of Building Regulations, which is given in Approved Document B (Fire Safety) 2000. Details of the Document are presented.

ROCKWOOL

EU; EUROPEAN COMMUNITY; EUROPEAN UNION; UK;  
WESTERN EUROPE; WESTERN EUROPE-GENERAL

Accession no.778851

Item 123

**Plastics in Building Construction**

24, No.7, 2000, p.5-6

**XEPS USED WITH CONCRETE SYSTEMS**

The use of Styrofoam insulation from Dow Chemical is described with reference to applications by the company's co-marketing customers. Styrofoam is a rigid, extruded, polystyrene foam insulation with a closed cell structure resulting in a high compressive strength and resistance to

water penetration. Its use in a variety of building applications is described, with particular reference to energy efficient, lightweight insulating and waterproofing structures.

DOW CHEMICAL CO.  
USA

*Accession no.778543*

*Item 124*

**Composites-French/English**

No.38, April/May 2000, p.90-2

English; French

**CRAY VALLEY - THERMOSET COMPOSITE MATERIALS AND THE BUILDING AND CONSTRUCTION INDUSTRY**

This article explores the use of thermosetting composite materials for building and construction, highlighting the outstanding properties and benefits of these materials, and looking in particular at a school renovation project which involved the use of phenolic resin panels made by Uniject SA of France.

UNIJECT SA  
EUROPEAN COMMUNITY; EUROPEAN UNION; FRANCE;  
WESTERN EUROPE

*Accession no.777595*

*Item 125*

**Composites-French/English**

No.38, April/May 2000, p.70-1

English; French

**FIBER-REINFORCED POLYMER (FRP) COMPOSITES IN CONSTRUCTION: A NORTH AMERICAN PERSPECTIVE**

This article discusses the acceptance of the use of fibre-reinforced polymer (frp) composite materials in the building industry in North America, and looks at the Cerf (Civil Engineering Research Foundation) Composite Durability Program, which is the centre-piece of an effort to understand and meet construction end-users needs for information about frp composites.

US,MARKET DEVELOPMENT ALLIANCE;  
AMERICAN SOCIETY OF CIVIL ENGINEERS;  
CIVIL ENGINEERING RESEARCH FOUNDATION  
NORTH AMERICA

*Accession no.777583*

*Item 126*

**Composites-French/English**

No.38, April/May 2000, p.62-3

English; French

**SPHERHOME'S INNOVATIVE SIDE BUILDINGS**

The "Spherhome" self-supporting dome structure accessory building is highlighted in this article. A brief description of the thermoplastic and composite dome is given, and its possible uses are drawn to our attention.

SPHERHOME; PH INDUSTRIES  
EUROPEAN COMMUNITY; EUROPEAN UNION; FRANCE;  
WESTERN EUROPE

*Accession no.777581*

*Item 127*

**Composites-French/English**

No.38, April/May 2000, p.46-7

English; French

**POLYMER COMPOSITES AS A WAY FORWARD FOR CONSTRUCTION**

Halliwell S M  
BRE,Centre for Building Fabric

This article discusses the use of composites in building and architectural applications, and considers the advantages these materials have over more traditional construction materials. The future use of composites in buildings is also considered.

MAUNSELL STRUCTURAL PLASTICS  
EUROPEAN COMMUNITY; EUROPEAN UNION; UK;  
WESTERN EUROPE

*Accession no.777578*

*Item 128*

**Composites-French/English**

No.38, April/May 2000, p.43-4

English; French

**COMPOSITES IN THE BUILDING AND CONSTRUCTION INDUSTRY: VARIETY IS THE NAME OF THE GAME**

This article examines the many uses of composite materials within the building and construction industry, highlighting the properties which make these materials such an excellent choice. Figures on Europe's composites market are also included.

APFE; VETROTEX  
EUROPE-GENERAL

*Accession no.777577*

*Item 129*

**Macplas International**

No.5, May 2000, p.147-8

**ROYAL INSULATION**

This article reports on the use of a thermal insulation and ventilation system based on special PU panels, which was used in the reconstruction and restoration of the Palazzo Reale in Milan, an ancient building which suffered fire damage in the 18th century and bombing during the Second World War.

EUROPEAN COMMUNITY; EUROPEAN UNION; ITALY;  
WESTERN EUROPE

*Accession no.777470*

*Item 130*

**Plastics in Building Construction**

24, No.6, 2000, p.6

**XEPS INSULATIONS RECEIVE ICBO  
ACCEPTANCE FOR DIRECT-TO-STEEL DECK  
APPLICATIONS**

Dow Chemical Co.'s Styrofoam, Deckmate and Deckmate Plus brand insulation has been accepted by the Evaluation Service group of the International Conference of Building Officials, (ICBO), it is reported, for use directly on steel roof decks. The rigid, extruded polystyrene foam insulation products have previously received code acceptance for direct application on steel decks from the Evaluation Service groups of Building Officials and Code Administrators International, and Underwriters Laboratories Inc.. Their use eliminates the need for a labour-intensive thermal barrier. Brief property data are included.

DOW CHEMICAL CO.; INTERNATIONAL  
CONFERENCE OF BUILDING OFFICIALS  
USA

*Accession no.776965*

*Item 131*

**Journal of Testing & Evaluation**

27, No.4, July 1999, p.249-65

**NEW DYNAMIC WIND LOAD CYCLE TO  
EVALUATE MECHANICALLY ATTACHED  
FLEXIBLE MEMBRANE ROOFS**

Baskaran A; Yin Chen; Vilaipornsawai U  
Canada,National Research Council

A report is presented on progress towards developing test procedures for certifying roofing systems under dynamic wind loads by the National Research Council of Canada's Special Interest Group for Dynamic Evaluation of Roofing Systems(SIGDERS). Wind tunnel investigations were carried out using two flexible roofing membranes, PVC and EPDM. Using the wind tunnel pressure records as source data and comparing the membrane responses of PVC with EPDM, SIGDERS developed a dynamic load cycle. With input from industries, building owners and roofing associations, the developed load cycle was generalised and extended to evaluate the ultimate strength of flexible membrane roofs. To validate the newly-developed load cycle, several membrane roofing systems were investigated and then reported separately. The SIGDERS load cycle in a laboratory mimicked failure modes similar to those observed in the field. 23 refs.

CANADA

*Accession no.776393*

*Item 132*

**Journal of Thermal Analysis and Calorimetry**

59, Nos.1-2, 2000, p.601-9

**APPLICATION OF TGA/DTA/MS TO THE  
HISTORIC PRESERVATION OF STONE**

Gembinski C; Charola A E; Price B; McGhie A R  
Pennsylvania,University; Philadelphia,Museum of Art

Details are given of an analysis of the repair of an historic stone pillar using a polymethyl methacrylate-based binder. The presence of discolouration was analysed using a combined TGA/differential thermal analysis/mass spectrometry technique in conjunction with FTIR, SEM, X-ray diffraction and optical microscopy. 7 refs.

USA

*Accession no.776102*

*Item 133*

Advances in Plastics Technology. Conference proceedings.

Katowice, Poland, 16th-18th Nov.1999, paper 9

**NEW GENERATION CPE MODIFIER FOR PVC  
WINDOW PROFILES**

Kim A; Gerlach D

DuPont Dow Elastomers SA

(Poland,Institute of Plastics & Paint Industry)

PVC is an outstanding material for the production of rigid extruded goods, such as pipes or profiles. However due, to its high glass transition temperature, it has shortcomings in impact strength. It has therefore to be modified to provide impact strength at ambient and low temperature. Impact modifiers provide consistently ductile behaviour over a broad temperature range. The requirements for impact strength depend on the end use - there are weight drop or slow fracture toughness tests for pipes, and notched (fast) impact tests for window profiles. Additional needs for outdoor use are weathering and ageing stability - in particular the maintenance of colour, gloss, and impact strength over extended periods. Last but not least, the processor seeks products with sufficient processing latitude - products which are easy to formulate and run reliably on a wide range of extruders and tools. A short overview is given of principles and mechanisms of impact modification. The different products used are discussed and positioned, and the possibilities for chlorinated PE (CPE), a product growing strongly in the profile industry, are expanded upon. 5 refs.

SWITZERLAND; WESTERN EUROPE

*Accession no.775955*

*Item 134*

**Plastics Network**

No.8, 2000, p.35-8

**ALTERNATIVES TO PVC USE IN BUILDINGS**

Details are given on materials that can be specified as alternatives to PVC in major uses in building, including flooring, pipes and ducts, electrical and information cables, windows, building membranes, guttering, underground drainage and cladding. The alternatives included in the article are HDPE, EPDM, MDPE, polyethylene, linoleum, rubber, wood and polypropylene. 4 refs.

UK CLAY DRAINAGE PIPE CO.; PIRELLI; DELTA  
ENERGY CABLES LTD.; SIEMENS; DATWYLER



CHINA; DENMARK; EUROPE-GENERAL; EUROPEAN COMMUNITY; EUROPEAN UNION; GERMANY; NETHERLANDS; SCANDINAVIA; SPAIN; SWITZERLAND; UK; WESTERN EUROPE

Accession no.773368

Item 135

**Journal of Testing & Evaluation**

27, No.2, March 1999, p.159-63

**EIFS SEALANT JOINT RESTORATION**

Yarosh K F

Dow Corning Corp.

The successful performance of exterior insulation and finish systems (EIFS) is related directly to the sealants used to weatherseal the EIFS and adjacent materials to EIFS. With millions of square feet of EIFS installed, proper restoration of EIFS joints can help ensure long-term watertight performance of the EIFS wall. A new test method that closely parallels ASTM C 1135 - Test Method for Determining Tensile Adhesion Properties of Structural Sealants, is currently under consideration by ASTM Task Group C 24.20.12. This new test method allows sealant joints to be evaluated in many conditions to more closely simulate actual field conditions. Emphasis is placed on types of EIFS joint failure and possible causes for failure. Different restoration methods are discussed with particular attention to the use of sealants to overlay failed sealant joints. A modification to the test method under review by ASTM Task Group C 24.20.12 is used to evaluate various joint conditions with EIFS, including standard square joints, hourglass-shaped joints, overlay joints with wet sealants and overlay joint with performed sealants. 3 refs.

USA

Accession no.772305

Item 136

**Journal of Testing & Evaluation**

28, No.2, March 2000, p.131-5

**REMEDIAL SEALANT PROCEDURES FOR FIXED GLASS AND CURTAIN WALLS**

Beers P E; Yarosh K F

Glazing Consultants Inc.; Dow Corning Corp.

A commonly prescribed remedy for fixed glass (non-operable windows) and curtain walls experiencing water leakage is to install new exterior sealants throughout the system. This is commonly referred to as 'wet sealing'. This method is commonly used on both new construction with water leakage problems and existing construction with aged sealants. Unfortunately, this repair solution is not always as easy as it sounds as there can be several complex details that must be addressed. When 'wet sealing', the design concept of a system originally designed to collect and drain water is changed to a barrier system. With a barrier system, the concept is that all water will be shed at the exterior surface. Accordingly, if any water is to penetrate the outside face it will lie trapped inside the assembly. Therefore a retrofit that stops less

than 100% of the water will not function. The factors to evaluate when considering a 'wet seal' application are presented, including a discussion about how to properly seal various types of joints when wet sealing. Finally other considerations that may affect the performance and longevity of the wet seal are outlined. 4 refs.

USA

Accession no.772291

Item 137

**Composites Part B: Engineering**

31B, No.2, 2000, p.87-96

**STRENGTHENING CONCRETE BEAMS FOR SHEAR USING CFRP MATERIALS: EVALUATION OF DIFFERENT APPLICATION METHODS**

Taljsten B; Elfgren L

Lulea, University of Technology; Stabilator AB

Different methods and tests for the application of CFRP fabrics and tapes to concrete beams are presented. The purpose of the tests are twofold; to study the shear force capacity of the beams both before and after strengthening; and to examine three different ways of applying the fabrics. These are: two hand lay-up systems, one vacuum injection system and one prepreg system. The total number of beams tested is eight. The test results prove that a very good strengthening effect in shear can be achieved by bonding fabrics to the face of concrete beams. However, a lot of energy is released at failure, which leads to brittle failures. The tests also show that the techniques which use hand lay-up are preferable as compared to other systems, even though the fibre weight fraction is considerably less. However, the vacuum injection system is the most environmentally friendly method. 31 refs.

EUROPEAN UNION; SCANDINAVIA; SWEDEN; WESTERN EUROPE

Accession no.771734

Item 138

Composites and Plastics in Construction. Conference proceedings.

Watford, UK, 16th-18th Nov.1999, paper 30

**POLYMER COMPOSITES IN CONSTRUCTION - THE WAY AHEAD**

Halliwell S M; Moss R

BRE Ltd.

(Rapra Technology Ltd.; BRE)

Fibre-reinforced plastics have been used in the construction industry for several decades for mainly architectural applications e.g. cladding. Polymer composites offer the architect, designer, structural engineer and building owner many advantages over traditional construction materials. Advanced polymer composites originally designed for the aerospace and military applications have superior properties that offer potential benefits to the construction industry. Advanced

composites can be used for many different applications such as sandwich panels, modular units, structural components, reinforcing bars, and repair and strengthening of structures. The advantages of advanced composites, recent developments in design and examples of current and potential applications are examined. 4 refs.

EUROPEAN COMMUNITY; EUROPEAN UNION; UK;  
WESTERN EUROPE

*Accession no.769306*

*Item 139*

Composites and Plastics in Construction. Conference proceedings.

Watford, UK, 16th-18th Nov.1999, paper 29

**PLASTIC AND COMPOSITE WINDOWS - THE WAY AHEAD**

Kent R

Tangram Technology Ltd.

(Rapra Technology Ltd.; BRE)

Windows primarily manufactured from PVC-U represent one of the largest markets for plastics in the European construction sector and one of the largest single markets for bulk polymers. In fact, PVC accounts for over 90% of plastics extrusions in the profile and tube products areas for Europe. This category of 'plastics profiles and tubes' excludes the usage of materials for pipe where the majority of the materials used are polyolefins (HDPE, LDPE and a variety of other similar products). In 1998 the production of plastics profiles and tube products exceeded 1.3 million tonnes and nearly 90% was used in the construction industry with window applications using 56% of the total production (over 700,000 tonnes). Other plastics materials used in construction profiles include PE, PP and PS, but these are all minor in comparison with PVC-U in the sector as defined. The average annual volume growth for PVC applications is forecast to be 4% for the next five years and PVC is here to stay as materials material in construction and window applications. On a European scale PVC-U windows accounted for 37% of all the windows produced in 1998, whereas in the UK this was doubled as PVC-U accounts for approximately 75% of the total windows produced. This does not mean that the market is stable and new materials are now appearing that could challenge or at the very least change, the dominance of PVC-U in the manufacture of window frames. 2 refs.

EUROPEAN COMMUNITY; EUROPEAN UNION; UK;  
WESTERN EUROPE

*Accession no.769305*

*Item 140*

Composites and Plastics in Construction. Conference proceedings.

Watford, UK, 16th-18th Nov.1999, paper 25

**HEAT INSULATION AND FIRE RESISTANCE USING COMPOSITE MATERIALS**

Burline P

TWI

(Rapra Technology Ltd.; BRE)

Sandwich structures for the construction industry have been used for a number of years. The sandwich structure consists of a laminated material in which the outer skins are relatively thin, strong and dense, whereas the cores are usually weaker than the skin material. The objective is to obtain a structure which is strong and stiff as a result of its design and construction, but at the same time is lightweight and has the desirable attributes which are not achievable when using the materials separately. Sandwich structures have found high volume and niche applications in transportation, aerospace, marine/offshore and the construction industry, aided by comparative requirements and transfer of technology. In many applications, materials are required to have fire resistance, and/or heat transfer for protection of people, equipment and increasingly the surrounding environment by not emitting any fumes. Sandwich structures can utilise a variety of materials and configurations, and therefore can provide a cost effective solution for many engineering problems including that of fire protection. In such applications structures are required to conform to mandatory fire regulations. Such regulations relate to smoke and toxic fume transmission. There is a need therefore for a low-density core material which can be used for fire resistant sandwich panels. Emphasis is placed on the use of one such product, a lightweight material known as Barrikade, which can be incorporated in sandwich structures. Barrikade is low cost, fire resistant and easily machinable without the disadvantages of traditional core products. Polymer foams, ceramic foams, honeycomb cores (aluminium, Nomex) and wood etc. have a number of disadvantages when using them as core products. None fulfil the criteria that many engineers require (density, cost, good insulation, no spread of flame, non-toxic). 4 refs.

EUROPEAN COMMUNITY; EUROPEAN UNION; UK;  
WESTERN EUROPE

*Accession no.769301*

*Item 141*

Composites and Plastics in Construction. Conference proceedings.

Watford, UK, 16th-18th Nov.1999, paper 22

**FIBRE REINFORCED POLYMER COMPOSITES FOR BLAST RESISTANT CLADDING**

Alderson A

CIRIA

(Rapra Technology Ltd.; BRE)

Since the terrorist bomb attacks in London and Manchester, blast resistance for key commercial and government buildings has become increasingly important, to ensure the safety of personnel and enable business to be resumed as quickly as possible with the minimum disruption. Blast resistant facades are one way of achieving this. As the result of a three-year collaborative project between Pera and the Construction Industry

Research and Information Association, CIRIA, lightweight blast resistant cladding panels, composed of fibre reinforced polymeric materials, have been successfully manufactured and validated. This has been achieved by transferring and adapting technology used in the aerospace/defence industries to provide a simple and economic manufacturing process using low cost materials to provide a high performance product. The work was supported by the DTI through their Carrier Technology Programme and 22 organisations who participated in the project, representing manufacturers, raw material suppliers, the construction industry, and testing and assessment organisations. Details are given of the project, completed in July 1998, and the further development work undertaken since then by Mech-Tool Engineering. Aspects covered include the background to the project, performance criteria for the panels to meet construction industry requirements, design methodology to meet the blast resistance requirements, manufacturing process, and testing to validate the performance of the panels and the computer model.

EUROPEAN COMMUNITY; EUROPEAN UNION; UK;  
WESTERN EUROPE

*Accession no.769298*

*Item 142*

Composites and Plastics in Construction. Conference proceedings.

Watford, UK, 16th-18th Nov.1999, paper 20

**REINFORCED PLASTICS CLADDING PANELS**

Halliwell S M

BRE Ltd.

(Rapra Technology Ltd.; BRE)

Fibre reinforced plastics (FRP) are being proposed for an increasing variety of construction applications where long-term durability with minimal maintenance is required, coupled with their mechanical properties of high strength at low weight. Glass fibres are the principal form of reinforcement used for plastics in construction applications because they offer a good combination of strength, stiffness and price. In 1974, BRE surveyed GRP cladding systems in several relatively new buildings chosen to include a representative cross-section of the ways of using GRP in this application. In 1997 the buildings were revisited to investigate durability of the cladding. The aims were to determine how far the use of GRP had been successful, and also to find out what problems occurred with the GRP panels. This information could then be used to aid development and structures in the future. The findings of the 1997 survey, and the key issues identified, are discussed. 5 refs.

EUROPEAN COMMUNITY; EUROPEAN UNION; UK;  
WESTERN EUROPE

*Accession no.769296*

*Item 143*

Composites and Plastics in Construction. Conference proceedings.

Watford, UK, 16th-18th Nov.1999, paper 18

**ALTERNATIVE STRUCTURAL STRENGTHENING WITH ADVANCED COMPOSITES**

Keble J

Weber & Broutin UK Ltd.

(Rapra Technology Ltd.; BRE)

The basic fibres used for advanced fibre composites are embedded into a matrix and applied externally as a reinforcing element to existing structures. The different types of fibre composites, the demands imposed upon the substrate, the correct choice of the adhesive matrix and examples of practical strengthening of structures with advanced composites are outlined. Structural strengthening involves the use of both prefabricated fibre laminates and fibre sheets for manual lamination to civil engineering structures. Advanced composites have the ability for multiple uses and can be used for structural tensile bending strengthening, shear reinforcement, embrace reinforcement, explosion and blast resistance. The diversity of modern high-performance fibres, the advances in resin matrix compounds, the large number of fibre strand orientation and type of fibres makes the use of advanced composites so attractive to engineers. Ultimately the choice of which composite to use depends upon the structure, the choice of fibre and the direction of the fibres. Types of fibre include carbon fibre, aramid, E glass and AR glass fibre, and polyester fibre. All of these fibres have their use in the construction industry and must always be viewed with the end use in mind.

EUROPEAN COMMUNITY; EUROPEAN UNION; UK;  
WESTERN EUROPE

*Accession no.769294*

*Item 144*

Composites and Plastics in Construction. Conference proceedings.

Watford, UK, 16th-18th Nov.1999, paper 17

**FRP MATERIALS FOR REINFORCING AND STRENGTHENING CONCRETE STRUCTURES**

Clarke J L

Concrete Society

(Rapra Technology Ltd.; BRE)

Fibre reinforced plastics (FRPs) have been used for many years in the aerospace and automotive industries, where their high strength and low weight has shown distinct advantages over traditional materials such as aluminium and steel. They are slowly being adopted by the construction industry either as construction materials in their own right, or for use in conjunction with traditional materials. They are being used as reinforcement or for prestressing tendons in concrete structures, where, if correctly formulated, they should prove more durable than conventional steel in aggressive environments. There is a rapid increase in the use of FRP materials for repair and strengthening of concrete and other structures. FRP materials are being used to form complete structures. A

general overview of the use of the materials in various concrete-related applications is presented.

EUROPEAN COMMUNITY; EUROPEAN UNION; UK;  
WESTERN EUROPE

Accession no.769293

*Item 145*

Composites and Plastics in Construction. Conference proceedings.

Watford, UK, 16th-18th Nov.1999, paper 16

**USE OF HIGH MODULUS CARBON FIBRES FOR REINFORCEMENT OF CAST IRON COMPRESSION STRUTS WITHIN LONDON UNDERGROUND - PROJECT DETAILS**

Hill P S; Smith S; Barnes F J

DML Composites

(Rapra Technology Ltd.; BRE)

The use of Mitsubishi K13710 pitch-based ultra-high modulus carbon fibres for the strengthening of cruciform cast iron struts in a vent shaft on London Underground East London tube line. The carbon composites are applied using DML's patented resin infusion technique and this application represents the culmination of four years of research and development. It is the largest strengthening scheme conducted to date using this technique. 160 infusions are completed, equating to a linear length of almost 1 km of carbon reinforcement with a weight approaching two tonnes. The design of the strengthening scheme and the validation of the technique are described, together with a review of the final installation of the material on site. The benefit of the high stiffness of the ultra-high modulus carbon fibre combined with the ease of use of composite materials enables strengthening to take place with no disruption to the workings of the London Underground Railway and minimum interference with the 140 year-old structure.

EUROPEAN COMMUNITY; EUROPEAN UNION; UK;  
WESTERN EUROPE

Accession no.769292

*Item 146*

Composites and Plastics in Construction. Conference proceedings.

Watford, UK, 16th-18th Nov.1999, paper 13

**STRESSED AND UNSTRESSED ADVANCED COMPOSITE PLATES FOR THE REPAIR AND STRENGTHENING OF STRUCTURES**

Darby J; Taylor M; Luke S; Skwarski A

Mouchel Consulting

(Rapra Technology Ltd.; BRE)

The understanding of the behaviour of advanced composite materials when used for the strengthening of structures has advanced significantly over recent years, such that specialist designers experienced in the techniques are now confident of its use in critical situations. Nevertheless, growth in the number of

applications depends upon the spread of that confidence throughout the industry as a whole. Some of the work that has contributed to the advance in knowledge is discussed, with emphasis on the following projects: the ROBUST project, funded under the DTI-LINK structural composites programme, provided the opportunity to study the effects of different reinforcement upon beams of length from 1.0 m to 18.0 m. Mouchel Consulting has recently developed a technique for application of stressed composite plates to structures. This was applied in early 1999 to Oxford's Hythe Bridge. This is believed to be the first application of stressed composites to a cast iron structure in the world, and was the winner of the 1999 British Construction Industry Award for small projects.

EUROPEAN COMMUNITY; EUROPEAN UNION; UK;  
WESTERN EUROPE

Accession no.769290

*Item 147*

Composites and Plastics in Construction. Conference proceedings.

Watford, UK, 16th-18th Nov.1999, paper 2

**MATERIALS IN USE AND DEVELOPMENTS IN MARKETS**

Dufton P; Watson M

Rapra Technology Ltd.; Construction Best Practice Programme

(Rapra Technology Ltd.; BRE)

Natural polymers and composites have long been used in construction in the form of wood plus plant by-products such as straw, hemp and others. Today, the construction market arguably takes the second highest quantity of plastics after packaging, and uses elastomers for seals, flexible jointing, coverings and insulation purposes. Various segments of the building construction and wider civil engineering sector are examined in which plastic and rubber components play an increasingly important role. The role of these components is briefly described and a review of the widening scope for their use is given. The wide range of applications, some relatively mature with others much more recent, shows the opportunities for polymeric materials in both structural and 'cosmetic' or protective elements.

EUROPEAN COMMUNITY; EUROPEAN UNION; UK;  
WESTERN EUROPE

Accession no.769280

*Item 148*

ARC '99. Conference proceedings.

Detroit, Mi., 9th-11th Nov.1999, p.411-5

**PROCESSING AND PROPERTIES OF AUTOMOTIVE SHREDDER RESIDUE/ POLYETHYLENE PROTOTYPES FOR BUILDING APPLICATIONS**

Xanthos M; Yilmazer U; Dey S K; Mitra S; Feng C

New Jersey, Institute of Technology

(SPE, Plastics Recycling Div.)

Automotive Shredder Residue (ASR) is evaluated as a potential additive in polymer composites for building applications. Prototype blocks are prepared by the 'intrusion' process using various ratios of ASR and LDPE, and evaluated for their leaching characteristics, mechanical and thermal properties. The leachable heavy metal and total organic carbon contents of as received ASR as well as of ASR/LDPE prototype blocks are determined at different pH values. Encapsulation of ASR by LDPE during moulding significantly reduces leachable content. In an effort to reduce the leachable content further, the ASR/LDPE pellets are processed in two stages by precompounding in a volatilising twin-screw extruder. Devolatilisation and homogenisation decrease the leachable heavy metal content by 98% on average in comparison to the as-received ASR. 3 refs.

USA

Accession no.768706

*Item 149*

Flame Retardants 2000. Conference proceedings. London, 8th-9th Feb.2000, p.69-76

**MECHANISMS AND PERFORMANCE OF MOLYBDENUM, TIN, ZINC AND BORON ADDITIVES AND COMPARATIVE FLAMMABILITY AND SMOKE RESULTS IN HALOGENATED POLYMERS INCLUDING WIRE & CABLE AND CONSTRUCTION PRODUCTS**

Cook P M; Musselman L L

FVI

(BPF; Interscience Communications Ltd.; APME; European Flame Retardant Assn.; Fire Retardant Chemicals Assn.)

Optimisation of flame retardant chemistry and morphological modification of the additive can result in improved efficiency of low-smoke flame retardant additive systems. Important application areas have been developed for this cost reduction technology in wire and cable compounds, adhesives, PVC and insulation materials and comparative application data is presented. 15 refs.

USA

Accession no.768657

*Item 150*

**Polymer News**

25, No.2, Feb.2000, p.63

**PLASTICS DEMAND IN WINDOWS AND DOORS**

Freedonia Group Inc.

The Freedonia Group Inc. has published a market study on the US demand for plastics in the manufacture of windows and doors, which indicates that demand in the USA will grow 5.6% annually, reaching 1.2 billion pounds in 2002. Market trends are forecast and statistics for

window and door material demand from 1987 through to 2002 are included.

USA

Accession no.766705

*Item 151*

**Adhesives Age**

43, No.2, Feb.2000, p.21-4

**BUILDING CONFIDENCE**

Schwartz J

It is predicted that demand for construction adhesives, which are used in the building and remodelling of homes, will grow 2.5% per year to 5.7 billion pounds by 2003. Construction adhesives represent about 17% of total global glue sales. Due to regulatory issues, there has been a movement to reduce or eliminate the amount of solvent in adhesive formulations. Solventborne adhesives are expected to lose market share over the next five to 10 years. CARB has said it is going to lower the limit for VOCs from 40% to 15% for construction adhesives. Observers report that major home improvement stores have cut back on the number of construction adhesive brands they sell.

USA

Accession no.764533

*Item 152*

**Insulation Journal**

Nov./Dec.1999, p.22

**GREEN LEARNING CURVE WITH KINGSPAN**

This article supplies details of two tried and trusted insulation products from Kingspan Insulation. Thermapitch TP10 sarking insulation for pitched roofs consists of a rigid polyurethane core with a tri-laminate foil/kraft/foil facing on both sides. It has an accredited thermal conductivity of 0.019W/mK. Thermataper TT40 tapered roof insulation is designed for use under partially bonded built-up felt roofing systems and has a thermal conductivity of 0.025W/mK. The core is a high performance HCFC-free rigid urethane insulant with zero ODP.

**KINGSPAN INSULATION**

EUROPEAN COMMUNITY; EUROPEAN UNION; UK; WESTERN EUROPE

Accession no.763870

*Item 153*

**Insulation Journal**

Nov./Dec.1999, p.12-3

**PURFECTION IN A PANEL**

Borland S

Building Sciences

This article supplies a comprehensive assessment of the features and advantages of rigid polyurethane insulation panels. The panels can improve the performance and

reduce the costs of buildings. The growth in the use of factory made insulated PUR panels is due to their thermal performance. The panels have a number of advantages over their more traditional counterparts. Polyurethane panels outperform site-insulated panels with respect to insulation performance, continuity, speed of erection and minimising the level of uncontrolled air leakage.

WALES, UNIVERSITY  
EUROPEAN COMMUNITY; EUROPEAN UNION; UK;  
WESTERN EUROPE

Accession no.763869

*Item 154*

**Plastics News(USA)**

11, No.50, 31st Jan.2000, p.21

**ABS COMPOSITE SIDING PRICEY, BUT DURABLE**

This article highlights a new ABS composite siding from Reynolds Building Products of Dallas, USA. While the material is thicker than traditional PVC sidings, it is more flexible, making it easier to use in cold climates, it is reported. Full details are given.

REYNOLDS BUILDING PRODUCTS; NORANDEX/  
REYNOLDS DISTRIBUTION CO.; OWENS  
CORNING; TOLEDO  
USA

Accession no.762963

*Item 155*

**Plastics Engineering**

56, No.1, Jan.2000, p.39-42

**PROCESSING AND PROPERTIES OF PETP FOAM LAMINATES FOR BUILDING/ CONSTRUCTION APPLICATIONS**

Xanthos M; Dey S K; Yilmazer U  
New Jersey, Institute of Technology

This article describes the production of high-density and low-density PETP foams and presents data on their flexural properties. The data is part of an R&D project with the overall objective of developing technologies for producing multi-layered sandwich structures based on a foamed core of post-consumer recycled PETP and intended for use as high-performance panels in building/construction applications. 8 refs.

USA

Accession no.760599

*Item 156*

**Modern Plastics International**

29, No.6, June 1999, p.31-2

**CEDAR-LIKE SHINGLES ARE A TARGET FOR POLYPROPYLENE**

Defosse M T

This article reports on a new development from Alcoa Building Products of the USA - injection moulded PP

shingles that have the appearance of cedar-wood. Full details of the new product are provided. The PP shingles are said to weather better than PVC, which is the usual material chosen for this sort of application.

ALCOA BUILDING PRODUCTS; MONTELL;  
TARGOR; BOREALIS

ASIA; DENMARK; EUROPE-GENERAL; EUROPEAN  
COMMUNITY; EUROPEAN UNION; NORTH AMERICA;  
SCANDINAVIA; USA; WESTERN EUROPE

Accession no.760064

*Item 157*

**Plastics in Building Construction**

23, No.12, 1999, p.6-9

**HIGHER REFLECTIVITY OF SINGLE PLY ROOFING SHOULD HELP COOL DOWN CITIES**

The importance of reducing the reflectance of roofing as a means of reducing the costs of excessive heat in cities, is briefly discussed, and the use of lighter high reflectivity single-ply roofing is suggested. The replacement of dark roofs and road surfaces with lighter materials would reduce the costs involved in cooling buildings and reduce the incidence of smog, it is claimed. The highest reflectances of 70-83% are obtained through the use of white single-ply membranes such as PVC or white coated EPDM.

USA

Accession no.759558

*Item 158*

International Composites Expo '99. Conference proceedings.

Cincinnati, Oh., 10th-12th May 1999, session 12-C

**PVC DECKING BOARDS AND DOCKS**

Kampmann J H

MEA Engineers Inc.

(SPI, Composites Institute)

Polyvinyl chloride (PVC) for use in the building industry is controlled and classified by ASTM D 4216. Other codes and standards relating to material properties and building applications are briefly described. The design and testing of extruded PVC sections for deck and dock planking is described, for extrusions intended to be direct replacements for 50 by 150 mm wooden boards, including prototype fabrication, determination of material and product properties, the preparation of design and specifications, product fabrication, and final proof testing.

USA

Accession no.759507

*Item 159*

**Plast' 21**

No.84, Sept.1999, p.51

Spanish

**RIGID POLYURETHANE FOAMS FOR INSULATION AND SCAFFOLDING**

Developments in the use of Bayer's rigid PU foams in the building industry are reviewed. These include thermal insulation panels manufactured by Linzmeier and components used in a lightweight roof scaffolding system developed by Listel Facade.

BAYER AG; LINZMEIER J., GMBH; JARKIM; MEFRAN; LISTEL FACADE  
EUROPEAN COMMUNITY; EUROPEAN UNION; FRANCE; GERMANY; WESTERN EUROPE

Accession no. 758801

Item 160

**Macplas International**

No.6, May 1999, p.87-8

**REINFORCEMENT FOR MASONRY**

This article discusses the use of composites in building applications. It lists the reasons for using structural composites in civil engineering projects, and then highlights the use of composite materials for the reinforcement and consolidation of a masonry structure situated in the gardens of one of the oldest villas in the region of Cassino in Italy.

CASSINO, UNIVERSITA  
CHINA; EUROPE-GENERAL; EUROPEAN COMMUNITY; EUROPEAN UNION; ITALY; JAPAN; NORTH AMERICA; WESTERN EUROPE

Accession no. 757294

Item 161

**Construction & Building Materials**

13, No.5, July 1999, p.253-62

**FLEXURAL BEHAVIOUR OF POLYMER CONCRETE**

Abel-Fattah H; El-Hawary M M  
Kuwait, University

The flexural behaviour of polymer concrete (PC) made with different types of resins is evaluated. A total of 54 beams is tested under four-point loading (36 singly reinforced and 18 unreinforced) to examine different parameters that influence the behaviour of polymer concrete in flexure. The beams are made of resins widely used in concrete repair works in the Gulf region. Three types of polymer resins are investigated: two types of epoxy from two different manufacturers and one polyester. The parameters studied include the percentage of polymer in the concrete mix (three percentages are used: 9, 12 and 15%), and the reinforcement ratio ( $p = 0, 0.0042$  and  $0.0116$ ). The results show that the modulus of rupture and ultimate compressive strains for PC are much higher than that of ordinary Portland cement concrete. The beams showed a very ductile behaviour and high ductility factors are obtained. The test results are compared with the equations used in the ACI design method and several recommendations are made to modify some of those equations to become more suitable for the flexure design of PC. 17 refs.

KUWAIT

Accession no. 757040

Item 162

**Journal of Elastomers & Plastics**

31, No.4, Oct.1999, p.334-52

**MODIFICATION OF A BITUMEN WITH VARIOUS POLYMERS FOR USE IN BUILT-UP ROOFING MEMBRANES**

Fawcett A H; McNally T; McNally G M  
Belfast, Queen's University

Blends of three commercially-used polymers with a 100% penetration grade Nynas bitumen at levels between 9% and 29% w/w were prepared using a Z-blade mixer. The polymers were atactic PP/EPM, alpha-olefin copolymers and SBS. The morphology, thermal and dynamic mechanical properties of these blends were examined using fluorescence optical microscopy, DSC and DMTA. The blends prepared with these polymers displayed low temp. flexibility and an onset of flow at high temps. The former characteristic was required for use in cold environments, the latter feature being a critical property when the membrane was manufactured and later when applied by the torching process on a roof. The different blends were shown to function in a manner which rendered them suitable for the production of built-up roofing membranes. 18 refs.

EUROPEAN COMMUNITY; EUROPEAN UNION; UK; WESTERN EUROPE

Accession no. 755877

Item 163

**Advanced Materials & Composites News**

21, No.22, 15th Nov.1999, p.1-2

**LARGEST FRP BEAMS IN WORLD MADE FOR SWISS BUILDING**

Information is presented in some detail on the development of what is reported to be the largest FRP glulam beam system ever made. The beams, a joint project between Swiss company Zollig Holzleimbau AG and the Wood Science & Technology Institute of Corvallis, Oregon, are said to consist of C12 Spruce low grade wood laminations reinforced with a pultruded Kevlar aramid fibre and epoxy vinyl ester reinforcing strips.

ZOLLIG HOLZLEIMBAU AG; WOOD SCIENCE & TECHNOLOGY INSTITUTE  
SWITZERLAND; USA; WESTERN EUROPE

Accession no. 755206

Item 164

**Kunststoffe Plast Europe**

89, No.8, Aug.1999, p.12-4

English; German

**HIGH SPEED EXTRUSION**

Endrass B  
Schwarz Extrusionswerkzeuge GmbH

The market for main window profiles has changed. The trend is now towards ever higher production rates. The demands this is making on the various areas of extrusion,

and the limits of the technology, are described and assessed. (Translated from *Kunststoffe* p.48-50)

EUROPEAN COMMUNITY; EUROPEAN UNION; GERMANY; WESTERN EUROPE

Accession no.753237

Item 165

**Adhesives Age**

42, No.9, Sept.1999, p.78

**WINDOW OF OPPORTUNITY**

Alpha Window Systems is a manufacturer of its own insulated glass used in the production of its custom steel-reinforced vinyl windows and patio doors. The company serves Long Island and the five boroughs of New York, selling direct to consumers, handling all installations and offering a 40-year warranty on its windows. A significant increase in business required Alpha Windows to find a way to simplify the glass sealing process to speed up production and reduce lead times. The company had been using a polyisobutylene (PIB) two-component polysulphide sealant process that required placing the window in a press between the PIB and polysulphide applications for a 24-hour cure cycle. The glass also had to be cleaned after the sealant was applied. The temperature of the insulated glass room had to be maintained at 70 deg.F. Alpha Window Systems has changed to a hot-melt butyl insulated glass sealant, eliminating the glass cleaning step in its glass manufacturing process and speeding up lead time. Details are given.

ALPHA WINDOW SYSTEMS LTD.; GRACO INC.  
USA

Accession no.753210

Item 166

**Polymers for Advanced Technologies**

10, No.9, Sept.1999, p.525-7

**UV CURING POLYMER MATERIALS FOR MAKING LASER GLASS**

Jian-Fang Li; Shou-Zhong An; Du-Xin Li; Yong Jiao Shanxi,University; Taiyuan Century Hologram Co.

Epoxy acrylate was synthesised by reacting epoxy resin with acrylic acid in the presence of quaternary ammonium salt. The effects of photoinitiators, such as benzoin dimethyl ether, benzoin n-butyl ether and benzophenone, on the curing rate were studied. Suitable UV-curing polymer materials for manufacture of laser glass (laser holograms replicated onto a glass plate) for decorative building applications were selected. The laser glass thus manufactured exhibited no visual physical changes and no losses in optical performance after accelerated life tests. 3 refs.

CHINA

Accession no.752038

Item 167

**Plastics News(USA)**

11, No.30, 13th Sept.1999, p.18

**FIRM HOPES TO TURN SCHOOL WASTE INTO WALLS**

Acohido B

Rastra Technologies manufacturers prefabricated wall panels composed of recycled PS and cement. The panels incorporate cement and, in place of gravel, recycled PS chips to create a type of insulated concrete form. The PS filler material is 100% recycled and accounts for about 85% of the final product by volume. The company is investigating sourcing the PS from used lunch trays.

RASTRA TECHNOLOGIES INC.

USA

Accession no.751298

Item 168

**Plastics News(USA)**

11, No.36, 25th Oct.1999, p.8

**CONSTRUCTION SECTOR LOOKS BRIGHT FOR PLASTIC**

Bregar B

Eagle Pacific Industries and CertainTeed, two construction sector leaders, claim plastics growth should hold up, even if a recession slows down the building industry, thanks to new markets such as vinyl decking and fencing and plastic pipe for drinking water. PVC pipe has moved into new recession-proof markets such as conduit to protect fibre-optic cables. The overall decking market has grown about 8%/year in the 1990s.

EAGLE PACIFIC INDUSTRIES INC.;

CERTAINTEED CORP.

USA

Accession no.751206

Item 169

**Elastomers Times**

No.21, 1999, p.2

**PORSCHE GETS A NEW ROOF**

The new roof of Porsche's Boxster plant near Stuttgart, Germany, has been quickly and successfully renovated with Alkorflex sheeting from Alkor Draka Handel. Alkorflex modified PE sheeting inherits much of its exceptional ignition resistance and weatherability from extensions of DuPont Dow's CPE chemistry.

PORSCHE AG; ALKOR DRAKA HANDEL GMBH

EUROPEAN COMMUNITY; EUROPEAN UNION; GERMANY; WESTERN EUROPE

Accession no.751192

Item 170

**Advanced Materials & Composites News**

21, No.20, 18th Oct.1999, p.4

**CFRP COMPOSITE REPAIRS OF DETERIORATED OR UNDERDESIGNED REINFORCED CONCRETE IN THE DESERT**

External Reinforcement applied 4,000 square feet of QuakeWrap carbon fibre and epoxy resins to strengthen



a portion of an underground utility tunnel where the reinforcing steel was damaged by corrosion. In another project, over 15,000 square feet of QuakeWrap was used to strengthen more than 50 columns and beams in a parking garage which had shown signs of distress from corrosion.

EXTERNAL REINFORCEMENT INC.  
USA

Accession no.751173

Item 171

**Plastics in Building Construction**

23, No.10, 1999, p.6-7

**PLASTICS CONTINUE AS FASTEST GROWTH MATERIAL IN CONSTRUCTION OF WINDOWS AND DOORS IN U.S.**

An analysis is presented of trends in window and door materials in the US for residential and non-residential sectors with particular reference to a study by the Freedonia Group. Plastic windows and doors are forecasted to rise 7% per year to 2003, and are the fastest growing material. The development of composite materials using wood fibres and plastic resins will provide competition to PVC in higher-end residential applications, it is stated, while wood will remain predominant in interior residential doors and steel for the majority of exterior entry. Market shares for materials are indicated, and the market as a whole is discussed in terms of demand and growth rates.

FREEDONIA GROUP INC.  
USA

Accession no.750808

Item 172

**Plastics and Rubber Weekly**

No.1807, 8th Oct.1999, p.7

**CHECKING RISING DAMP**

Today, around 40,000 tonnes of PE damp-proof membrane are installed in new-build projects every year. Despite its apparent simplicity, the damp proof membrane is also likely to be the most critical building component installed. Even though the cost of installing "quality assured" DPM is a negligible part of the end-cost of any construction project, some merchants and site contractors are not insisting on material which meets the UK standard, PIFA6/83A:1995, and this could spell disaster if the DPM fails at a later date.

PIFA  
EUROPEAN COMMUNITY; EUROPEAN UNION; UK;  
WESTERN EUROPE

Accession no.749268

Item 173

**European Plastics News**

26, No.9, Oct.1999, p.27

**DUMAPLAST DEVELOPS MICROCELLULAR**

**PROFILES**

MuCell microcellular foam technology from Trexel is now being used commercially for the first time in Europe. Dumaplast, a Belgian company, is using the technology in the full-scale production of PVC extrusion profiles for interior applications, hollow-wall claddings and ceilings. The MuCell technology uses supercritical fluids of atmospheric gases to create evenly distributed and uniformly sized microscopic cells throughout thermoplastic polymers. The process allows Dumaplast to foam thin product cross sections of less than 0.5mm, while maintaining desirable surface qualities and physical properties.

DUMAPLAST

BELGIUM; EUROPEAN COMMUNITY; EUROPEAN UNION;  
WESTERN EUROPE

Accession no.749174

Item 174

PVC '99. Conference proceedings.

Brighton, 20th-22nd April 1999, p.233-8

**TECHNICAL PROGRESS AND STANDARDISATION FOR THE USE OF SPREAD PVC PRODUCTS IN INDOOR APPLICATIONS**

Howick C

European Vinyls Corp.(UK) Ltd.  
(IOM Communications Ltd.; BPF)

New developments have taken place in the use of spread PVC products for indoor environments - principally for flooring and wall covering. These have been both technical developments such as the use of additives of lower inherent volatility, and also through the standardisation process with the appearance of new and amended product standards that list specific requirements for the emission of certain products into the indoor air. This is in addition to safety requirements. European Standard EN233 (domestic wall coverings) contains a clause relating to vinyl chloride monomer and the RAL standard in Germany includes a maximum level for total volatile organic chemicals. These standards and other related pieces of legislation are discussed. The future will see the meeting of the technical progress with the standardisation process in the form of specified test methods for the analysis of spread products. These will include methods such as Headspace gas chromatography, the use of test cells such as the Field Laboratory Emission Cell and other analyses. A comparison of methods, and some results from PVC and competitive materials, are discussed. The impact of the tests on future products for both indoor applications, and the related application of spread automotive leathercloth are assessed. 11 refs.

EUROPE-GENERAL; EUROPEAN COMMUNITY; EUROPEAN UNION; UK; WESTERN EUROPE

Accession no.747895

Item 175

PVC '99. Conference proceedings.

Brighton, 20th-22nd April 1999, p.200-9  
**IMPACT PERFORMANCE OF WOOD-GRAIN  
FOIL COATED PVC-U WINDOW PROFILES,  
AND THE EFFECT OF ARTIFICIAL  
WEATHERING AND ABRASION**

Newman C J; Gardiner D  
UK, Building Research Establishment  
(IOM Communications Ltd.; BPF)

Foil coatings are now widely used on PVC-U windows to give wood-grain finishes. PVC-U is notch-sensitive, and thus scratches or a brittle surface layer can affect its impact resistance. The impact resistance of foil coated profile material is compared with that of uncoated material, including the effect of weathering and scratching. Specimens are taken from a broad range of foil coated window profiles, some of which have matching faces without foil coatings. Impact resistance is evaluated using a multi-axial failing weight test. Some of the specimens are artificially weathered prior to impact testing using a Xenon arc weathering machine. Other specimens are abraded in a controlled manner. The effects of these treatments on impact resistance are then analysed. Specimens with laminated foil coatings show a satisfactory performance when new, but scratching or artificially weathering causes a substantial drop in impact resistance. In these tests, no equivalent reduction in impact resistance is produced in uncoated specimens, or those with transfer foils. This indicates that PVC-U windows with laminated foil coatings may be more susceptible to impact damage in service than uncoated windows. It is concluded that the relevant British Standard, BS 7722, should be enhanced to incorporate a test for impact strength retention for surface coated profiles following weathering. 12 refs.

EUROPEAN COMMUNITY; EUROPEAN UNION; UK;  
WESTERN EUROPE

*Accession no.747892*

*Item 176*  
**Insulation Journal**  
Aug.1999, p.24-6  
**COMBAT COLD**

Lynch G  
Combat Polystyrene Group Ltd.

Whether it is for new built or refurbishment, insulation and energy efficiency are at the top of the agenda when it comes to specification. When designing the external walls of a building, it is generally accepted that insulation positioned to the outer skin, often as part of a composite panel, is beneficial both in terms of preventing heat loss and ensuring the comfort of the living space. PS is a cost-effective, easy-to-use and environmentally friendly insulant which can be used on its own or as one element of a system. Two major types are available; expanded PS and extruded PS. The advantages and disadvantages of each in different situations are described.

EUROPEAN COMMUNITY; EUROPEAN UNION; UK;  
WESTERN EUROPE

*Accession no.747860*

*Item 177*  
**Insulation Journal**  
Aug.1999, p.16/22  
**SEALING WARMTH INSIDE FROM OUT**  
Swan A L  
CCS Scotseal

The Building Regulations 1990 (amended 1994) set out to reduce energy consumption in buildings and consequently the CO<sub>2</sub> emissions which are a principal cause of the 'greenhouse' effect. As a result, one of the most important criteria by which a building is now judged is its walls' ability to retain heat, expressed as its 'U-value'. The statutory U-value required for new buildings, and extensions and refurbishments for which adherence to Building Regulations is required, is 0.45 W/sq.mK. There are three principal places in a building where insulation can be applied but one of the most cost-effective means of achieving efficient insulation is by applying an external insulation system. The advantages of this approach and the benefits that designers, and building owners and operators can derive from it are described.

EUROPEAN COMMUNITY; EUROPEAN UNION; UK;  
WESTERN EUROPE

*Accession no.747859*

*Item 178*  
Shawbury, Rapra Technology Ltd., 1997, pp.189,  
30cm. Rapra Industry Analysis Report Series.  
**POLYMERS IN BUILDING CONSTRUCTION.  
MATERIALS IN USE AND RECENT  
DEVELOPMENTS IN MARKETS**  
Dufton P

This report examines the various segments of the building, construction and wider civil engineering sector in which plastic and rubber components are playing an increasingly important role. It describes the role of these components and gives a review of the widening scope for their use in both structural and cosmetic or protective applications. Details are given of the main materials in use, and key markets are examined and trends in usage and applications noted. In addition, data on supply and demand is provided where possible, and comment is offered about the effect on, and the implications for, both rubber and plastic processors.

WORLD

*Accession no.747807*

*Item 179*  
**Plastics in Building Construction**  
23, No.9, 1999, p.2-3  
**BUILDING MATERIALS INDUSTRY  
ESTIMATED TO REACH 71.5 BILLION US  
DOLLARS IN 2003**

This article supplies details of the expected growth in the US building materials industry which is estimated to reach 71.5 billion US dollars in 2003. The article supplies

separate figures for the projected growth in the markets of different segments of the industry, including roofing, siding, doors, windows, and interior piping. Only the market for residential house sidings is forecast to remain fairly static, with roofing being the largest growth segment.

USA

Accession no.747588

Item 180

**Plastics News International**

Sept.1999, p.44

**MAJOR WALL-CLADDING PROJECT FOR POLYCARBONATE**

The Millennium Dome has a diameter of 320m and a circumference of 1km. The wall cladding consists of two different grades of GE Structured Products' Lexan polycarbonate sheet. The bottom half is constructed from Exell 8mm sheet and the top half features Thermoclear 16mm screen printed sheet. The roof light closure and the roof fabric is glazed with Exell D sheet. The roof consists of woven glassfibre cloth coated with DuPont's Teflon fluoropolymer dispersion.

GE STRUCTURED PRODUCTS; DUPONT CO.

EUROPEAN COMMUNITY; EUROPEAN UNION; UK;  
WESTERN EUROPE

Accession no.747162

Item 181

**Journal of Advanced Materials**

31, No.3, July 1999, p.23-36

**DEVELOPMENT OF THE DARPA/BIR COMPOSITE ARMY BRIDGE: PHASE 1 ACCOMPLISHMENTS**

Kosmatka J B; Policelli F J

California,University at San Diego

An overview is presented of the development program of an all Composite Army Bridge, which is intended for use as a lightweight short-span mobile bridge and should weigh and cost less than existing metal bridges. Aspects covered include performance requirements, design issues, structural analysis, fabrication, developmental experimental studies, including wear surface and roadway deck testing, and full-scale composite treadway testing. 11 refs.

USA

Accession no.745950

Item 182

**Modern Plastics International**

29, No.9, Sept.1999, p.70/79

**PROCESSORS FOCUS ON DIFFERENTIATION IN WINDOW PROFILES**

Defosse M

The need for product differentiation in the window industry is discussed as the market reaches maturity. In

the two largest geographical markets, North America and Germany, penetration is said to be over 40% and 50% respectively. Processors are aware that future sales growth will depend on offering unique products, including the use of composites materials and taking advantage of possible US legislation regarding the energy efficiency of buildings, by offering thermally efficient products. Product developments are reviewed.

EUROPEAN COMMUNITY; EUROPEAN UNION; GERMANY;  
NORTH AMERICA; WESTERN EUROPE

Accession no.745194

Item 183

**Focus on Plastics Additives**

No.14, 1999, p.3-4

**ADDITIVES MARKETS IN EUROPE**

Construction activities take about 20% of all plastics and they account for the major share of PVC. Window frames, doors, cladding, pipes, flooring and cable are just some of the outlets for impact modifiers, mineral fillers and stabilisers. With all the mineral fillers, plasticisers, modifiers and other additives going into vehicles, the prospects for future vehicle sales can be crucial for additives and resin suppliers.

WESTERN EUROPE-GENERAL

Accession no.742820

Item 184

**Plastiques Modernes et Elastomeres**

51, No.3, April 1999, p.10-3

French

**COMPOSITES AND CONSTRUCTION**

Anslijn R

CRIF

Applications of composites in building and civil engineering are examined, and reasons for the limited use of composites in these markets are discussed. The advantages of resin transfer moulding, pultrusion and filament winding in the production of components for these areas of application are reviewed.

BELGIUM; EUROPEAN COMMUNITY; EUROPEAN UNION;  
WESTERN EUROPE; WORLD

Accession no.742552

Item 185

**Materiaux & Techniques**

87, Nos.1/2, Jan./Feb.1999, p.61

French

**PVC WATERPROOFING MEMBRANES**

A brief account is given of a project for the renovation of a sports stadium in Lyon using Sarnafil S 327 PVC waterproofing membranes.

SARNAFIL SRL; SOPREMA SA

EUROPEAN COMMUNITY; EUROPEAN UNION; FRANCE;  
WESTERN EUROPE

Accession no.742547

Item 186

**Injection Molding**

7, No.7, July 1999, p.58

**BUILDING AND CONSTRUCTION**

Freedonia predicts relatively mild 3% annual growth in injection moulding construction demand through 2006. The company says that pipe fittings present the best opportunity for this market, while plumbing fixtures, shower heads, faucet and shower handles, and lighting fixture diffusers are expected to grow at a slower pace. Building and construction markets are typically dominated by extruded products, such as window stripping and vinyl siding. But moulded offerings are making some headway with introductions such as the eco-shake shingle from Re-New Wood, which is moulded from recycled PVC and wood filler. Nailite, International also offers a line of moulded wood-like shake for exteriors, which is finding favour in severe weather locations. Resin usage figures for 1997 from SPI indicate that ABS and SAN are popular in exterior products for weatherability (235 million lb), while PS for indoor moulded products was 499 million lb. Other prominent resins include PVC, chlorinated PVC and ASA.

FREEDONIA GROUP INC.

USA

Accession no.741802

Item 187

**Plastics in Building Construction**

23, No.8, 1999, p.9-12

**METHODS OF INSTALLATION AND THE STRUCTURAL ANALYSIS OF TWO SHORT SPAN COMPOSITE HIGHWAY BRIDGES**Richardson D; Dumlao C; Henderson M; Foster D  
Martin Marietta Materials Inc.; Lockheed Martin  
Missiles & Space; LJB Inc.

Two FRP composite highway bridges are described. The first bridge was installed on the Idaho National Engineering and Environmental Laboratory (INEEL) Transportation Complex outside Idaho Falls, Idaho. INEEL is 9.1 m long, 5.5 m wide, and 914 mm deep. The second bridge is the Butler County Bridge in Ohio. The Butler County Bridge, named TECH 2 1, was installed on a highway off Route 128. TECH 2 1 has a traffic count of 1,000 and is expected to increase to 2,000 with the bridge growing from a one-lane to a two-lane bridge. TECH 2 1 is 10.1 m long, 7.3 m wide and 838 mm deep. Design, manufacturing, installations and testing of both bridges are discussed. 4 refs.

USA

Accession no.741658

Item 188

**Plastics in Building Construction**

23, No.8, 1999, p.4-5

**MEMBRANES TO CONTINUE AS FASTEST****GROWTH SEGMENT IN ROOFING**

US demand for roofing products is forecast to advance 2.1% per annum through 2003, reaching 288 million squares valued at 11.8 billion US dollars. This represents a deceleration from the 1993-1998 period, when brisk construction of new housing bolstered the residential roofing market and office and commercial building aided demand for new non-residential roofing. Through 2003, the replacement segment of demand, which accounts for approximately three quarters of the US roofing market, will provide better opportunities than new roofing. For non-residential roofing markets, most segments will experience slower growth. These and other trends are presented in Roofing, a new study from Freedonia; some statistics are presented.

FREEDONIA GROUP INC.

USA

Accession no.741657

Item 189

**Materie Plastiche ed Elastomeri**

64, No.3, March 1999, p.114-23

Italian

**FOAMS KEEP OUT THE COLD**

Modini G

Applications of PS and PU foams in thermal insulation for buildings are examined. Methods used in the production of PS foams are described, and the thermal conductivity and compression strength of these materials are discussed. PU foams produced by Bayer and PS foams produced by BASF, Dow Chemical and EniChem for thermal insulation applications are reviewed.

BAYER AG; BAUELEMENTE LINZMEIER;  
PUREN-SCHAUMSTOFF GMBH; PAZEN-  
EUROTEC; ENICHEM SPA; BASF AG; DOW  
CHEMICAL CO.EU; EUROPEAN COMMUNITY; EUROPEAN UNION;  
GERMANY; ITALY; USA; WESTERN EUROPE; WESTERN  
EUROPE-GENERAL

Accession no.740594

Item 190

**Plastics in Building Construction**

23, No.7, 1999, p.8

**FRP COMPOSITE USED FOR COVERS IN WASTE TREATMENT PLANTS**

It is reported here that a structural enclosure in a waste treatment plant has been constructed from a chemical-resistant isopolyester composite resin. Fiberglass Structures & Tank Co. of the USA made the enclosure. Full details are given.

FIBERGLASS STRUCTURES & TANK CO.;  
ASHLAND CHEMICAL CO.; INTERPLASTIC  
CORP.;

USA

Accession no.737713

*Item 191*

**Reinforced Plastics**

43, No.7/8, July/Aug.1999, p.34-8

**CANADA'S INFRASTRUCTURE BENEFITS FROM FRP**

Redston J  
ISIS Canada

Despite the lack of codes and standards, FRP has unofficial sanction in Canada where its benefits are being proven in the rehabilitation of existing structures, as well as new projects. Field applications equipped with fibre optic monitoring technology are helping to promote confidence in composites. Applications include the rehabilitation of bridge decks and columns. New structures, such as Joffre Bridge, have been constructed using CFRP reinforcements for concrete instead of steel.

CANADA

*Accession no.737538*

*Item 192*

**Reinforced Plastics**

43, No.7/8, July/Aug.1999, p.4

**EYECATCHER PRESENTS POTENTIAL OF COMPOSITES IN CONSTRUCTION**

A team of architects, pultruders and materials suppliers has developed a transportable residential/office building with GRP profiles forming its structural elements. Facade panels are fitted between the load bearing profiles as opposed to being placed on the outside of the building. The panels, in the shape of FRP channel plates, are filled with Aero-Gel insulation material and are partly transparent.

FIBERLINE AS; JAKEM  
SWITZERLAND; WESTERN EUROPE

*Accession no.737520*

*Item 193*

Antec '99. Volume III. Conference proceedings.  
New York City, 2nd-6th May 1999, p.3750-3. 012

**TESTING OF RECYCLED PETP REBAR CHAIR**

Jenkins T  
Santa Clara,University  
(SPE)

Small chairs for supporting reinforcing steel in concrete slabs are moulded from recycled PETP. The performance of these chairs is tested relative to plastic chairs available on the market. Four tests are used to evaluate the chairs. The tests are designed to evaluate impact, compression and UV degradation strengths of the chairs, as well as the adhesion between the PETP and concrete. The recycled PETP chairs perform better than commercial chairs under compression, but do not allow for flow of the concrete. The impact performance of recycled chairs is very comparable to the commercial chairs. UV results are embedded in the impact and compression tests.

USA

*Accession no.733997*

*Item 194*

Antec '99. Volume III. Conference proceedings.  
New York City, 2nd-6th May 1999, p.3588-91. 012  
**PROPERTY/PROCESSING ENHANCEMENT VIA IMPROVED LOW-TEMPERATURE FUSION FOR RIGID PVC CONSTRUCTION PRODUCTS**

Rapacki S R  
Rohm & Haas Co.  
(SPE)

Impact property development in RPVC construction products is highly dependent on the type of impact modifier used and its contribution to processing. With increasing attention being paid to all aspects of production, particularly machine utilisation and cost effectiveness of raw materials, maintaining performance properties remains critical. It is discussed how impact modifier selection can influence processing and the levels of other ingredients, and through these effects, influence the performance properties of articles like siding and window profile.

USA

*Accession no.733964*

*Item 195*

Antec '99. Volume III. Conference proceedings.  
New York City, 2nd-6th May 1999, p.3236-40. 012  
**MODIFICATION OF CEMENT USING POST INDUSTRIAL RECYCLED ACRYLONITRILE BUTADIENE STYRENE (ABS) LATEX POWDER**

Palos A; D'Souza N A  
North Texas,University  
(SPE)

Polymer latex modification of cement has increased the ductility of the resultant concrete. However, practical application of the concrete is limited since latex is used in a liquid form. In contrast, the use of post-industrial recycled ABS powder (rABS) is examined. Pullout tests indicate an increase in adhesive bond strength between the polymer-modified mortar and steel re-bar. Thermogravimetric analysis is carried out to examine the influence of the latex on the kinetics of degradation. The results indicate a novel approach of using (rABS) in cement modification. 8 refs.

USA

*Accession no.733699*

*Item 196*

**International Polymer Science and Technology**

25, No.10, 1998, p.78-81

**POLYETHYLENE TEREPHTHALATE DOUBLE MODULE FOR THE GLAZING OF INDUSTRIAL BUILDINGS AND GREENHOUSES**

Kokoev M N; Fedorov V G

The development of an airtight, transparent, double-walled module that is suitable for the glazing of industrial plants and buildings and also of greenhouses for the

commercial production of vegetables is described. The polymeric material used is PETP and the module is designed for manufacture by the blow extrusion technique. Advantages and disadvantages of such modules are discussed. 4 refs. (Full translation of *Plast.Massy*, No.4, 1998, p.34)

RUSSIA

*Accession no.733380*

*Item 197*

***Materie Plastiche ed Elastomeri***

63, Nos.11/12, Nov./Dec.1998, p.718/27

Italian

**TRANSPARENT SHEETING FOR BUILDING AND ARCHITECTURE**

Modini G

Applications of transparent PMMA and polycarbonate sheeting in building and related sectors are examined by reference to the range of products manufactured by Elf Atochem, GE Structured Products and Rohm. Data are presented for the properties of PMMA and polycarbonate compared with those of glass.

ALTUMAX; ELF ATOCHEM SA; GE STRUCTURED PRODUCTS; ROHM GMBH; BAYER AG

EUROPEAN COMMUNITY; EUROPEAN UNION; FRANCE; GERMANY; ITALY; USA; WESTERN EUROPE

*Accession no.732500*

*Item 198*

***Macplas***

23, No.202, Oct.1998, p.65-6

Italian

**DISCONTINUOUS PRODUCTION OF CURVED FOAMED PANELS**

Mariani V

Impianti OMS SpA

The structure and properties of curved building panels comprising metal skins and PU foam cores are examined, and foaming and moulding processes used in their manufacture are described.

EUROPEAN COMMUNITY; EUROPEAN UNION; ITALY; WESTERN EUROPE

*Accession no.732477*

*Item 199*

***Materie Plastiche ed Elastomeri***

No.10, Oct.1998, p.678-83

Italian

**PVC IN WATER PIPES**

Hero F

Centro di Informazione sul PVC

The West European market for PVC in water pipes is examined on the basis of studies undertaken by Corporate Development Consultants and Philip Townsend Associates. Statistics are presented for the consumption

of PVC and other plastics in pipes and building applications.

CORPORATE DEVELOPMENT CONSULTANTS;  
TOWNSEND P.,ASSOCIATES

EUROPEAN COMMUNITY; EUROPEAN UNION; ITALY; UK;  
WESTERN EUROPE; WESTERN EUROPE-GENERAL

*Accession no.732467*

*Item 200*

***Urethanes Technology***

16, No.2, April/May 1999, p.16

**PHENOLIC PANEL HOMES?**

Urey C

American Structural Composites has introduced a new modular home system based on glass-reinforced phenolic resin panels. The panels include an internal truss system for added strength and can be filled with polyisocyanurate foam for insulation. The panels are produced on a continuous lamination line and a variety of surface textures can be integrated into the surface of the panels as they are being made.

AMERICAN STRUCTURAL COMPOSITES INC.  
USA

*Accession no.730626*

*Item 201*

***Urethanes Technology***

16, No.2, April/May 1999, p.10

**EAST BLOCK'S FOAMS**

Reed D

A Bulgarian firm, Polynor, has developed a building block with integral rigid PU foam insulation. The company has applied for patent protection for its asymmetric block design which it says eliminates thermal bridging and so gives more energy efficient structures. Both brick and concrete facings can be used as required. Because the foam is primarily closed cell, it does not absorb or transmit water by capillary attraction and water vapour transmission is low. Property data are presented.

POLYNOR LTD.

BULGARIA; EASTERN EUROPE

*Accession no.730623*

*Item 202*

***Composite Structures***

44, Nos. 2-3, Feb-March 1999, p.155-61

**DURABILITY CHARACTERISTICS OF CONCRETE COLUMNS WITH ADVANCED COMPOSITE MATERIALS**

Toutanji H A

Alabama,University

The durability performance of concrete columns confined with fibre-reinforced polymer composite sheets was studied. Columns were wrapped around with four different types of FRP composite wraps, i.e. GRP and CFRP made

with two different epoxy resins. The confined and unconfined specimens were subjected to two environmental conditions, i.e. room temperature, wet and dry cycling. For the wet and dry exposure, the specimens were placed in an environmental chamber in which they were subjected to 300 cycles of wetting and drying. Sea water was used for the wet cycles and hot air at 35°C average for the dry cycles. After every 30 cycles, pulse velocity and weight changes were measured. At the end of 300 cycles the stress-strain behaviour of the samples was obtained in order to evaluate their strength, stiffness, and ductility, which were compared to the performance of the unconditioned samples (room temperature exposure). Results show that both epoxy systems produced similar results in the unconditioned specimens, with respect to strength, ductility, and failure behaviour. However, specimens wrapped with polyoxypropylenediamine/epoxy resin GRP experienced reduction in both strength and ductility on wet/dry exposure. CFRP showed no loss of properties with either epoxy resin. 18 refs.

USA

Accession no.729200

*Item 203*

Utech Asia '99. Conference proceedings. Singapore, 16th-18th March 1999, Building & Construction Paper 4. 43C6

**COMPARISON OF CONTINUOUS VS. DISCONTINUOUS PANEL PRODUCTION**

Chua D

Hennecke Maruka Asia Pte.Ltd.  
(Crain Communications Ltd.)

When investing in sandwich panel plants, all planning is preceded by a decision of general principle: which type of production technique is the most suitable one, either continuous or discontinuous production. This question cannot be easily answered. Many parameters have to be kept in mind. Rigid PU foam is the best insulation material available. No matter whether produced in continuous or discontinuous operation, metal composite elements and insulation sheets with a core made of PU rigid foam are extremely valuable in many respects. The processes are compared.

SINGAPORE

Accession no.729040

*Item 204*

Utech Asia '99. Conference proceedings. Singapore, 16th-18th March 1999, Building & Construction Paper 3. 43C6

**INNOVATIVE SOLUTION FOR MANUFACTURING INSULATED CURVED ROOFS FOR INDUSTRIAL BUILDINGS**

Taverna M; Spanio G  
Cannon Group

(Crain Communications Ltd.)

The replacement of asbestos-based flat and curved roof panels has provided the opportunity to replace poorly-insulated roofs with energy-efficient insulating elements, obtained foam-backing various facings (fibrous-concrete, painted steel etc.) with a low-density PU rigid foam. The innovative equipment supplied recently to manufacture curved insulated roof panels using a very compact, highly automated plant based on rotating mould carrier is described.

EUROPEAN COMMUNITY; EUROPEAN UNION; ITALY; WESTERN EUROPE

Accession no.729039

*Item 205*

Utech Asia '99. Conference proceedings. Singapore, 16th-18th March 1999, Building & Construction Paper 2. 43C6

**BETTER QUALITY AND HIGHER PRODUCTIVITY IN THE PRODUCTION OF SANDWICH PANELS**

Willmeroth G

Hennecke Maruka Asia Pte.Ltd.  
(Crain Communications Ltd.)

From the 1.2 to 1.3 million tons of PU raw materials used in civil engineering in 1998, a high percentage is accounted for by sandwich panels, particularly panels with profiled sheet steel facings generally known as metal composite elements. Compared to the conventional building methods they offer many advantages, which are particularly exploited in industrial construction and cold storage depots. Light, yet solid, they allow rapid, safe and economic construction of buildings with first-class thin-walled thermal insulation. Metal composite elements can be assembled all year round in any type of weather. This method is particularly suitable for improving people's supplies of perishable foodstuffs, especially in the Far East. A gap-free chain of cold-storage facilities from producer to consumer can easily be achieved. The vast majority of sandwich panels is produced on large continuous double conveyor plants featuring a high degree of automation. Patented VarioCast technology, developed by Bayer and Hennecke, constitutes a new plant concept which enables environmentally-friendly manufacture of composite elements with considerably improved quality, while reducing moulding cycle times by up to 30% and optimising density distribution throughout the whole element.

SINGAPORE

Accession no.729038

*Item 206*

Utech Asia '99. Conference proceedings. Singapore, 16th-18th March 1999, Building & Construction Paper 1. 43C6

**MAXIMISING THE VERSATILITY OF**

**POLYURETHANE AT KUALA LUMPUR  
INTERNATIONAL AIRPORT**

Evans D A C

ICI Polyurethanes (Asia-Pacific) Pte.Ltd.  
(Crain Communications Ltd.)

PU is rapidly becoming the material of choice for specifiers in the construction industry. Its outstanding versatility and insulation properties, combined with integral strength, low maintenance and aesthetic qualities, enable it to meet and exceed the criteria set for projects of international standing. The new world class airport in Kuala Lumpur, Malaysia, is one such project where the specifications for technical and aesthetic elements were extremely demanding. The vast size and scope of the project with all its facilities to be built from zero, together with the fast-track construction schedule, required first rate materials. It is shown how PU was able to meet the specifications for several different applications within the In-Flight Catering Facility, where insulation, hygiene and durability are all critical factors in maintaining a smooth operation.

BELGIUM; EUROPEAN COMMUNITY; EUROPEAN UNION;  
WESTERN EUROPE

*Accession no.729037*

*Item 207*

**International Polymer Processing**

14, No.1, March 1999, p.10-20

**UTILISATION OF RHEOLOGY CONTROL TO  
DEVELOP WOOD-GRAIN PATTERNED PVC/  
WOOD FLOUR COMPOSITES**

Yong Lak Joo; Myung Ho Cho

Hanwha Group

The effects of wood flour and plasticiser on the rheology and extrusion of PVC-based wood-plastic composites were investigated. The intention was to determine an optimal pair of PVC-based wood-plastic composites that would exhibit substantially different rheological behaviours so that patterns similar to wood grain can be developed inside and on the surface of the product when the two compounds are extruded together. Experiments were performed on a single screw extruder, an intermeshing, co-rotating twin screw extruder and an intermeshing, counter-rotating twin screw extruder. Only the counter-rotating, twin screw extruder gave wood pattern both inside and on the surface as well as complete plasticisation. Considerable rheological, compounding (DOP content, wood flour content and optional acrylic impact modifier content), Tg, and processing data are given. Mechanical properties need to be improved before the composites can be used for door frames and windows. 22 refs.

KOREA

*Accession no.728752*

*Item 208*

**Modern Plastics Encyclopedia**

75, No.12, 1998, p.A25-7

**PVC AND PHENOLICS LEAD THE GROWTH  
OF RESINS IN A VERY DYNAMIC MARKET**

Porwal S K

Technology Solutions International

In 1997, the building and construction industry consumed 21% of all plastic resin sales in North America. Sales of plastics to the sector have risen from 11.88 billion lb in 1992 to 17.12 billion lb in 1997. PVC accounts for more than half of all plastics consumed, with major growth coming from piping, siding, windows and doors. Among thermosets, phenolics represent over 54% of all consumption. New developments and growth opportunities are discussed.

USA

*Accession no.728630*

*Item 209*

**Kunststoffe Plast Europe**

89, No.2, Feb. 1999, p.36-7. (Translated from Kunststoffe 89 (1999), 2, pp.104-5).

**IMPROVED INSULATING PANELS IN  
PENTANE-BLOWN RIGID PIR FOAMS**

Schmidt H; Calgua E

Elastogran GmbH

Elastogran is reported to have developed pentane-blown polyisocyanurate formulations with considerably reduced levels of halogen-free flame retardants, but which still pass the specified fire tests for use in thermal insulation panels in building applications. New polyester polyols (Lupraphen) have been developed especially for these pentane-blown formulations which contain isocyanurate. Details are given of PIR rigid foam insulating panels with flexible outer layers, their flame retardant properties and dimensional stability.

EUROPEAN COMMUNITY; EUROPEAN UNION; GERMANY;  
WESTERN EUROPE

*Accession no.726071*

*Item 210*

**Kunststoffe Plast Europe**

89, No.2, Feb. 1999, p.34-6. (Translated from Kunststoffe 89 (1999), 2, pp.100-3)

**PLASTICS IN BUILDING CONSTRUCTION**

Hasemann W; Weltring R

Institut fuer das Bauen mit Kunststoffen

A review is presented of the use of plastics in the German building industry, together with some statistics of the industry in general. The German building industry is said to have been in decline since the mid-1990s following the boom caused by the reunification of the country. Examples of plastic construction materials in competition with traditional materials are given, and recent developments in plastics construction products are described. Factors such as their economic and ecological



advantages will increase market share at the expense of traditional materials, it is stated. 12 refs.

EUROPEAN COMMUNITY; EUROPEAN UNION; GERMANY; WESTERN EUROPE

Accession no.726070

*Item 211*

**Insulation Journal**

March/April 1999, p.11-5

**TO PROTECT & SAVE**

Weigand E

Bayer AG

This article discusses the contribution of PU rigid foam thermal insulation in environmental protection and the saving of the world's resources. The insulation of a pitched roof and the insulation of a floor are described to demonstrate the primary energy consumption as well as certain possible effects on the environment, such as greenhouse warming, acidification and nutrification potential.

EUROPEAN COMMUNITY; EUROPEAN UNION; GERMANY; WESTERN EUROPE

Accession no.724489

*Item 212*

**Adhesives & Sealants Industry**

6, No.1, Feb. 1999, p.32-3

**SO THE SWALLOWS CAN RETURN NEXT YEAR...EPOXY INJECTION SYSTEM STABILISES FAMOUS MISSION**

The choice of Power-Fast amine-based epoxy resin adhesives for the restoration of a stone church San Juan Capistrano founded in 1776. The mission is constructed from sandstone and volcanic tuff, and was destroyed in 1812 by an earthquake. The Power-Fast epoxy injection gel system was chosen for its fastening strength and odour-free benefits. It is used to install stainless steel pins in the walls to stabilise them.

POWERS FASTENERS INC.

USA

Accession no.723048

*Item 213*

**Revue Generale des Caoutchoucs et Plastiques**

No.768, May 1998, p.30-3

French

**STADE DE FRANCE: PLASTICS IN THE FINAL**

Delannoy G

An examination is made of applications of plastics in the Stade de France, a football stadium constructed for the 1998 World Cup in France. An underground PVC geomembrane produced by Alkor Draka was installed as a barrier to gases permeating from the site, which was previously occupied by a factory operated by Gaz de France. PVC sheeting produced by Braas was used in

construction of the roofing, and the stadium seating was injection moulded by Grosfillex in a UV stabilised propylene copolymer.

ALKOR DRAKA; FILLON; SMAC ACIEROID SA; GROSFILLEX; BRAAS GMBH

EUROPEAN COMMUNITY; EUROPEAN UNION; FRANCE; GERMANY; WESTERN EUROPE

Accession no.721774

*Item 214*

**Chimica e l'industria**

80, No.4, May 1998, p.507-8

Italian

**CHEMISTRY AGAINST THE EARTHQUAKE**

Portesani M

Details are given of a programme undertaken by Sacen of Italy to restore the basilica of St. Francis at Assisi following earthquake damage in September 1997. The materials used included composites and mortars and epoxy resin structural adhesives produced by Mapei.

MAPEI SPA; SACEN

EUROPEAN COMMUNITY; EUROPEAN UNION; ITALY; WESTERN EUROPE

Accession no.721773

*Item 215*

**Kunststoffe Synthetics**

No.7, 1994, p.20-1

German

**PLASTICS IN THE CONSTRUCTION INDUSTRY**

Verding K J

General Electric Plastics has constructed a show building at its European headquarters in Bergen op Zoom to demonstrate the use of a wide variety of plastics in construction. This follows a similar project in the USA in 1989.

GENERAL ELECTRIC PLASTICS; ROYAL PLASTICS GROUP OF TORONTO

EUROPEAN COMMUNITY; EUROPEAN UNION; NETHERLANDS; USA; WESTERN EUROPE

Accession no.721553

*Item 216*

**Macplas International**

Nov. 1998, p.52-3

**DISCONTINUOUS PRODUCTION OF CURVED PANELS**

Mariani V

Impianti OMS

The discontinuous production of curved panels is described with reference to polyurethane foam-core modular elements used to cover insulation in building applications. Advantages of the use of this product are outlined, and details of the foaming plant are given.

EUROPEAN COMMUNITY; EUROPEAN UNION; ITALY; WESTERN EUROPE

Accession no.720548

Item 217

**Macplas International**

Nov. 1998, p.40-1

**BUILDING FOR ENVIRONMENT**

The environmental impacts of some plastic based building components are examined, and recycling schemes, life cycle analyses and energy conservation projects are described. Details are given of PVC window frame recycling projects and studies to determine their environmental impacts, life cycle analyses of floor coverings, and the development of energy efficient heating systems.

WESTERN EUROPE

Accession no.720545

Item 218

**Surface Coatings International**

82, No.2, Feb. 1999, p.77-83

**CHEMISTRY AND PROPERTIES OF SILICONE RESINS**

Mayer H

Wacker-Chemie GmbH

Details are given of the use of water repellent silicone resin coating systems for exterior masonry in the construction industry. The chemistry of silicones is discussed.

EUROPEAN COMMUNITY; EUROPEAN UNION; GERMANY; WESTERN EUROPE

Accession no.720397

Item 219

Handbook of Polymer Composites for Engineers.  
Cambridge, Woodhead Publishing Ltd., 1994, p.262-80. 627

**WALKWAYS AT TERMINAL 2, HEATHROW AIRPORT: DESIGNING FOR FIRE PERFORMANCE**

Berry D

Edited by: Hollaway L  
(BPF)

In the mid-1970s, Terminal 2 at Heathrow was being extensively redeveloped. One of the objectives was to give passenger arrivals on the first floor access to ground level without mingling with passengers checking in on the ground floor, which was becoming increasingly crowded. For this reason, two external walkways were planned leading from first to ground level. Terminal 2 was a prize-winning design and had a brick facade, and it was proving difficult to come up with a design of walkway which blended in with the original design. It was therefore decided to come up with a contrasting design which was obviously a subsequent addition to the original building. At that time GRP was making great advances and some new buildings were being distinctively clad with GRP panels. It was therefore decided to try to design the walkways in GRP. Aspects of the design described include

fire performance, theory of fire performance, fire tests, the future, the European market, the cone calorimeter, design of the walkway panels to Class 0 and their fire resistance. 21 refs.

EUROPEAN COMMUNITY; EUROPEAN UNION; UK; WESTERN EUROPE

Accession no.718989

Item 220

**Plastics News(USA)**

10, No.51, 1st Feb.1999, p.9

**UREY C**

Owens-Corning has introduced a new structural insulation panel using its brand of expanded polystyrene foam. The article supplies details of the advantages and construction of the panels. The foam portions of the panels are manufactured by Owens Corning, and the finished product is produced by Insulspan Inc., of Pittsfield, Michigan, through a licensing agreement. The panels have recently gained momentum in the home-building business.

OWENS-CORNING; INSULSPAN INC.

USA

Accession no.718300

Item 221

**Plastics News(USA)**

10, No.51, 1st Feb.1999, p.8

**ASC UNVEILS PHENOLIC MODULAR HOME SYSTEM**

Urey C

American Structural Composites Inc. of Reno, Nevada has introduced a new modular home system based on glass-reinforced phenolic panels. The article supplies details of the construction and advantages of the panels which include an internal truss system for added strength and can be filled with foam for insulation. A variety of surface textures can be integrated into the surface of the panels as they are being made. The panels are extremely strong, lightweight, and cost about 20% less than a traditional stick-built structure. The company plans commercial production of the panels by March of this year.

AMERICAN STRUCTURAL COMPOSITES INC.

USA

Accession no.718299

Item 222

**Plastics News(USA)**

10, No.51, 1st.Feb.1999, p.1/9

**ALCOA'S NEW SLANT ON SIDING: INJECTION MOULDED PP PANELS**

Urey C

This article supplies details of a new product, 'Cedar Heights' siding panels from Alcoa Building Products of Sidney, Ohio. The company used a block of machine cut cedar to build the

original mould. The panels, which are three-quarters of an inch thick, are made of injection moulded polypropylene, and boast three-dimensional features which are difficult to produce in an extruded product. Cedar Heights is the first such product intended for the whole home.

ALCOA BUILDING PRODUCTS  
USA

Accession no.718291

Item 223

**Modern Plastics International**

29, No.2, Feb.1999, p.34/6

**PVC SHELTERS HOLD PROMISE FOR DEVELOPING COUNTRIES**

Snyder M R

Western Profiles of Winnipeg has produced a DIY kit to build a 16x20ft housing-worthy shelter made entirely of recycled PVC at a base price of about 3500 US dollars. The houses are made by assembling hollow tongue-and-groove PVC planks fastened with screws into a framework of structural members. The concept could help meet a serious housing shortage in developing countries.

WESTERN PROFILES  
CANADA

Accession no.714488

Item 224

**Plastics Technology**

44, No.13, Dec.1998, p.46-8

**PVC WINDOW PROFILES: HOW HIGH CAN OUTPUT GO?**

Schut J H

In the past two years, many PVC window profile producers have doubled output rates, first by increasing line speeds, then by extruding two strands instead of one. It is possible that an output of 2,000 lb/hr may be soon be achieved - double what is considered 'high output' today. As more processors increase output, the more the competition grows. Big European processors are looking to the USA for growth. Plunging resin prices also squeeze domestic processors' margins. This has resulted in intense pressure to boost extruder power, streamline dies, multiply strands, add extra calibrators and water tanks, lengthen cooling sleeves, automate takeoff and handling, and speed tool changes on shorter production runs. A review of developments in the area of window profile extruders is presented.

ACTUAL OF AMERICA INC.; AMERICAN MAPLAN CORP.; DAVIS-STANDARD CORP.; KRAUSS-MAFFEI CORP.; MILACRON PLASTICS TECHNOLOGIES GROUP; TECHNOPLAST INTERNATIONAL INC.; UNIPLAST INTERNATIONAL INC.; VOBAU GMBH  
EUROPEAN COMMUNITY; EUROPEAN UNION; GERMANY; USA; WESTERN EUROPE

Accession no.714080

Item 225

**Advanced Composite Materials**

7, No.4, 1998, p.395-401

**PULTRUDED CFRP RODS FOR GROUND ANCHOR APPLICATIONS**

Sumitani A; Kikuchi M; Sotooka M; Akimoto H; Ozawa N

Komatsu Ltd.; Komatsu Plastics Industry Co.Ltd.

CFRP rods with spiral surface indentations were developed as tension elements in prestressed concrete and as anchor tendons in place of conventional prestressing steels. The indented-type CFRP rods had sufficient bonding strength to concrete without sacrificing the high TS. As a low cost manufacturing process for the advanced composite, the pultrusion processing method was used to make CFRP rods continuously. Ground anchors using the pultruded CFRP rods were installed for slope stabilisation at Fukuchiyama, Kyoto, in March 1998. 9 refs.

JAPAN

Accession no.713761

Item 226

**Plastics News International**

Jan./Feb.1999, p.24/6

**VALVE GATING TECHNIQUE FOR LARGE MOULDINGS**

The floor of the new Telekom telephone booth in Germany is injection moulded in foamed polycarbonate using a hot-runner system with a special gating technique. The 60 kg body is injection moulded in one piece from foamed polycarbonate in a mould weighing 185 tonnes. The other injection moulded parts required to complete the booth are made of foamed PC and weigh between 2.9 and 15.6 kg. The moulds ranged from 6.9 to 20 tonnes in weight. Due to the foaming polycarbonate with its expanding agent, high injection moulding speeds are required. The injection moulding points have to be closed immediately following the injection process so that the pressurised molten mass does not escape from the cavity. The hot runner system from Incoe is described.

INCOE INC.

EUROPEAN COMMUNITY; EUROPEAN UNION; GERMANY; WESTERN EUROPE

Accession no.713560

Item 227

Vinyltec '98. Retec proceedings.

East Brunswick, N.J., 13th-14th Oct.1998, p.96-100. 42C382

**ACHIEVING LOW GLOSS IN VINYL SIDING WITH ACRYLIC IMPACT MODIFICATION**

Szamborski G

Rohm & Haas Co.

(SPE, Vinyl Div.)

PVC siding has grown rapidly during the last decade to reach a prominent position in the North American housing market both in remodeling and in new construction. PVC

has captured the majority share of the cladding market and has virtually eliminated aluminum siding and is significantly challenging other construction materials used for house siding, including wood, composites, etc. Features such as low maintenance, weatherability, relative ease of installation, and impact resistance, have elevated PVC siding to an annual volume of nearly 1.7 billion lb. An additional feature for siding is to have house siding appear 'natural' and not 'plastic'. The homeowner desires the look of wood in a PVC siding. Such a feature is not given for PVC because it typically tends to be glossy as a result of the relatively high melt temperatures developed during extrusion. The surface gloss of the extrusion can be reduced in several ways, including mechanical means and by the formulation additive approach. Mechanically, embossing is commonly used for obtaining a wide variety of wood grain textures designed to disrupt the panel surface to effect light scattering. Among additives used in the formulation, mineral fillers, immiscible polymeric additives, certain types of lubricants, and even high molecular grades of PVC resin have been used to attain some level of gloss reduction. These approaches generally show a downside in cost and/or performance, as in reduced impact strength, tooling wear and plateout. However, there is one type of additive that can impart gloss reduction without the acrylic impact modifier specifically designed to produce a low gloss extruded surface finish. 5 refs.

USA

Accession no.713518

Item 228

**Materials World**

7, No.2, Feb.1999, p.78-9

**BUILDING ON THE SUCCESS OF COMPOSITES**

Brookes A; Potts A; Wilson M

Advanced Composites Group; Taylor Woodrow Construction

The practicalities of using advanced composite materials to construct large and long span structures are being explored in a two-year research project being funded through the DETR's Partners in Technology programme. Low temperature moulding technology from Advanced Composites Group allows designers and manufacturers to use LTM composite materials on the construction site, away from autoclaves and composites manufacturing shops.

EUROPEAN COMMUNITY; EUROPEAN UNION; UK; WESTERN EUROPE

Accession no.713139

Item 229

**Plastics in Building Construction**

23, No.2, 1998, p.4-6

**ASA POLYMER BLENDS FOR CONSTRUCTION MARKETS**

Excerpts are published from a talk given by Terry Carothers of GE Plastics on the use of acrylonitrile-

styrene-acrylate terpolymers (ASA) for construction and building applications. Modifications to improve weathering resistance are discussed, and include blending and coextrusion.

GE PLASTICS

USA

Accession no.711727

Item 230

**Adhesives Age**

41, No.12, Dec.1998, p.20

**EPOXY INJECTION GEL SYSTEM SECURES BRICK FACADE**

It was found that a building in New York City had been built without any wall ties to fasten the facade to the building core and sections were pulling away. To correct the problem, engineers recommended pinning the brick facade to the concrete block wall and specified the Power-Fast epoxy injection gel system developed by Powers Fasteners. Epoxy is injected into a stainless steel mesh screen tube, which is then inserted into a drilled hole. When a threaded rod is pushed into the screen to spread the epoxy, Power-Fast bonds to the base material and expands into hollow areas to form a solid key lock.

POWERS FASTENERS INC.

USA

Accession no.711273

Item 231

**Advanced Materials & Composites News**

21, No.1, 4th Jan.1999, p.1-3

**CARBON FIBRE TECHNOLOGY USED TO REPAIR THE PARKING STRUCTURE AT PITTSBURGH INTERNATIONAL AIRPORT**

Carl Walker Construction Group has recently completed what is believed to be the world's largest installation of carbon fibre reinforcement for strengthening structural concrete at the 2,000-car parking garage for Pittsburgh International Airport. Carbon fibres are laminated with an epoxy resin matrix and externally bonded to steel rebar reinforced concrete structural members to increase their strength and load carrying capacity.

WALKER C.,CONSTRUCTION GROUP INC.

USA

Accession no.709424

Item 232

**Insulation Journal**

Nov./Dec.1998, p.18

**INSULATE, STRENGTHEN & REFURBISH**

Problems of structurally defective housing stock due to cavity wall tie failure and poor building standards, coupled with the need to insulate old properties to the new Building Regulations, can be tackled using a PU structural foam which can insulate, strengthen and refurbish, all in one

step. The two-part system is mixed at the point of injection and reaches correct formulation inside the wall cavity. The PU structural foam bonds to the entire wall area, is eight times stronger than wall ties, has a 25 year minimum lifetime and insulates the property to Building Regulations.

ISOTHANE LTD.

EUROPEAN COMMUNITY; EUROPEAN UNION; UK;  
WESTERN EUROPE

Accession no.709406

Item 233

**Insulation Journal**

Nov./Dec.1998, p.14-5

**PUMP IT IN PUMP IT UP**

Trafford L

Owens Corning

This article discusses cavity wall insulation and how it can help increase energy efficiency and reduce harmful gas emissions. For partial fill applications, Owens Corning recommends Polyfoam Plus Cavityboard as the ideal solution for the partial fill of new masonry cavity walls, as an external wall insulation and for thermal insulation of masonry walls by dry lining. The product is a CFC-free, closed cell, rigid extruded PS board with rebated edges.

EUROPEAN COMMUNITY; EUROPEAN UNION; UK;  
WESTERN EUROPE

Accession no.709405

Item 234

Designed for Life: Composites '94. Publication  
No.293/8. Conference proceedings.

Birmingham, 22nd-23rd Nov.1994, p.59-73. 627

**COST-EFFECTIVE ADVANCED COMPOSITE  
STRUCTURES DESIGNED FOR LIFE IN THE  
INFRASTRUCTURE**

Head P R

Maunsell Structural Plastics Ltd.

(BPF)

The third of a trilogy of papers presented at BPF Composites Congresses over a period of 12 years reporting the developments in the design and application of advanced composite materials in the construction industry. In this period interest in the construction market has grown enormously, fuelled by the need to improve durability, reduce site labour costs and construction time and improve safety. In the USA, Europe and Japan many demonstration structures have been built using carbon, aramid and glass fibres to reinforce and prestress concrete in place of steel. Emphasis is placed on developments in Britain which have led to the construction of a number of landmark advanced composite structures over the last four years. Many material suppliers, manufacturers, machinery suppliers and those in advanced composites research are not familiar with the construction industry

and an analysis of how the industry is changing is presented, covering how this will lead to increasing interest in these materials from clients, designers and contractors and how opportunities can then be taken by those in the composites industry. Detailed examples are included of how substantial advances have been made in providing confidence that high quality advanced composite materials are suitable for life in the infrastructure. 15 refs.

EUROPEAN COMMUNITY; EUROPEAN UNION; UK;  
WESTERN EUROPE

Accession no.709067

Item 235

Vinyl Retec '97: Plastic Systems for the Building  
Industry. Retec proceedings.

Atlanta, Ga., 14th-15th Oct.1997, p.251-7. 42C382

**USE OF ACRYLIC FILM LAMINATES IN  
INTERNATIONAL CONSTRUCTION  
PRODUCTS**

Kozak S L

Polymer Extruded Products Inc.

(SPE, Vinyl Div.)

This paper fully discusses the use of acrylic film laminates on PVC building products to protect them from UV radiation which damages their appearance and physical characteristics. It highlights "Korad" acrylic film laminate from Polymer Extruded Products Inc. of the USA. Section headings include: an introduction, Korad acrylic films, mechanisms of protection, PVC formulations with Korad laminates, design concepts with Korad laminates, existing applications in the European market, and potential US applications.

EUROPE-GENERAL; USA

Accession no.706771

Item 236

Vinyl Retec '97: Plastic Systems for the Building  
Industry. Retec proceedings.

Atlanta, Ga., 14th-15th Oct.1997, p.63-72. 42C382

**ASA BASED POLYMER BLENDS FOR  
BUILDING AND CONSTRUCTION MARKETS**

Carothers T W

GE Plastics

(SPE, Vinyl Div.)

It is explained that weatherability of ABS can be improved by removing the source of instability - the polybutadiene rubber - with a more saturated rubber that lacks the reactive site susceptible to oxidative attack. Rubbers commonly used for this purpose are EPDM and polybutyl acrylate. These materials are referred to as AES and ASA respectively. This paper discusses the following aspects of ASA resin: commercial uses, weathering, physical property retention, erosion resistance, and colourability. 12 refs.

USA

Accession no.706758

*Item 237*

Profiles '98. Conference proceedings.  
Neuss, Germany, 24th-26th Feb.1998, paper 17.  
42C382

**STRUCTURE OF THE PLASTIC BUILDING  
PROFILE INDUSTRY**

Jones T  
Applied Market Information Ltd.  
(Applied Market Information Ltd.; European Plastics  
News)

This is made up of a series of copies of overhead  
projections providing information on the structure of the  
plastic building profile industry in Western Europe. It  
covers: plastics processing, number of processors, average  
throughput of processors, profile extrusion manufacture,  
building profile extrusion operations by country, polymer  
demand for building profiles, the emergence of leading  
groups, and key supply characteristics of individual  
country markets.

SOLVAY; ELF ATOCHEM; VEKAPLAST; REHAU;  
ALPHACAN; KOEMMERLING; PLASTIVAL;  
PROFEX; LVM

BENELUX; CHINA; EUROPEAN COMMUNITY; EUROPEAN  
UNION; FRANCE; GERMANY; ITALY; NORTH AMERICA;  
SPAIN; UK; WESTERN EUROPE

*Accession no.706753*

*Item 238*

Profiles '98. Conference proceedings.  
Neuss, Germany, 24th-26th Feb.1998, paper 8. 42C382

**THERMOPLASTIC ELASTOMERS FOR  
GLAZING SEALS - AN OPPORTUNITY FOR  
THE PVC PROFILES EXTRUSION INDUSTRY**

van der Loo L L H  
DSM Thermoplastic Elastomers  
(Applied Market Information Ltd.; European Plastics  
News)

Thermoplastic elastomers (TPE's) have made  
considerable progress this decade as seals in the rigid PVC  
profiles industry, and their influence is still growing. This  
paper takes a detailed look at the present status of TPE  
profiles in the window gasket industry.

EUROPEAN COMMUNITY; EUROPEAN UNION;  
NETHERLANDS; WESTERN EUROPE

*Accession no.706744*

*Item 239*

**Plastics News(USA)**

10, No.41, 23rd Nov.1998, p.9/41

**FIRM'S TECHNOLOGY COULD MOVE  
METALLOCENES INTO CONSTRUCTION**

Esposito F

A new plastics technology firm claims its patented liquid  
monomer materials can push metallocene-based plastics  
into the construction market, taking 10% of PVC's overall  
business by 2010. Chemecol's technology creates a liquid

monomer that functions as a plasticiser for metallocene-  
based PE and PP. The plasticising effect allows  
metallocene PE and PP to be processed on the same  
equipment that processes PVC. The resulting  
metallocenes can be used in wall covering, roofing, siding,  
ceiling tiles and geomembranes. The products are said to  
differ from PVC in that they have less toxicity when  
destroyed, have increased flexibility and prevent  
migration of chemicals because of superior bonding.  
Details are given.

CHEMECOL  
USA

*Accession no.705952*

*Item 240*

**Pigment & Resin Technology**

27, No.6, 1998, p.382-3

**WATER-BASED PAINT SYSTEMS AID MARKET  
RECOVERY**

Difficult market conditions in the building paints industry  
have forced manufacturers to take decisive action,  
according to Frost & Sullivan's latest study of this sector.  
Changes which initially threatened the industry have  
become the key driving force behind the latest technical  
developments, which now contribute to recovering overall  
revenue growth rates of 2.6%. The emergence and growth  
of new paint systems, such as waterborne paints, high  
solids, radiation cured and powder coatings, mean that  
manufacturers can offer the stability, application and  
performance end-users demand while lowering solvent  
content. In the decorative paints industry, water-based  
paints have been very successful as a cleaner alternative  
to solvent-based paints. Powder coatings have also  
enjoyed rising popularity, particularly as facade coverings.  
Waterborne paints are particularly popular in the DIY  
market, largely because consumers tend to like to be seen  
using 'green' products while industries are far more  
concerned about performance and price. Alternative  
technologies have had considerably less success in making  
inroads in the market for industrial paints, primarily  
because there remains scepticism over the performance  
they can deliver. Details are given.

FROST & SULLIVAN LTD.  
EUROPE-GENERAL; EUROPEAN COMMUNITY; EUROPEAN  
UNION; UK; WESTERN EUROPE

*Accession no.705735*

*Item 241*

**Plastics and Rubber Asia**

13, No.82, Oct.1998, PU Asia, p.20-1, contained within  
13, No. 82, Oct. 1998

**MANIK FLIES INTO KLIA**

Sulaiman W

The use of PU cored sandwich panels at the new Kuala  
Lumpur International Airport (KLIA) is the first time such  
a Malaysian-made product has been used on the walls of

buildings. Involvement in this prestigious project puts Manik Prestasi on the world map of international airport designers, suppliers and installers of the external building envelope. Manik was chosen to make the composite insulated panels for buildings that would house the activities of national flag carrier Malaysia Airlines (MAS). The award of the contract in 1996, with no previous experience at all in PU processing, was a big step for Manik. Details are given.

MALAYSIA

Accession no.704728

Item 242

**Kunststoffe Plast Europe**

85, No.1, Jan.1995, p.27-8

**BUILDING WITH PLASTIC MATERIALS**

Hasemann W; Weltring R

Plastics have a very wide range of application in the building industry. Except in very exceptional cases, for many years virtually nothing has been built without plastics. The diversity of their properties and the possibility of adapting these properties to the job at hand have enabled plastics to gain a real advantage over other building materials. Whilst as early as 1959 the value of plastics materials was a considerable 5% of all materials, by 1971 it had surpassed 12% and is now over 20%. After the packaging industry, the building industry is the second largest consumer of plastics in Germany - even bigger than the automotive industry. Aspects examined include thermal insulation saving fuel, plastics pipes, the use of fibre composite materials to support bridges, renovation and waterproofing and the development of innovative building products using recycled plastics. Illustrations may be found in Kunststoffe, 85, No.1, 1995, p.93/6.

EUROPEAN COMMUNITY; EUROPEAN UNION; GERMANY; WESTERN EUROPE

Accession no.704440

Item 243

Journal of the Adhesive and Sealant Council. Spring 1997. Conference proceedings.

Pittsburgh, Pa., 23rd-26th March 1997, p.77-87. 6A1

**SILYL TERMINATED POLYETHERS FOR CONSTRUCTION SEALANTS**

Hashimoto K

Kaneka America Corp.

(ADHESIVE & SEALANT COUNCIL)

This paper discusses the use of silyl terminated polyethers as a raw material in construction sealants. Section headings include: introduction, polymer design, basic properties of silyl terminated polyethers, properties of construction sealants, the condition of the Japanese construction sealant market, and a summary. 9 refs.

JAPAN; USA

Accession no.703518

Item 244

**Rubber and Plastics News 2**

20, No.2, 26th Oct.1998, p.4

**ARIZ. DEVELOPER AIMS TO BUILD LOW-COST HOMES USING SCRAP TYRES**

Moore M

An Arizona developer, Richards Development, is seeking partners for a project to build low-income housing using scrap tyres as the main structural material. The houses are based on the "Earthship" design, a self-sufficient, environmentally friendly entity. In the Earthship design, load-bearing walls are made of steel-belted radial tyres packed with up to 300 pounds of rammed earth apiece.

RICHARDS DEVELOPMENT INC.

USA

Accession no.702634

Item 245

**Plastiques Modernes et Elastomeres**

49, No.8, Nov.1997, p.77-9

French

**PLASTICS IN THE SUNSHINE OF BANDOL**

Gailliez E

A review is made of topics discussed at a conference on the ageing of polymers held in September 1997 by Station d'Essais de Vieillessement Naturel de Bandol, the natural ageing testing station at Bandol in the South of France. Results were presented of studies of the photoxidative degradation of PVC window frame profiles, polyolefins stabilised with hindered amine systems, EPDM and impact modified PP for use in automotive applications, and PVC/nitrile rubber blends.

BANDOL, STATION D'ESSAIS DE VIEILLESSEMENT NATUREL; 3V SIGMA SPA; GREAT LAKES CHEMICAL CORP.

EUROPEAN COMMUNITY; EUROPEAN UNION; FRANCE; ITALY; USA; WESTERN EUROPE

Accession no.702514

Item 246

**Revue Generale des Caoutchoucs et Plastiques**

No.762, Oct.1997, p.45-9

French

**BUILDING: PS FOAM FIGHTS IN THE INSULATION MARKET**

Lavabre S

Developments in the use of PS foams and other plastics materials in acoustic and thermal insulation in the building industry are examined. Trends in the French building sector and their influence on the consumption of insulation materials are discussed, and statistics are presented for the West European market for insulation materials in the building industry.

TUBULAM; BASF AG; DOW CHEMICAL CO.; PROMO PSE; PLATRES LAFARGE

EUROPEAN COMMUNITY; EUROPEAN UNION; FRANCE;  
GERMANY; USA; WESTERN EUROPE; WESTERN EUROPE-  
GENERAL

Accession no.702494

*Item 247*

International Composites Expo '98. Conference  
proceedings.  
Nashville,Tn., 19th-21st Jan.1998, Session 7-B. 627  
**DESIGN OF A FOUR POSTER HOUSE: AN  
INNOVATIVE FRP STRUCTURAL SYSTEM**  
Hogansen G E; Tyng A G; Wilson R J; Lavine C;  
Keener C C

E.T.Techtonics Inc.  
(SPI,Composites Institute)

The proposed design and analysis of an FRP structural system for use in a state-of-the-art house designed by internationally acclaimed architect, Anne Griswold Tyng, is investigated. The proposed structural system is constructed of carbon and glass fibre tubular shapes. A case study provides an overview of the potential use of FRP components in challenging residential projects of this type. Design criteria and site issues concerning the house are addressed. A three-dimensional computer analysis has been developed to demonstrate the feasibility of the proposed design. Advantages derived from using FRP in comparison to traditional materials such as wood, concrete and steel are evaluated.

USA

Accession no.702116

*Item 248*

International Composites Expo '98. Conference  
proceedings.  
Nashville,Tn., 19th-21st Jan.1998, Session 6-C. 627  
**ONE PIECE CONSTRUCTION FLOWGRIP FRP  
PLANK FLOORING IMPROVES SAFETY IN  
INDUSTRIAL WORK AREAS**

Freeman J  
Redman Fisher Engineering Ltd.  
(SPI,Composites Institute)

FlowGRiP one-component FRP construction panels are developed in direct response to feedback from existing and potential FRP users. The design criteria also takes account of the increasingly important issue of safety in the workplace. The resulting panel not only builds on the advantages of existing FRP flooring, but can improve safety in the workplace. An attempt is made to illustrate the primary areas in which the one-piece FRP construction panel can make a valid contribution towards improving safety in the workplace.

EUROPEAN COMMUNITY; EUROPEAN UNION; UK;  
WESTERN EUROPE

Accession no.702111

*Item 249*

International Composites Expo '98. Conference  
proceedings.  
Nashville,Tn., 19th-21st Jan.1998, Session 6-B. 627  
**REHABILITATION OF STEEL STRUCTURES  
USING ADVANCED COMPOSITES AND  
ADHESIVES**

Mosallam A S  
California,State University  
(SPI,Composites Institute)

The results obtained from a pilot study for developing innovative techniques for seismic repair and rehab of steel beam-to-column welded moment connections are described. The research work includes both full-scale connection tests, as well as finite element numerical modelling using ANSYS software. In this programme, the feasibility of using a combination of polymer composites, high-strength adhesives, high-strength bolts and nuts, as well as conventional steel stiffeners is explored for repair/retrofit steel frame connections. The primary system investigated is in the form of attaching three-dimensional graphite/epoxy composite stiffening to the flanges of both beams and columns. Two detailed groups are tested, namely, composite stiffener with high-strength adhesives only, and bolted composite stiffeners.

USA

Accession no.702110

*Item 250*

International Composites Expo '98. Conference  
proceedings.  
Nashville,Tn., 19th-21st Jan.1998, Session 4-B. 627  
**FATIGUE AND FAILURE EVALUATION OF  
MODULAR FRP COMPOSITE BRIDGE DECK**

Lopez-Anido R; Howdyshell P A; Stephenson L D;  
Ganagarao H V S  
West Virginia,University; US,Army Construction  
Engineering Research Lab.  
(SPI,Composites Institute)

Load cycling fatigue and strength evaluations for modular fibre reinforced polymer (FRP) composite decks are presented. The FRP composite deck is made of pultruded components that are bonded and interlocked. Emphasis is on the presentation of an innovative fatigue experimental qualification programme for FRP composite bridge decks. Fatigue live loads are computed based on AASHTO highway bridge specifications. Variations of strain and deflection measurements with number of cycles and mode of failure after load cycling are used to characterise the fatigue and strength performance of the FRP deck. Limitations in applying the existing AASHTO highway bridge specifications to fatigue design of FRP composite decks are discussed. 4 refs.

USA

Accession no.702098



*Item 251*

International Composites Expo '98. Conference proceedings.

Nashville, Tn., 19th-21st Jan. 1998, Session 22-E. 627

**CREEP BEHAVIOUR OF FRP-REINFORCED GLULAM BEAMS**

Dagher H J; Breton J; Shaler S; Abdel-Magid B  
Maine, University; Winona, State University  
(SPI, Composites Institute)

Twelve 22 ft. long glulam beams are tested for creep in 4 pt bending in a controlled environment and a stress of 25% above the allowable design stress. This is an ongoing test commenced in May 1997, and is scheduled to continue for one year. The beams are Douglas fir and Western hemlock and are reinforced with 0%, 1% or 3% E-glass FRP on the tension side. A wood bumper strip is added to the tension face to protect the FRP layers. Mid-span deflections and wood moisture content are reported for the first five months of testing. Reinforced beams can support up to twice as much load as unreinforced beams. However, the preliminary results show that despite the increased loading for reinforced beams, there is no increase in relative creep. 13 refs.

USA

*Accession no. 702079*

*Item 252*

International Composites Expo '98. Conference proceedings.

Nashville, Tn., 19th-21st Jan. 1998, Session 22-C. 627

**FRP REINFORCEMENT OF DOUGLAS FIR AND WESTERN HEMLOCK GLULAM BEAMS**

Dagher H J; Shaler S M; Poulin J; Abdel-Magid B; Tjoelker W; Yeh B

Maine, University; Composite Materials Engineering; Willamette Industries Inc.; Engineered Wood Association  
(SPI, Composites Institute)

With recent changes in availability of forest resources, high quality tension laminations necessary for glulam construction have become more expensive and increasingly difficult to procure. FRPs promise to serve both as a substitute for the high quality wood laminations and as reinforcement for glulam beams. Glulam, like reinforced concrete, can be reinforced in tension to more efficiently utilise the wood's compressive strength. The ultimate strength behaviour of FRP-reinforced glulam beams made with Douglas Fir and Western Hemlock is quantified experimentally. Like many other wood species, lower grades of Western Hemlock and Douglas Fir have higher compression strength than tensile strength. It is primarily this differential in tension and compression values that justifies the use of tension reinforcement. Sixty 21 ft span glulam beams reinforced with FRP on the tension side and thirty unreinforced controls are instrumented and tested to failure in four-point bending. FRP reinforcement ratios are 1 and 3%.

USA

*Accession no. 702077*

*Item 253*

International Composites Expo '98. Conference proceedings.

Nashville, Tn., 19th-21st Jan. 1998, Session 22-B. 627

**FINITE ELEMENT ANALYSIS AND EXPERIMENTAL INVESTIGATIONS ON THE FRP REINFORCED REPLACEMENT RAFTERS USED IN THE WINGSPREAD PROJECT**

Tingley D A; Gai C; Cheng P  
Wood Science & Technology Institute Ltd.  
(SPI, Composites Institute)

Replacement rafters for the historical Wingspread building near Racine, Wisconsin, are designed using triaxial CFRP reinforced laminated veneer lumber (LVL) to resist uniaxial tensile loads in the longitudinal direction of the rafters. A three-dimensional finite element model, with the CFRP reinforcement faced-bonded to the LVL, is developed to evaluate stress distributions. One full-scale rafter is fabricated and tested under uniaxial tensile loading condition. High stress concentrations are found near the gussets at the arm of the rafter. 6 refs.

USA

*Accession no. 702076*

*Item 254*

International Composites Expo '98. Conference proceedings.

Nashville, Tn., 19th-21st Jan. 1998, Session 16-E. 627

**NEW GENERATION OF FIBRE-REINFORCED POLYMER REBARS FOR CONSTRUCTION**

Faza S; Mathers W; Pauer R  
Marshall Industries Composites; Mathers Engineering Corp.; Reichhold Chemicals Inc.  
(SPI, Composites Institute)

Advanced FRP composites made of resin impregnated fibres have the potential to become a prominent reinforcing material in the 21st century for the construction industry. However, the processing method, as well as the constituent materials of these advanced composites, are critical, as they determine the material's properties as well as long-term durability. Advances in fabrication, ability for post bending, improvements and consistency in mechanical properties, proper selection and formulation of resins and strict quality control are some of the issues that make a clear distinction for the new generation of MP rebars. The advances made in the design, manufacturing and field applications of C-BAR reinforcing rod are reviewed. A cost comparison between FRP rebar versus steel rebar used in a major sea wall renovation project is highlighted. 3 refs.

USA

*Accession no. 702047*

*Item 255*

International Composites Expo '98. Conference proceedings.

Nashville, Tn., 19th-21st Jan. 1998, Session 16-A. 627  
**CHARACTERISATION OF GRP RIBBED ROD  
USED FOR REINFORCED CONCRETE  
CONSTRUCTION**

Nanni A; Rizkalla S; Bakis C E; Conrad J O;  
Abdelrahman A A  
Missouri-Rolla, University; Manitoba, University;  
Pennsylvania, State University  
(SPI, Composites Institute)

The results of a two-university project to verify various material properties of a commercially available GRP rod are presented. Among the basic test types performed are a uniaxial tensile test and a pullout test of 90 deg. bent rods. Two types of test are used to evaluate the strength of the 90 deg. bent rods. A specially designed pull-out test is used to determine the bond characteristics and the minimum development length. The uniaxial tensile test is performed to establish the following characteristics: ultimate strength, ultimate strain and modulus of elasticity. Epoxy coated steel rods are also tested as a benchmark. The experimental results suggest that this GRP rod is suitable for reinforced concrete construction.

USA

Accession no. 702043

*Item 256*

International Composites Expo '98. Conference proceedings.  
Nashville, Tn., 19th-21st Jan. 1998, Session 13-F. 627  
**EVALUATION OF POLYMER CONCRETE  
OVERLAY FOR FRP COMPOSITE BRIDGE  
DECK**

Lopez-Anido R; Gangarao H V S; Pauer R J;  
Vedam V R  
West Virginia, University; Reichhold Chemicals Inc.  
(SPI, Composites Institute)

The development of a modular FRP composite deck requires the application of a suitable wearing surface or overlay. A thin polymer concrete (PC) overlay is specified for construction of two highway bridge decks in West Virginia. The flexible response of the FRP composite deck needs a PC overlay with high tensile elongation. Furthermore, the PC overlay needs to develop adhesion to the FRP deck surface, provide a non-skid surface, absorb energy and require a simple placement method. The selected PC binder is an isophthalic unsaturated polyester resin. A urethane-based primer is applied (after sandblasting and cleaning of the surface) to enhance adhesion to the FRP composite deck. The aggregate material is fine silica sand. The primer and resin materials are supplied by Reichhold Chemicals. Three-point bending tests are conducted on coupon specimens of FRP deck with PC overlay for various span to depth ratios. Specimens are tested with both the PC on the tension side and on the compression side to simulate the actual deck response subjected to a wheel load. The PC bonded to the FRP specimens exhibits more than 2% tensile

elongation to failure without debonding. The field placement procedure adopted for highway bridges with FRP composite decks is presented. 2 refs.

USA

Accession no. 702034

*Item 257*

**Popular Plastics and Packaging**

Annual, 1998, p.51-5

**GLASS FIBRE REINFORCED PLASTICS (GRP)  
IN BUILDING CONSTRUCTION**

Sundaram S; Sridhar N B  
FGP Ltd.

The use and benefits of glass fibre-reinforced plastics in building and construction applications is discussed. Comparisons are made between the material properties of GRP and those of aluminium, steel and wood. Applications in the building industry for which GRP are used to advantage are examined, and include rooflight sheeting, prefabricated houses, cladding, water storage tanks, doors and windows, sanitary ware, mass seating, and structural profiles.

INDIA

Accession no. 701611

*Item 258*

**Construction & Building Materials**

12, Nos.6-7, 1998, p.393-402

**PERFORMANCE OF ELASTOMERIC PARKING  
GARAGE MEMBRANE SYSTEMS**

Mailvaganam N P; Collins P G; Lacasse M A; Paroli R M  
National Research Council of Canada

Physicochemical techniques and mechanical test methods were used to characterise and evaluate the performance and durability of selected elastomeric membrane systems (liquid-applied traffic bearing membrane systems and asphaltic systems). The effect of concrete quality, surface preparation, variation in chemical composition of the products and sensitivity to environmental conditions on the performance of the membranes was determined. The results obtained showed that, although the membranes restricted the ingress of moisture and chlorides into the concrete deck, improper surface preparation or membrane installation could result in pin holes and blisters which allowed the permeation of chloride ions. The effects of high and low ambient temps. and some chemicals encountered in the parking garage environment significantly affected the performance of a membrane. 8 refs.

CANADA

Accession no. 700275

*Item 259*

**Kunststoffe Plast Europe**

88, No.9, Sept. 1998, p.34-5, 1482/6

German; English

**THERMOPLASTIC ELASTOMER(TPE)  
SEALING PROFILES FOR PLASTIC WINDOWS**

Beitzel M

Gummiwerk Kraiburg

The suitability of TPEs based on styrene-(ethylene-butylene)-styrene copolymers for manufacture of sealing profiles for plastic windows is discussed. The mechanical properties and weathering resistance of three extrusion grades of these TPEs, developed by Kraiburg, are considered and the properties of one of these grades are compared with those of EPDM and acrylate-modified PVC. 4 refs.

EUROPEAN COMMUNITY; EUROPEAN UNION; GERMANY;  
WESTERN EUROPE

*Accession no.699041*

*Item 260*

1997 Asian International Laminates Symposium.

Conference proceedings.

Hong Kong, China, 19th-21st Nov.1997, p.31-7. 626

**MARKET DEVELOPMENT FOR LAMINATE  
FLOORING**

Nystrom P; Johansson H

Perstorp Flooring AB; Perstorp Flooring Inc.  
(TAPPI)

The flooring market in Europe matures with limited growth, with the exception of Eastern Europe. The total US flooring market is showing moderate growth. There is, however, quite a dramatic shift among floor materials. Textile floor coverings are losing market share in Europe, while vinyl flooring is losing ground in USA. Hardwood flooring is increasing its share worldwide. This is the context in which laminate flooring has achieved a market share of 4% in Europe in 15 years, and almost 1% in the USA in less than three years. The global market potential is huge, and laminate flooring is forecast to gain market share.

EUROPE-GENERAL; SCANDINAVIA; SWEDEN; USA;  
WESTERN EUROPE

*Accession no.698473*

*Item 261*

Materials Challenge - Diversification and the Future.

Volume 40: Book 1. Symposium proceedings.

Anaheim, Ca., 8th-11th May 1995, p.552-61. 627

**STRENGTHENING WITH PULTRUDED CFRP  
LAMINATES**

Meier U; Spencer N; Erath M

EMPA; PAN American Composites; Stesalit Ltd.  
(SAMPE)

The ways in which advanced polymer matrix composite materials developed for high-performance aircraft can offer major advantages for rehabilitation and retrofitting of existing civil engineering structures through external bonding of thin carbon fibre/epoxy (CFRP) laminates are

demonstrated. Criteria for design of the use of these materials are suggested. Retrofitting with CFRP laminates is shown in cost comparisons with classical rehabilitation methods to be superior in most cases. It had originally been assumed that this technique would only be cost-efficient if there were very high requirements relative to corrosion, fatigue performance and light weight. However, after further price decreases of carbon fibres, this method has become also cost effective for applications where not all these requirements are present. Easy handling on structural sites due to the light weight of the CFRP laminates helps to reduce labour cost. For this reason commercial use has increased dramatically in Switzerland. 18 refs.

SWITZERLAND; USA; WESTERN EUROPE

*Accession no.698147*

*Item 262*

Materials Challenge - Diversification and the Future.

Volume 40: Book 1. Symposium proceedings.

Anaheim, Ca., 8th-11th May 1995, p.513-21. 627

**USE OF CARBON FIBRE TOW SHEET  
REINFORCEMENT FOR IMPROVED BRIDGE  
CAPACITY RATINGS IN JAPAN**

Kobayashi A; Endoh M; Kuroda H; Kliger H

Tonen Corp.; Kliger H.S.,& Associates  
(SAMPE)

Carbon fibre tow sheet reinforcing materials are now being used in Japan to upgrade existing steel reinforced concrete bridge structures. A new bridge design load requirement in Japan (JL25) is being applied to existing structures in an effort to accommodate increasing traffic patterns. In a trial, Forca Tow Sheet is applied to the tension face of a concrete bridge slab. The design and application procedures, and the on-site loading tests performed to confirm the reinforcement effect, are described.

JAPAN; USA

*Accession no.698143*

*Item 263*

Materials Challenge - Diversification and the Future.

Volume 40: Book 1. Symposium proceedings.

Anaheim, Ca., 8th-11th May 1995, p.504-12. 627

**COMPOSITES JUST ANOTHER BUILDING  
MATERIAL - ONLY BETTER**

Brandt Goldsworthy W

Brandt Goldsworthy J.,& Associates Inc.  
(SAMPE)

Several recent highly successful forays of composite materials into civil engineering applications are highlighting some facts that should have been self evident. Composites are just another building material - but not that radically different. It now appears that using the same software designed for traditional materials and simply changing the numbers derived by a few coupon tests will

yield a perfectly satisfactory structure. These materials should, therefore, simply be chosen for the advantages that they offer in the structure being contemplated. All this, of course, within the economic constraints that allow the product to be viable. Advantages such as high strength, light weight, corrosion resistance, low thermal conductivity, electrical insulation, acoustical damping, decorative capability, processability and combinations of these with other specific properties should make composites a front runner in almost any structural design.

USA

Accession no.698142

*Item 264*

Flame Retardants '98. Conference proceedings. London, 3rd-4th Feb.1998, p.33-44. 54F

**THE ROLE OF POLYMERS IN THE DUSSELDORF AIRPORT FIRE**

Mugge J

Vestolit GmbH

(BPF; Interscience Communications Ltd.; APME; European Flame Retardant Assn.; Fire Retardant Chemicals Assn.; Institute of Materials)

An overview of the factors contributing to the Dusseldorf Airport Fire in April 1996 is presented. Aspects covered include the construction of the airport building, chronology of the airport fire, origin and spread of the fire, materials involved - especially the role of plastics, shortcomings in the conception of the building and in the organisation during the fire and conclusions drawn up by the Official Airport Commission of the State of Northrhine-Westphalia. The statements are based on the results of the Official Airport Commission (report part I dated April 19th, 1997) on presentations of Dr. Schiffers, an expert for damages in fire, working for the relevant assurance and on presentations of Dr. Rotard, German Environmental Protection Agency.

EUROPEAN COMMUNITY; EUROPEAN UNION; GERMANY; WESTERN EUROPE

Accession no.697341

*Item 265*

**Cellular Polymers**

17, No.3, 1998, p.177-92

**STATIC BEHAVIOUR OF A PVC FOAM COMPOSITE SANDWICH PANEL**

Ferreira J A M; Moreira da Costa J D

Ciombra, Universidade; Lisboa, Institute of Science & Technology

Details are given of the static and creep behaviour of a sandwich panel made of PVC foam as core and two skins of GRP. The flexural properties and creep behaviour were evaluated at room temperature. 15 refs.

EUROPEAN COMMUNITY; EUROPEAN UNION; PORTUGAL; WESTERN EUROPE

Accession no.696313

*Item 266*

**Cellular Polymers**

17, No.3, 1998, p.163-76

**DEVELOPMENT OF HFC BLOWING AGENTS. II. EXPANDED PS INSULATING BOARDS**

Albouy A; Roux J-D; Mouton D; Wu J

Elf Atochem SA; Elf Atochem North America Inc.

Details are given of the properties of blowing agents used in PS insulating boards. A theoretical model is used to simulate their long term behaviour with emphasis on thermal insulation. 10 refs.

EUROPEAN COMMUNITY; EUROPEAN UNION; FRANCE; USA; WESTERN EUROPE

Accession no.696312

*Item 267*

**Kunststoffe Plast Europe**

88, No.8, 1998, p.47-8

**CPE AS IMPACT MODIFIER**

Gerlach D

DuPont Dow Elastomers

Chlorinated PE as an impact modifier in PVC window profiles is discussed with reference to the advantages it affords. The principle behind impact modifier use is explained and the two possible morphologies are examined, i.e., network structures and particle structures. Processing advantages associated with chlorinated PE are described, and it is compared to a current acrylic modifier in terms of impact strength and processability.

SWITZERLAND; WESTERN EUROPE

Accession no.695890

*Item 268*

**Plast' 21**

No.62, June/July 1997, p.30-4

Spanish

**ADVANTAGES OF PLASTICS IN BUILDING**

A survey is made of building and related applications of plastics, including pipes, doors, window frames, floor and wall coverings, cellular thermal insulation and decorative laminates.

WESTERN EUROPE-GENERAL

Accession no.695272

*Item 269*

**Composites Plastiques Renforcees Fibres de Verre Textile**

No.19, Jan./Feb.1997, p.6-9

English; French

**SPOTLIGHT ON AZUREL**

Petit J

An examination is made of the structure and properties of Azurel building panels, developed by Dow Chemical and combining wood and Styrofoam extruded PS foam. New PP and linear LDPE capacities installed by Dow

Chemical and the activities of Du Pont Dow Elastomers in rubbers and thermoplastic elastomers are briefly reviewed.

DOW CHEMICAL CO.; DU PONT DOW  
ELASTOMERS; DOW CHEMICAL SA  
EUROPEAN COMMUNITY; EUROPEAN UNION; FRANCE;  
GERMANY; USA; WESTERN EUROPE

Accession no.695261

*Item 270*

Advances in Plastics Technology. Conference proceedings.

Katowice, Poland, 9th-11th December 1997, Paper 4. 8

**COLOURING OF VINYL SIDING AND OTHER WEATHERABLE RIGID PVC PROFILES WITH HOLCOBATH ENCAPSULATED PIGMENTS**

Groot R

Holland Colors Americas Inc.

(Institute of Plastics & Paint Industry)

The North American vinyl siding industry has developed into the second largest rigid PVC segment after PVC pipe. Colouring methods have changed slowly, with the change from full siding to coextrusion. Achieved originally with pigments in the hot/cool mixer it changed to colouring on-line with free flowing concentrates like Holcobath. The colour hold guidelines, the weathering parameters in which vinyl siding colours should maintain their shade, were explained. These parameters are the basis on which colour concentrate producers determine suitable pigment choices in relation to items like weathering and heat build up. These colour hold guidelines have lead to the creation of new special pigments such as IR-Blacks. As colour concentrate suppliers are now the direct suppliers to the industry, they have taken the lead with regard to developing the industry with colour pigment formulations - in close co-operation with manufacturers of basic pigments. Holland Colours (HCA) services the industry not only from a colourmatch stand point; it also generates and publishes studies on the weathering performance of all basic inorganic and organic pigments for vinyl weatherable profiles. Information is given on an industry not too well known outside North America; a few new trends are highlighted, including new stabiliser systems that can be used for darker colours.

USA

Accession no.694482

*Item 271*

**Ends Report**

No.282, July 1998, p.31-2

**TIMBER AND PLASTIC INDUSTRIES IN BATTLE OVER BUILDING MATERIALS**

Plastics manufacturers are reported to have complained to the Advertising Standards Authority (ASA) about several advertisements from a timber trade body which criticise the environmental impact of PVC windows. The

dispute is the latest episode in a tussle in the building materials market characterised by the selective use of environmental claims. Producers of construction materials such as steel, timber, PVC and concrete have frequently used environmental claims as a weapon in their struggles for market share. Recent examples include claims by concrete pipe manufacturers that their products are better for the environment than PVC pipes, and claims by a linoleum producer that its product offers an environmentally preferable floor covering. In 1997, the Timber Trades Federation (TTF) issued an advert as part of its 'think wood' campaign which attacked steel as non-renewable. Details are given.

EUROPEAN COMMUNITY; EUROPEAN UNION; UK;  
WESTERN EUROPE

Accession no.692517

*Item 272*

**Journal of Applied Polymer Science**

69, No.9, 29th Aug.1998, p.1761-4

**PRESERVATION OF CANKIRI LIMESTONE IN SULFUR DIOXIDE ATMOSPHERE BY IN SITU POLYMERIZATION OF ETHYL METHACRYLATE**

Isik-Yuruksoy B; Kis M; Guven O

Hacettepe,University

Ethyl methacrylate was polymerised within Cankiri limestone by a sulphur dioxide-tert-butyl hydroperoxide redox initiator pair having a low decomposition activation energy. The mechanical stability of the original and polymer-loaded stones was measured. As the amount of the polymer in the limestone was increased, compressive strength also increased. The polymer-containing limestone was shown to be more resistant to abrasion by water and to the effects of acid rain. 14 refs.

TURKEY

Accession no.692414

*Item 273*

**Adhesives Age**

41, No.6, June 1998, p.26-9

**STRUCTURAL ADHESIVES TECHNOLOGY: TWO DECADES OF ENDURING PROGRESS**

Drake R

This article is the second of a two-part review of the development of structural adhesives. In this article, the author covers the following topics: cure, toughening, performance on command, various families of structural adhesives, water-based adhesive primers, and predicting bonded assembly life. 15 refs.

USA

Accession no.691660

*Item 274*

**Insulation Journal**

May/June 1998, p.24-5

**OF MUTUAL BENEFIT TO ALL**

Sears B  
Celotex

It is reported that in the UK's West Midlands, architects for vehicle manufacturer Rover BMW are specifying "Pi" foam thermal insulation for the company's factory roof. Pi is a polyisocyanurate produced by Celotex of the UK. In this article, Celotex's technical services manager reflects on risk assessment, and the role of Factory Mutual approval.

ROVER BMW; FACTORY MUTUAL RESEARCH CORP.

EUROPEAN COMMUNITY; EUROPEAN UNION; UK; WESTERN EUROPE

*Accession no.691644*

*Item 275*

**Insulation Journal**

May/June 1998, p.12-3

**CONTEXT OVER CONTEST**

UK,Mineral Wool Association

In this article the secretary general of Eurisol, the UK Mineral Wool Association, Ian Knight, calls for a thorough review of fire test data for sandwich panels. Section headings include: size is not everything, fire source and fire load, time of exposure, measure of smoke, representing real life, and accentuating the positive.

EUROPE-GENERAL; EUROPEAN COMMUNITY; EUROPEAN UNION; UK; WESTERN EUROPE

*Accession no.691643*

*Item 276*

**Insulation Journal**

May/June 1998, p.14-5

**TESTING IN PROPORTION TO REALITY**

Trew P

Engineered Panels in Construction

This article discusses in detail the findings of recent large-scale fire tests on external cladding panels, carried out by Engineered Panels in Construction, of the UK. It outlines confusion over reports from serious fires, then looks at test findings, structural integrity, and inspection of core insulation. It concludes with a summary.

UK,FIRE SERVICE INSPECTORATE

EUROPEAN COMMUNITY; EUROPEAN UNION; UK; WESTERN EUROPE

*Accession no.691642*

*Item 277*

**Revue Generale des Caoutchoucs et Plastiques**

No.760, June/July 1997, p.83-6

French

**FLAME RETARDANT PROPERTIES OF EPDM COMPOUNDS**

Krans J; Eichler H J

Martinswerk GmbH; DSM Elastomers Europe

Results are presented of a study of the influence of different fillers, plasticiser oils and curing systems on the limiting oxygen index and smoke emission of EPDM compounds, and of flammability tests undertaken on roof coverings based on three different compounds. 5 refs.

EUROPEAN COMMUNITY; EUROPEAN UNION; GERMANY; NETHERLANDS; WESTERN EUROPE

*Accession no.691336*

*Item 278*

**Adhesive Technology**

15, No.1, March 1998, p.26-7

**DURABILITY OF BUILDING SEALANTS**

Ford P

The myriad of factors that affect the durability of building sealants were examined at a seminar organised by the UK Building Research Establishment (BRE), Watford and the International Union of Testing and Research Laboratories for Materials and Structures (RILEM) based in Cachan, France. The realistic assessment of the performance of a sealant is discussed.

UK,BUILDING RESEARCH ESTABLISHMENT

EUROPEAN COMMUNITY; EUROPEAN UNION; UK; WESTERN EUROPE

*Accession no.689842*

*Item 279*

**Adhesive Technology**

15, No.1, March 1998, p.2

**ADHESION IS THE KEY TO TOLL BOOTH DESIGN**

ACX Industries specialises in design solutions using composite materials. The company designs and manufactures in a range of specialist areas that focus on light weight, ease of production and installation, special design and high-performance requirements. Adhesive technology came to the rescue for a project to design a motorway toll booth in France. The company has achieved a European first in the field of civil engineering. It designed, constructed and then installed a roofing system for motorway toll booths on the A29 between Le Havre and Yvelot made entirely from glass reinforced polyester. The roof design measures 60 m long x 20 m wide and is entirely self-supporting. During the early stages of the design process, it became clear that the mechanical requirements for the points where the roofing was to be anchored to the main structure were very complex. The search for a cost-effective and high-performance solution led to a combination of metal copings, bolts and Araldite 2022, a two-component toughened methacrylate adhesive system from Ciba Speciality Chemicals. Brief details are noted.

ACX INDUSTRIES

EUROPEAN COMMUNITY; EUROPEAN UNION; UK; WESTERN EUROPE

*Accession no.689828*

Item 280

**Polymers Paint Colour Journal**

188, No.4406, July 1998, p.4

**WATER-BASED PAINT SYSTEMS AID MARKET RECOVERY**

According to Frost & Sullivan's latest study, difficult market conditions in the building paints industry have forced manufacturers to take decisive action. The new report finds that changes which initially threatened the industry have become the key driving force behind the latest technical developments, which now contribute to recovering overall revenue growth rates of 2.6%. The emergence and growth of new paint systems, such as waterborne paints, high solids, radiation cured and powder coatings, mean that manufacturers can offer the stability, application and performance end-users demand while lowering solvent content. In the decorative paints industry, water-based paints have been successful as a cleaner alternative to solvent-based paints. Powder coatings have also enjoyed popularity, particularly as facade coverings. Waterborne paints are particularly popular in the DIY market, largely because consumers like to be seen using 'green' products while industries are more concerned about performance and price. Some economic information is presented.

FROST & SULLIVAN LTD.

EUROPE-GENERAL; WESTERN EUROPE

Accession no.689752

Item 281

**Composite Structures**

29B, No.4, 1998, p.411-24

**EXPERIMENTAL STUDY OF THE FAILURE MODES OF REINFORCED CONCRETE BEAMS STRENGTHENED WITH PRESTRESSED CARBON COMPOSITE PLATES**

Garden H N; Hollaway L C

Surrey,University

Concrete structures deteriorate for various reasons and upgrading has been achieved for over 20 years by bonding steel plates using epoxy resins. Disadvantages of this method include transporting, handling and installing heavy plates and corrosion of the plates. The use of composite materials overcomes these problems and provides equally satisfactory solutions. The rehabilitation of concrete structures represents a large demand for efficient strengthening methods and composite materials are well suited to this application. Further advantages are gained by prestressing the plate before bonding to the concrete. The benefits of external prestressing using polymeric composite materials have been investigated only recently and further work is required to understand the behaviour of members prestressed with composite materials. Emphasis is placed on the failure modes of reinforced concrete beams prestressed in this way. 34 refs.

EUROPEAN COMMUNITY; EUROPEAN UNION; UK; WESTERN EUROPE

Accession no.688029

Item 282

Antec '98. Volume II. Conference proceedings.

Atlanta, Ga., 26th-30th April 1998, p.2486-91. 012

**BLENDS OF BITUMEN WITH POLYMERS FOR BUILT UP ROOFING MEMBRANES**

McNally T; Fawcett A H; McNally G M; Andrews F; Clarke J

Belfast,Queen's University; Dussek Campbell Ltd. (SPE)

Bitumen is a mixture of four main components - aromatics, paraffins, asphaltenes and resins - that remain after crude oil has been processed in distillation plants and catalytic crackers. It finds applications in road construction and as a waterproofing agent to more specialised purposes such as being used, when blended with a proportion of a polymer, in built up membranes for the roofing industry. The previously unreported properties are described on a molecular level of three commercially-used blends of polymers with bitumen, following measurements made by fluorescence optical microscopy, differential scanning calorimetry and dynamic mechanical thermal analysis. It can be seen how the different blends function in a manner that makes them suitable for the production of built up roofing membranes. 10 refs.

EUROPEAN COMMUNITY; EUROPEAN UNION; UK; WESTERN EUROPE

Accession no.687397

Item 283

Bristol, Applied Market Information Ltd., 1998, 17 papers. 150.00. 31cms. 24/7/98. 42C382

**PROFILES '98. PROCEEDINGS OF A CONFERENCE HELD NEUSS, GERMANY, 24TH-26TH FEB. 1998**

Applied Market Information Ltd.; European Plastics News

Seventeen papers presented at Profiles '98 are published here. Day 1 focuses on raw materials and includes papers on photoageing of rigid PVC under normal or severe climate conditions, calcium zinc stabilisers and their influence on PVC profile performance and processing, and study of rheology at different formulations for profile extrusion. Day 2 focuses on machinery, and the markets for the profile industry. Papers include high performance extrusion lines for profile extrusion, profile die using simulation, views and perspectives of a profile extruder, and the structure of the plastic building industry in Western Europe.

Accession no.686014

Item 284

**Journal of Vinyl and Additive Technology**

4, No.2, June 1998, p.94-5

**ROLE OF ADDITIVES IN PVC MARKET OPPORTUNITIES**

Johnson R W; Oliveri F J; Szamborski E C  
Rohm & Haas Co.

Very brief details are given of the performance benefits of additives for PVC in raising heat distortion temperature, increase impact performance, improve colour fastness and improve processing. Emphasis is given to benefits in the construction industry.

USA

Accession no.684909

Item 285

**Journal of Vinyl and Additive Technology**

4, No.2, June 1998, p.87-9

**RECYCLING DURABLE VINYL PRODUCTS**

Wisner D

Geon Co.

Brief details are given of a recycling project for vinyl siding conducted in Grand Rapids, Michigan by the National Association of Home Builders.

USA

Accession no.684907

Item 286

Brussels, 1998, pp.12. 21cms. 11/5/98

**PLASTICS : A MATERIAL OF CHOICE IN BUILDING AND CONSTRUCTION. PLASTICS CONSUMPTION AND RECOVERY IN WESTERN EUROPE 1995**

APME

Building and construction requirements currently account for 20% (4.89 million tonnes) of Western Europe's total annual plastics consumption of 24.9 million tonnes. This APME publication looks at the advantages of using plastics in place of traditional building materials and provides a breakdown of consumption by European country, polymer type, and specific construction application. The report also focuses on the 841,000 tonnes of plastics construction waste generated in 1995 and provides a forecast of future waste patterns in this sector over the next decade. Plastics waste management options and solutions are also outlined.

BELGIUM; EUROPEAN COMMUNITY; EUROPEAN UNION;  
WESTERN EUROPE

Accession no.682539

Item 287

**Macplas International**

Feb.1998, p.70-1

**RISING OUT OF ASHES**

The heating and air-conditioning system of an Italian "marquee" theatre not only had to guarantee the uniform distribution of environmental conditions throughout the structure, but also good acoustic levels. To control the speed of the air fed by the diffusers, the sizes and routing of the channelling had to be carefully evaluated. Engineers

opted for aluminium channelways pre-insulated with rigid PU foams. In another Italian theatre, heat-insulating PUR foam panels were laid directly onto the wooden ceiling joists in the scenic tower.

EUROPEAN COMMUNITY; EUROPEAN UNION; ITALY;  
WESTERN EUROPE

Accession no.682028

Item 288

20th Annual Anniversary Meeting of the Adhesion Society. Conference proceedings.

Hilton Head Island, S.C., 23rd-26th Feb.1997, p.671-3. 8(10)

**EFFECT OF POLYMER MODIFICATION ON THE PROPERTIES OF ASPHALT CONCRETE**

Bhurke A S; Shin E E; Rozeveld S; Vallad P; Drzal L T  
Michigan, State University

Edited by: Drzal L T; Schreiber H P

(US, Adhesion Society)

Polymer modified asphalts show promise in improving the properties of asphalt concrete. One of the parameters controlling the properties of asphalt concrete is the interaction between the asphalt binder and aggregates. This is characterised by the study of the interfacial adhesion between the binder and aggregate and the cohesive performance of the binder. Poor adhesive or cohesive performance leads to premature failure, cracking and poor pavement performance. The failure and fracture morphology of asphalt concrete is characterised qualitatively by studying the fracture morphology using in-situ environmental scanning electron microscopy (ESEM) tensile tests and quantitatively by low temperature fracture toughness measurements. 7 refs.

USA

Accession no.681476

Item 289

**Composites-French/English**

Nos.25-26, 15th Feb.-15th June 1998, p.95-7

**HOUSE PROVES THAT COMPOSITES ARE AS ADVANTAGEOUS AS CONCRETE**

Nine years ago, Impact Design Group built a prototype house out of composite materials in France. The house is built out of GRP polyester or acrylic matrix (20%) resin with an aluminium hydroxide filler (60%) added to meet fire/smoke standards and roving to stabilise the structure. The materials are said to have weathered well.

IMPACT DESIGN GROUP

EUROPEAN COMMUNITY; EUROPEAN UNION; FRANCE;  
WESTERN EUROPE

Accession no.680744

Item 290

**Composites-French/English**

Nos.25-26, 15th Feb.-15th June 1998, p.28-30



**PULTRUDED PROFILES: A VALUABLE ALTERNATIVE!**

Fibreforce Composites specialises in the production of pultruded profiles. Composite profiles offer many advantages that make them a real alternative to traditional materials such as steel, aluminium and wood. Glass-polyester pultrusions are mainly used in door and window frame production.

FIBREFORCE COMPOSITES LTD.  
EUROPEAN COMMUNITY; EUROPEAN UNION; UK;  
WESTERN EUROPE

*Accession no.680727*

*Item 291*

**Composites-French/English**

Nos.25-26, 15th Feb.-15th June 1998, p.23-4

**STENI RECOMMENDS A "PERFECT FINISH"**

Steni manufactures composite facing panels filled with rock aggregates intended for the building and public works sector. In the Steni Nature range, the surface aggregate is embedded in a Synolite resin with a mineral filler and a glass reinforcement. Launched in 1996, the Steni colour product has the same matrix as Steni Nature, but with a gel coat finish.

STENI  
NORWAY; SCANDINAVIA; WESTERN EUROPE

*Accession no.680724*

*Item 292*

**European Plastics News**

25, No.5, May 1998, p.30-1

**TIME FOR A DECISION**

Seifert S  
Battenfeld Extrusionstechnik

Factors to be borne in mind are considered, with reference to choosing a high output extrusion system for window profiles production. Details are given of the capabilities and suitability of high speed single strand lines and twin strand lines. Comparisons are made for various line configurations with respect to prices, output, energy consumption, and floor space.

*Accession no.679515*

*Item 293*

**Materie Plastiche ed Elastomeri**

Nos.11/12, Nov./Dec.1996, p.668-75

Italian

**PVC: A COMPETITIVE BUILDING MATERIAL**

Gianotti G

A survey is made of building and related applications of PVC, including pipes, window frames, floor and wall coverings, waterproofing membranes and cable insulation. Statistics show European consumption of PVC in such applications in 1995 with forecasts for 1997 and 2000. Environmental aspects of PVC are discussed, and methods

used in the recycling and disposal of PVC building products are reviewed.

EUROPE-GENERAL

*Accession no.679054*

*Item 294*

**Smart Materials & Structures**

7, No.2, April 1998, p.229-36

**APPLICATION AND RELIABILITY OF A FIBRE OPTICAL SURVEILLANCE SYSTEM FOR A STAY CABLE BRIDGE**

Bronnimann R; Nellen P M; Sennhauser U  
EMPA

Details are given of the application of a fibre optical system for the surveillance of a new stay cable bridge using cables of carbon fibre-reinforced plastic. Results of an observation period of more than six months during construction are presented. Tests of the reliability of the fibre optical monitoring system are discussed. 14 refs.

SWITZERLAND; WESTERN EUROPE

*Accession no.678639*

*Item 295*

**Journal of Vinyl and Additive Technology**

4, No.1, March 1998, p.12-21

**MATERIALS AND TESTING FOR EXTRUSION OF RPVC CONSTRUCTION PRODUCTS**

Rapacki S R  
Rohm & Haas Co.

Rigid PVC extruded construction products take many forms. Typical are house siding, window profiles, storm doors, pipe, fencing, and various accessory items generally used for installation. In addition to these solid products, foam or cellular rigid PVC materials are entering the marketplace as substitutes for the traditional solid materials, or allowing PVC to capture other maintenance free applications; typical forms now in use include interior moulding profiles and foam core pipe. Emphasis is placed on the formulation ingredients constituting the articles above, how they are put together and influence the manufacturing process and final product, and how they can be tested to determine fit to the application requirements.

USA

*Accession no.676572*

*Item 296*

**Plastics in Building Construction**

22, No.4, 1998, p.8-12

**POLYPROPYLENE BASED RESINS DESIGNED FOR BUILDING AND CONSTRUCTION INDUSTRY**

Coperthwait J D; Congdon J P; Phillips E M  
Montell Polyolefins

PP is a relative newcomer as a material for the building and construction industry, being invented in only 1956. The

manufacturing process, catalysts, stabilisation and modification technologies have made huge advances over the last fifty years. Today, this plastic is being used in demanding construction applications where the expected service life is longer than the fifty years since Ziegler/Natta first polymerised propylene. Since its invention, new catalyst and process technologies have dramatically expanded the properties available from PP. Details are given.

USA

*Accession no.675066*

*Item 297*

**Reinforced Plastics**

42, No.3, March 1998, p.44-7

**BUILDING BETTER BRIDGES WITH CFRP**

Swiatecki S

COWI Consulting Engineers & Planners in Denmark says it is interested in investigating FRP for reinforcement of concrete because steel reinforcement can lead to corrosive damage and expensive repair. The company heads the team of consultants behind the Herning CFRP bridge. COWI has calculated that the break-even cost for a steel versus a CFRP reinforced bridge, with maintenance over a lifetime included, is reached at a 25% reduction of the present cost for CFRP rods.

COWI CONSULTING ENGINEERS & PLANNERS  
DENMARK; EUROPEAN COMMUNITY; EUROPEAN UNION;  
SCANDINAVIA; WESTERN EUROPE

*Accession no.672975*

*Item 298*

**Reinforced Plastics**

42, No.3, March 1998, p.38-43

**SEISMIC RETROFIT PROVIDES OPPORTUNITIES FOR FRP**

Marsh G

Seismic retrofit and repair are big business in areas prone to earthquakes such as California and parts of Japan. Fibre reinforced plastics can serve to fortify existing structure, for example strengthening steel plates used to reinforce bridge decks. Wrapping concrete columns in composite jackets strengthens the concrete, prevents its collapse in an earthquake and protects the columns from corrosive environments. Polymers can be used in seismic bearings to isolate built structures from ground disturbance.

JAPAN; USA

*Accession no.672974*

*Item 299*

**Insulation Journal**

Jan.Feb.1998, p.18-9

**YOU ARE NOW ENTERING THE QUIET ZONE**

Torr A

Owens Corning Co.

This comprehensive article supplies details of QuietZone, an advanced system of acoustic insulation products from

Owens Corning, designed to combat the persistent incursion of noise in everyday life. The products are designed for use in partitions, roofs, walls, ceilings and floors, in both domestic and commercial environments. There are fourteen products in the QuietZone portfolio. They neutralise sound in three ways: by blocking the sound path; breaking the vibration path; and absorbing the sound energy. Details of the various products are included in the article.

EUROPEAN COMMUNITY; EUROPEAN UNION; UK;  
WESTERN EUROPE

*Accession no.672765*

*Item 300*

**Adhesives Age**

41, No.1, Jan.1998, p.45-6

**DURABILITY OF BUILDING SEALANTS**

Bowtell M

This reports on papers presented at a UK conference held in November 1997 at the Building Research Establishment. The papers discuss several aspects of sealant use in the building industry, in particular their weathering and durability properties.

UK,BUILDING RESEARCH ESTABLISHMENT;  
DOW CORNING CORP.; INTERNATIONAL UNION  
OF TESTING AND RESEARCH LABORATORIES  
FOR MATERIALS & STRUCTURES  
EUROPEAN COMMUNITY; EUROPEAN UNION; FRANCE; UK;  
WESTERN EUROPE

*Accession no.670737*

*Item 301*

**Gemini**

No.1, 1998, p.32-3

**FIGHTING DAMPNES IN OUTER WALLS AND ROOFS**

Kjaervik A

Plastic foil used as a vapour barrier against dampness in outer walls and roofs, combined with a good ventilation system, is presently the best known guarantee against mould and rot in wooden houses. The use of other materials than plastic foil as a vapour barrier could result in an accumulation of moisture inside structures, which in turn could produce favourable conditions for mould and rot and the damage these cause, according to the Norwegian Building Research Institute in Trondheim, and the NTNU's Department of Building & Construction Engineering. Details are given.

NORWEGIAN BUILDING RESEARCH INSTITUTE;  
NORWEGIAN UNIVERSITY OF SCIENCE &  
TECHNOLOGY  
NORWAY; SCANDINAVIA; WESTERN EUROPE

*Accession no.670342*

*Item 302*

**Advanced Composite Materials**

7, No.1, 1998, p.47-61

**SURFACE TREATMENTS AND ADHESION  
BONDING BETWEEN CONCRETE AND CFRP  
COMPOSITE**

Ye L; Friedrich K; Weimer C; Mai Y-W  
Sydney,University; Kaiserslautern,University

Applications of fibre-reinforced plastics to repair worn-out civil structures rely on comprehensive understanding of strengthening mechanisms, especially adhesion bonding between composites and concrete. A special testing procedure is developed to investigate adhesion bonding between concrete and a CFRP, mainly under normal loading conditions. As concrete surface treatments are expected to influence bond strength, different abrasive procedures are investigated; in addition, the application of a silane primer on the concrete surface is studied, using an epoxy resin or a vinyl ester resin as adhesive. An approach based on fracture mechanics is applied to evaluate debonding fracture energy. Microscopic examinations are conducted to identify fracture mechanisms. Crack propagation is found to be dependent on surface treatments as well as the type of adhesive. Applying the silane primer as coupling agent, bonding strength is clearly improved for poorly treated surfaces. The vinyl ester resin as adhesive is found to be inefficient for achieving high bonding strength between the CFRP and the concrete. 20 refs.

AUSTRALIA; EUROPEAN COMMUNITY; EUROPEAN UNION;  
GERMANY; WESTERN EUROPE

Accession no.670182

Item 303

*Journal of Advanced Materials*

29, No.1, Oct.1997, p.3-10

**LAMINATE ANALOGY FOR COMPOSITES  
ENHANCED CONCRETE STRUCTURES**

Chamis C C; Gotsis P K  
US,NASA,Lewis Research Center

A method is described to design composites to repair damage or enhance the overload strength of concrete infrastructures. The method is based on laminate analogy and the computer codes from which it is derived are described. The detailed application of Integrated Composite Analyzer to concrete and reinforced concrete is discussed. 6 refs.

USA

Accession no.669435

Item 304

*Advanced Materials News*

No.103, Jan.1998, p.10-11

**CONCRETE'S NEW ALLY**

Replacing steel with plastic in something as demanding as concrete reinforcement would have been unthinkable ten years ago. However, technologies rapidly evolve. Driven by the maxim, anything metals can do plastics

can do better, the latest generation of reinforcing bar is entirely plastics composite. Some emphasis is placed on Marshall Industries Composites' C-Bar, a composite rebar made using hybrid pultrusion/compression moulding.

MARSHALL INDUSTRIES COMPOSITES  
USA

Accession no.668808

Item 305

*Advanced Materials News*

No.103, Jan.1998, p.8-9

**COMPOSITES BRANCH OUT**

When material scientists first investigated the idea of blending plastics composite with wood, little was known about how or where the technology might lead. Several years on, some of the biggest companies in the US construction business are examining the material as a strategic replacement for steel, concrete and more expensive grades of wood. Most of the research is being conducted at the University of Maine's Advanced Engineered Wood Composites Center in the USA. Details are given.

MAINE,UNIVERSITY  
USA

Accession no.668807

Item 306

*Plastiques Modernes et Elastomeres*

48, No.6, July/Aug.1996, p.49-51

French

**BUILDING: FROM BITUMEN TO CLADDING,  
PLASTICS ASSERT THEMSELVES**

Topuz B

A survey is made of developments in the use of plastics in building applications, including facades, foams for acoustic and thermal insulation, window frames and modified concretes. Statistics are presented for the insulation materials markets in France and Germany in 1995.

EUROPEAN COMMUNITY; EUROPEAN UNION; FRANCE;  
GERMANY; WESTERN EUROPE

Accession no.666957

Item 307

*Plastiques Modernes et Elastomeres*

48, No.6, July/Aug.1996, p.47-8

French

**BUILDING: PROGRESS IN SPITE OF THE  
CRISIS**

Topuz B

Trends in the use of plastics in building applications and in the market for plastics in the building industry in France and Europe are examined. Statistics show European consumption of plastics, by weight, in building and related applications.

SOFRES

EUROPE-GENERAL; EUROPEAN COMMUNITY; EUROPEAN UNION; FRANCE; WESTERN EUROPE

Accession no.666956

Item 308

**Revue Generale des Caoutchoucs et Plastiques**

No.751, June/July 1996, p.37-40

French

**BUILDING: PLASTICS ARE NO LONGER HIDING**

Soler L

A survey is made of the use of plastics in visible building components such as window frames, glazing, walls and facades, and building applications of composites and coated fabrics are also examined. Economic trends in the French building industry are reviewed, and statistics show the market for particular types of plastics in this sector.

ALPHACAN SA; ATOHAAS; FERRARI; ROHM GMBH; ELF ATOCHEM SA; CIMAG; SOTIRA; TUBUS BAUER GMBH

EUROPEAN COMMUNITY; EUROPEAN UNION; FRANCE; GERMANY; ITALY; WESTERN EUROPE

Accession no.666922

Item 309

International Composites Expo '97. Conference proceedings.

Nashville, Tn., 27th-29th Jan.1997, Paper 92. 627

**FRP COMPOSITE REBARS COME OF AGE: RATIONAL STRATEGY FOR COMMERCIALISATION**

McClaskey C R

Reichhold Chemicals Inc.

(SPI,Composites Institute)

FRP composite technology utilising C-bar introduces to the construction industry a relatively low cost, non-corrosive reinforcement alternative for commercialisation consideration worldwide. 4 refs.

USA

Accession no.665469

Item 310

International Composites Expo '97. Conference proceedings.

Nashville, Tn., 27th-29th Jan.1997, Paper 58. 627

**DEVELOPMENT AND DEMONSTRATION OF MODULAR FRP DECK FOR BRIDGE CONSTRUCTION AND REPLACEMENT**

Lopez-Anido R; GangaRao H V S; Trovillion J; Busel J West Virginia,University; US,Army Corps of Engineers; SPI,Composites Institute

(SPI,Composites Institute)

A partnership of academia, state and federal agencies and the composites industry has developed a system intended to replace deteriorated concrete bridge decks with

modules made of non-corroding composite material. Deck modules are designed with enhanced cross-section and fibre architecture. Testing prototypes and field demonstration decks are fabricated by VARTM and by pultrusion. Two bridge demonstration projects are planned to be constructed. The composite deck system is expected to be utilised to replace aged concrete decks, to construct new bridge decks, and to build all-composite short-span bridges. 1 ref.

USA

Accession no.665435

Item 311

International Composites Expo '97. Conference proceedings.

Nashville, Tn., 27th-29th Jan.1997, Paper 37. 627

**NEWLY DEVELOPED FLEXIBLE VINYL ESTER RESIN WITH AIR DRYING**

Aoki T; Tanaka K; Arakawa K; Noamaguchi K

Hitachi Chemical Co.Ltd.

(SPI,Composites Institute)

A newly-developed vinyl ester resin mainly used for concrete overlay is described. The surfaces of concrete structures such as building roof, floor and drainage in food processing plants and chemical plants are damaged by water, boiling water, corrosive detergents, disinfectants and other chemicals. Therefore, the surfaces must be protected by resin overlay. Traditionally, the matrix resins used for this application have been unsaturated polyester and vinyl ester resins with air drying additives, which are mainly paraffin wax. However although the paraffin wax improves the surface curing property of these resins, it often involves a delamination between intermediate layer and top-coat in the overlay. The problem of this delamination is solved by developing a flexible vinyl ester resin with air drying property (developed FVE). The resin also has optimum chemical resistance, mechanical and curing properties compared with a conventional unsaturated polyester and vinyl ester resins. 1 ref.

JAPAN

Accession no.665424

Item 312

International Composites Expo '97. Conference proceedings.

Nashville, Tn., 27th-29th Jan.1997, Paper 27. 627

**TOM'S CREEK BRIDGE REHABILITATION AND FIELD DURABILITY STUDY**

Lesko J J; Weyers R E; Duke J C; Hayes M D; Howard J N; Witcher D E; Barefoot G; Formica R I Gomez J; Villalba E; Volgyi J F J

Virginia Tech; Morrison Molded Fiber Glass Co.;

Virginia,Transportation Research Council;

Virginia,Dept.of Transportation

(SPI,Composites Institute)

Questions concerning the long-term durability of composites in the infrastructure prohibit their routine use in present designs. A central obstacle to answering these questions lies in the complex interaction of stress, time, temperature and environmental exposure. Furthermore, the sheer number of possible combinations of fibre and matrix systems disallows a universal generalisation of durability for composites in all environments and applications. Thus, the team formed by Virginia Tech, the Town of Blacksburg, Morrison Molded Fiber Glass, the Virginia Transportation Research Council and the Virginia Department of Transportation have approached the durability problem by examining the specific performance of a composite structural box I beam in the Tom's Creek Bridge. This experimental programme aims to properly implement the structural shape in this small bridge and to develop a field site monitoring program which will assist in advancing a predictive methodology for composite performance in the infrastructure. 14 refs.

USA

Accession no.665413

*Item 313*

International Composites Expo '97. Conference proceedings.

Nashville, Tn., 27th-29th Jan.1997, Paper 23. 627

**STRENGTHENING OF CONCRETE STRUCTURES - STATE OF THE ART AND FUTURE NEEDS**

Emmons P H; Vaysburd A M; Thomas J; Vadovic M  
Structural Preservation Systems Inc.  
(SPI,Composites Institute)

Deterioration, increased load-carrying requirements, inadequate design or construction errors are some of the main reasons for repair and strengthening of existing concrete structures. Historically, conventional strengthening techniques such as section enlargement, post-tensioning and steel plate bonding were used to address these problems. But in some cases, these methods are not viable due to constraints imposed by durability, constructibility and aesthetics limitations. New needs require new technical solutions. Emphasis is placed on strengthening using externally applied CFRPs. Along with being lightweight and having a very high strength-to-weight ratio, CFRP has the benefits of being non-corrosive and highly resistant to chemicals. To date, a few testing methods for bond strength between FRP and existing concrete have been suggested, but these are tests which can be carried out under controlled laboratory conditions. Their applicability to in-situ conditions is very questionable. The results of an in-situ bond testing programme used to determine the applicability of proposed tensile and shear bond strength testing techniques are described. The programme was performed at the Hollidaysburg Waste Water Treatment Plant in Pennsylvania. 6 refs.

USA

Accession no.665409

*Item 314*

International Composites Expo '97. Conference proceedings.

Nashville, Tn., 27th-29th Jan.1997, Paper 22. 627

**MCKINLEYVILLE BRIDGE: CONSTRUCTION OF CONCRETE DECK REINFORCED WITH FRP REBARS**

Kumar S V; Thippeswamy H K; GangaRao H V S  
West Virginia,University  
(SPI,Composites Institute)

McKinleyville Bridge is the first vehicular bridge in the USA with a concrete deck reinforced with FRP rebars. The construction of this bridge was completed and opened to traffic in October 1996. Some of the first-hand experience in handling and placement of FRP bars in concrete deck have been presented in this paper. The light weight of FRP rebars is attractive for construction crew in terms of easy handling and placement. It is recommended that leather gloves are used to avoid bruises and itching caused by fibres. Other issues like spacing of chairs for FRP mesh and flotation of FRP rebars while vibrating wet concrete are addressed. Improper construction practices and adverse weather conditions while casting the concrete bridge deck can cause excessive shrinkage and thermal cracks in the deck. Moreover in FRP reinforced concrete, unlike steel, once these cracks are formed, they can greatly enhance in their size due to lower modulus of elasticity of FRP bars. Hence, it is necessary to reconsider some of the precautionary measures to minimise cracking in concrete deck. 6 refs.

USA

Accession no.665408

*Item 315*

International Composites Expo '97. Conference proceedings.

Nashville, Tn., 27th-29th Jan.1997, Paper 21. 627

**FRP GRIDS FOR REINFORCED CONCRETE: INVESTIGATION OF FIBRE ARCHITECTURE**

Engel R S; Bakis C E; Nanni A; Croyle M  
Pennsylvania,State University  
(SPI,Composites Institute)

The manufacture and performance of fibre reinforced plastic (FRP) grids used in reinforced concrete are described. Composite manufacturing methods, such as fibre placement and closed moulding, easily lend themselves to the production of structures with intricate shapes and contours such as the grid or lattice structures used in reinforced concrete panels. Continuous carbon fibres are impregnated with vinyl ester resin and placed via filament winding into a mould to form a two-dimensional grid. Once filled, the mould is closed and the part cured under low temperature and pressure. During filament winding, fibre placement is controlled such that two general types of layer architectures at the grid joints are obtained: cross ply, i.e. alternating unidirectional tapes without fibre connectivity between layers, and weaves

with fibre connectivity between adjacent layers. The influence of fibre architecture on the grid stiffness and the ability of the grid to transmit loads is studied using stand-alone tensile tests and pull out tests. While the magnitudes of the joint strength and post damage stiffness vary little for the two different architectures, the damage progression, characterised by permanent damage via shear displacement of a transverse grid element for a given load, is lower for the cross-ply joint. 8 refs.

USA

Accession no.665407

*Item 316*

International Composites Expo '97. Conference proceedings.

Nashville, Tn., 27th-29th Jan.1997, Paper 20. 627

**AGEING OF GLASS FIBRE COMPOSITE REINFORCEMENT**

Porter M L; Mehus J; Young K A; O'Neil E; Barnes B A  
Iowa State University; Reinertsen Engrg.Ans; Moore W.P.,& Associates Inc.; US,Army; Black & Veatch (SPI,Composites Institute)

Over the last ten years, fibre-reinforced plastic (FRP) reinforcement, such as glass, carbon or aramid fibers embedded in a resin, such as vinyl ester, epoxy or polyester, has emerged as a promising solution to the deterioration problem caused by the corrosion of steel reinforcement in structural concrete. However, before FRP reinforcement can become a commonly used construction material, more knowledge about the short-term load-carrying capabilities, physicomechanical characteristics and long-term weathering performance must be determined. The high pH of the concrete porewater creates a potentially damaging environment for the FRP reinforcement, and there is a strong need for long term durability studies of different fibres and resin systems that may be used in this application. This short-term need for long-term weathering data has necessitated the development of analytical techniques such as accelerated ageing as a supplement to real-time weathering testing. A study of accelerated ageing effects on commercially available FRP reinforcement for regular and prestressed concrete is carried out, simulating approximately 50 years of real-time ageing. Specimens tested include CFRP and GRP tendons for prestressed applications, and GRP reinforcement for non-prestressed applications. The specimens are exposed to an ageing solution with a high pH (simulating a concrete environment) and an elevated temperature to accelerate the ageing process. The specimens are tested both unloaded and under constant load (stress rupture and stress corrosion) and results compared to control specimen properties. 9 refs.

USA

Accession no.665406

*Item 317*

International Composites Expo '97. Conference proceedings.

Nashville, Tn., 27th-29th Jan.1997, Paper 18. 627  
**CONSTRUCTABILITY ASSESSMENT OF FRP REBARS**

Holman Dietz D; Harik I E  
Kentucky,University  
(SPI,Composites Institute)

One potential solution to the corrosive deterioration of reinforced concrete bridge decks in harsh environments is to use FRP rebars rather than conventional epoxy coated steel rebars. A concern with the use of FRP rebars to reinforce concrete bridge decks is the behaviour of the material during construction. Changes in construction techniques from conventional methods using steel rebars might be required due to the lightweight and flexibility of the FRP rebar. To assess the characteristics of FRP rebars during construction two bridge decks were built as slabs on grade. One of the slabs is reinforced with FRP rebars and constructed using plastic ties and chairs. The other deck was built using conventional epoxy coated steel rebars and epoxy coated steel construction materials. Comparisons between construction procedures and material behaviour during the construction of the two decks are made. Results of the study show that decks reinforced with the different material types can be constructed using similar procedures. Observations show that some of the problems encountered during the construction were due to the flexibility and strength of the plastic chairs and plastic ties used. These problems can be overcome by using epoxy coated steel ties and epoxy coated steel chairs during construction.

USA

Accession no.665404

*Item 318*

International Composites Expo '97. Conference proceedings.

Nashville, Tn., 27th-29th Jan.1997, Paper 6. 627

**DESIGN AND CONSTRUCTION OF FRP PEDESTRIAN BRIDGES: REOPENING POINT BONITA LIGHTHOUSE TRAIL**

Johansen G E; Wilson R J; Roll F; Garrett Gaudini P; Gray K  
E.T.Techtonics Inc.  
(SPI,Composites Institute)

The construction of two GRP truss bridges in Golden Gate National Recreation Area, San Francisco, are investigated. The two bridges, 10.7 m and 21.4 m in length, are constructed using E.T. Techtonics' new lightweight GRP building system (Longspan Prestek). The system is constructed using glass fibre/isophthalic polyester resin channels and tubes. The case study addresses the structural concerns involving seismic issues and extreme wind conditions, the use of camber and X-bracing in the design to increase overall strength and stiffness, difficult site constraints which had to be overcome in the erection of the bridges and the overall advantages derived in using the Longspan Prestek System in comparison to traditional

structural systems such as wood, steel and concrete in a marine environment of this type. The aesthetic considerations in the overall design of the bridges are also evaluated, i.e. the use of camber and the colour white for the bridges, and the resulting visual image in the Marin Headlands landscape. 11 refs.

USA

Accession no.665392

*Item 319*

International Composites Expo '97. Conference proceedings.

Nashville, Tn., 27th-29th Jan.1997, Paper 5. 627

**DESIGN AND EVALUATION OF MODULAR FRP BRIDGE DECK**

Lopez-Anido R; Gangarao H V S; Vedam V; Overby N  
West Virginia,University  
(SPI,Composites Institute)

The characterisation of a modular fibre reinforced polymer (FRP) composite bridge deck designed with hexagonal cross-sectional shape and multi-axial fibre architecture is discussed. The FRP H-deck is modelled and designed using an engineering approach. Static and fatigue test results of FRP H-decks are reported. A finite element model of the FRP deck is correlated with experimental data. The design limit states of FRP decks for highway bridges are presented. The design of FRP H-decks is controlled by deflection limit states. 1 ref.

USA

Accession no.665391

*Item 320*

International Composites Expo '97. Conference proceedings.

Nashville, Tn., 27th-29th Jan.1997, Paper 3. 627

**FIBRE-REINFORCED COMPOSITE DECKS FOR INFRASTRUCTURE RENEWAL - RESULTS AND ISSUES**

Karbhari V M; Seible F; Hegemier G A; Zhao L  
California,University  
(SPI,Composites Institute)

Based on their high strength- and stiffness-to-weight ratios, corrosion resistance, environmental durability and inherent tailorability, fibre reinforced polymer composites are being increasingly considered for use in infrastructure renewal. One area of potential application of these materials is in the fabrication of lightweight bridge decks that can be deployed in uses ranging from the replacement of deteriorating decks, to the erection of completely new superstructure. Test results from an ongoing investigation relating to the use of composite bridge deck components are discussed. Issues related to manufacturing, overall durability and joining are also described. 2 refs.

USA

Accession no.665389

*Item 321*

International Composites Expo '97. Conference proceedings.

Nashville, Tn., 27th-29th Jan.1997, Paper 2. 627

**DESIGN AND CONSTRUCTION OF LIGHTWEIGHT FRP WORK PLATFORM FOR USE AT OYSTER CREEK NUCLEAR POWER PLANT**

Wilson R J; Johansen G E; Ribble S; Fogle A  
E.T.Techtonics Inc.  
(SPI,Composites Institute)

The design and fabrication of a motorised GRP platform span, to be used to facilitate the refuelling process in a nuclear power plant, are examined. The pultruded structural system is mounted on motorised steel trucks and incorporates additional mechanical and electrical subsystems, for use by workers servicing the reactor core. 4 refs.

USA

Accession no.665388

*Item 322*

International Composites Expo '97. Conference proceedings.

Nashville, Tn., 27th-29th Jan.1997, Paper 1. 627

**TWO FEDERAL AGENCIES EXPERIMENT WITH COMPOSITE BRIDGES: CASE STUDIES ON ACCEPTANCE OF COMPOSITE MATERIALS**

Mandigo G  
GHL Inc.  
(SPI,Composites Institute)

The US Federal Highway Administration (FHWA) and the US Forest Service (USFS) both recently began experimenting with composite pedestrian bridges. The Federal Lands Highway Office (FLHO) of the FHWA initiated in June 1996 an effort to assess composite materials for bridge design and construction in an effort to promote the use of innovative technology and materials. A new pedestrian span along the George Washington Parkway in Washington, DC was selected for a demonstration project because of its relative low risk, small size, and overall low cost. A principal FLHO objective for the project was gaining an internal design capability for composite structures to better service client agencies, such as the National Park Service, that are already using composite bridges. The USFS experimental effort also resulted from increased interest in composite bridges by USFS trail managers. Rather than selecting a flagship bridge project, the USFS initiated a broader based research effort to evaluate composite structures, including those already in service. The UM emphasis was again on developing an internal capability to work with the new materials. Certain common elements from these applications case studies offer lessons to the composites industry. Bridge engineers respond best to their own customers; composite suppliers must equip agency

engineers to work with composite materials (e.g. application focused design guides, software); and low-risk structures present a near-term mechanism to introduce composite materials.

USA

Accession no.665387

*Item 323*

Polyurethanes World Congress '97. Conference proceedings.  
Amsterdam, Netherlands, 29th Sept.-1st Oct.1997,  
p.192-9. 43C6

**POLYURETHANE RIGID FOAM, PROVEN HIGH PERFORMANCE BUILDING MATERIALS**

Demharter A

Puren-Schaumstoff GmbH

(SPI,Polyurethane Div.; ISOPA)

PUs are high molecular weight polymers based on the polyaddition of a polyfunctional hydroxyl group containing compounds and polyisocyanates. A wide variety of properties can be tailored to fulfil the requirements of different applications: soft to hard, plastic, elastic or thermoset, compact or foamed. Compared with other insulating materials, rigid PU foam is highly competitive. There are five product-related advantages: low thermal conductivity, high mechanical and chemical properties at both high and low temperatures, all major international fire safety requirements can be satisfied, the ability to form sandwich structures with various facer materials and the new generation is CFC-free and recyclable. Rigid PU foams perform well in most areas of building and industrial applications. Products in density ranging from approximately 30 to 200 kg/cub.m withstand temperatures from -200 deg.C to + 130 deg.C and high mechanical stress. Typical applications are refrigerated vehicles and container construction, road and rail tankers, vessels for refrigerated cargo, pipelines, liquid gas tanks for LPG and LNG, radomes or towers for aerial installations and cryogenic wind tunnels. Structural applications and corresponding properties of the rigid foams used are presented. 5 refs.

EUROPEAN COMMUNITY; EUROPEAN UNION; GERMANY;  
WESTERN EUROPE

Accession no.665097

*Item 324*

Polyurethanes World Congress '97. Conference proceedings.  
Amsterdam, Netherlands, 29th Sept.-1st Oct.1997,  
p.159-61. 43C6

**THREE YEARS' EXPERIENCE WITH PENTANE POLYURETHANE RIGID FOAM FOR METAL PANELS**

Fryn W

Fischer Profil GmbH

(SPI,Polyurethane Div.; ISOPA)

The CFC ban has forced the PU industry to find alternative blowing agents. Production lines have had to be adapted and approved accordingly. Pentane has been considered as an alternative for CFCs, HCFCs and HFCs for manufacturing PU rigid foams as was first introduced into the commercial production of metal-faced sandwich elements in 1994. As a result of the high flammability of pentane, production facilities have to be re-equipped. Long-term experience has shown that pentane offers a technical, economical and ecological alternative. The handling of pentane-blown raw material systems, as well as the necessary technical changes of the manufacturing facilities, is described. The mechanical properties are compared with metal-faced panels containing CFC. Three years' experience with pentane in the sandwich metal panel field are summarised.

EUROPEAN COMMUNITY; EUROPEAN UNION; GERMANY;  
WESTERN EUROPE

Accession no.665092

*Item 325*

Polyurethanes World Congress '97. Conference proceedings.  
Amsterdam, Netherlands, 29th Sept.-1st Oct.1997,  
p.152-8. 43C6

**EVALUATION OF HFC-245FA AND PENTANES IN POLYISOCYANURATE AND POLYURETHANE LAMINATED PANEL RIGID FOAM FORMULATIONS**

Rossitto F C; Adam N

Bayer Corp.; Bayer AG

(SPI,Polyurethane Div.; ISOPA)

The laminated panel industry in both the USA and Europe has successfully converted from CFCs to alternative blowing agents. The US markets championed HCFC-141b, while the European markets concentrated on pentane. Since the production and use of HCFCs will be phased out worldwide by the year 2020, all alternative non-chlorinated blowing agents with zero ozone depletion potential (ODP) and low global warming potential (GWP) need to be evaluated to determine which are best suited for different rigid foam applications. It is crucial to develop products which meet these stringent criteria to ensure the continued growth of the PU rigid foam industry. Emphasis is placed on HFC-245fa and the normal, iso-, and cyclo-isomers of pentane. As was experienced with the conversion from CFC-11 to HCFC-141b, there are many potential technical challenges associated with blowing agent conversion. These challenges need to be explored by experimentation to ensure a smooth transition into the next generation of blowing agents. A comparative study is presented of HFC-245fa and HCFC-141b blowing agents in polyisocyanurate and PU rigid foam systems currently using HCFC-141b. Full-scale panels are processed on a pilot-scale laminator and tested for end-use properties. 5 refs.

EUROPEAN COMMUNITY; EUROPEAN UNION; GERMANY;  
USA; WESTERN EUROPE

Accession no.665091



*Item 326*

Polyurethanes World Congress '97. Conference proceedings.  
Amsterdam, Netherlands, 29th Sept.-1st Oct.1997,  
p.27-35. 43C6

**INDUSTRIAL EXPERIENCES WITH CO2  
BLOWN POLYURETHANE FOAMS IN  
MANUFACTURE OF METAL FACED  
SANDWICH PANELS**

Ottens A; Keller P; Vreys M; Bertucelli L  
Dow Deutschland Inc.; Dow Benelux NV; Dow Italia  
SpA  
(SPI,Polyurethane Div.; ISOPA)

Metal faced sandwich elements with a PU foam core are mainly used in building as insulating cladding or roofing panels, and in food preservation for construction of cold stores and assembly of reefers. In Europe, most of the PU foams used in these industries employ HCFCs as blowing agents. Time for phasing out HCFCs is approaching fast, as a result of the oncoming strengthening of EC regulation of ozone depleting substances (ODS), and some national regulations already limiting the marketplace for HCFC-containing products. Dow offers the metal faced sandwich panel industry a range of ODS-free PU technologies for producing CO<sub>2</sub>, HFC-134a and hydrocarbons blown foam both with continuous and discontinuous processes. HFC-245fa and HFC-365mfc are now being sampled in significant quantities by the industry, and are subject to extensive evaluation. They will be commercially available only in the years 2000-2003. An additional point of concern to the industry is how new EC fire classification would change the cost elements in favour of one or the other blowing technologies. Industrial experience with CO<sub>2</sub> water blown PU foams in the metal faced sandwich panel production is described. Proper design of the formulation has allowed to match reactivity, rise and rise rate profile, flow properties and very nearly the curing behaviour of the current HCFC blown foams; resulting in the processing behaviour required by the sandwich panel industry. Details are given. 6 refs.

EUROPEAN COMMUNITY; EUROPEAN UNION; GERMANY;  
ITALY; NETHERLANDS; WESTERN EUROPE

*Accession no.665079*

*Item 327*

Polyurethanes World Congress '97. Conference proceedings.  
Amsterdam, Netherlands, 29th Sept.-1st Oct.1997,  
p.22-6. 43C6

**POLYISOCYANURATE MODIFIED RIGID  
FOAMS FOR CONTINUOUS PRODUCTION OF  
LAMINATE BOARD**

Calgua E; Schmidt H-U; Abend E; Schroeder N;  
Muehlberg R  
Elastogran GmbH; Bauder P.,GmbH  
(SPI,Polyurethane Div.; ISOPA)

Laminate board is currently produced with PU systems containing n-pentane or mixtures of n-pentane with isopentane as blowing agent. HCFCs are also still being used. However they are only an interim solution to the phaseout of CFCs. Hydrocarbons, such as n-pentane, isopentane and cyclopentane, meet the requirements regarding environmental safety, processing, ageing, insulation and availability. For these reasons, the above mentioned hydrocarbons have been used in various PU applications for some years. However, in order to pass the corresponding fire classes, for example B2 according to DIN 4102, formulations with high amounts of flame retardants are in use. Therefore, it has become necessary to find new solutions for formulations capable of meeting the requirements regarding flame retardancy with lower amounts of flame retardants. BASF/Elastogran has developed PIR formulations with halogen free flame retardants based on new polyols for the production of pentane blown PIR laminate board. They are based on polyester polyols, especially developed for the above mentioned application. They have reduced levels of halogen free flame retardants; however, they maintain the same flame retardancy. The processing of the new PU formulations is comparable to conventional PU systems. Processing properties of the foam, such as core curing and adhesion, are comparable with conventional PU foams. However, the values of dimensional stability are superior to those of the former systems.

EUROPEAN COMMUNITY; EUROPEAN UNION; GERMANY;  
WESTERN EUROPE

*Accession no.665078*

*Item 328*

***Journal of Composites Technology & Research***

19, No.4, Oct.1997, p.205-13

**EFFECTS OF ENVIRONMENTAL EXPOSURE  
ON FIBRE-REINFORCED PLASTIC  
MATERIALS USED IN CONSTRUCTION**

Chin J W; Nguyen T; Aouadi K  
US,National Institute of Standards & Technology

Details are given of the characterisation of chemical and physical changes in polymeric matrix resins following exposure to UV radiation, moisture, temperature and high pH environments. Data are given for polyvinyl ester and isophthalate polyesters. Changes in strength, viscoelastic response, and thermal properties were evaluated by tensile testing, dynamic mechanical thermal analysis, and DSC. 20 refs.

USA

*Accession no.664736*

*Item 329*

***Revue Generale des Caoutchoucs et Plastiques***

No.749, April 1996, p.31-4

French

**STUDY OF THE AGEING OF PVC PROFILES**

Morel P; Gervat L; Delprat P; Gaumet S; Lemaire J

Elf Atochem SA; Elf Aquitaine; Centre National d'Evaluation de Photoprotection

The photodegradation of pigmented PVC window frame profiles was studied by accelerated ageing tests under different conditions. The influence of stabilisers (lead/barium/cadmium and calcium/zinc systems) and impact modifiers on degradation rate and yellowing was investigated. Formulations containing calcium/zinc stabilisers showed reduced photooxidation compared to those stabilised with lead/barium/cadmium systems, while the degree of yellowing was extremely low and similar for both stabiliser systems. 5 refs.

EUROPEAN COMMUNITY; EUROPEAN UNION; FRANCE; WESTERN EUROPE

Accession no.663522

Item 330

**Journal of Thermal Insulation**

Vol.21, Oct.1997, p.137-52

**IMPACT RESISTANCE OF POLYURETHANE FOAM ROOFS AGAINST HAIL**

Kashiwagi D T; Pandey M K  
Arizona,State University

An analysis is presented of the resistance of different types of sprayed polyurethane foam (SPF) roof systems. This research identifies factors affecting the resistance of the SPF roof systems to hail damage; hail resistance characteristics of the SPF roofs near freezing temperatures; use of the 'information theory' to modify and add decision-making information to the Factory Mutual Class I, Severe Hail (FM-SH) test; and differences in hail resistance of SPF roofs and recommendations for expanding the FM-SH test. 21 refs.

USA

Accession no.662819

Item 331

**Plastics in Building Construction**

21, No.9, 1997, p.4-7

**FIRE ASSESSMENT**

Hirschler M M  
GBH International

The management of a restaurant in a jurisdiction which uses the Standard Building Code, managed by SBM (Southern Building Codes Conference) wished to replace part of the laminate material used as interior finish or trim by a new material, chosen because of its improved appearance and ease of maintenance. A local manufacturer had been contracted to carry out the replacement, which would involve a certain amount of trim at various locations, within the public area of the cafeteria. A fire safety analysis was conducted to determine whether the replacement of part of the existing wall finish trim by the proposed thermoplastic trim material would make a significant contribution to increased fire hazard. The analysis considered the following aspects: heat release required for flashover, radiant ignition of a nearby

fuel, potential heat released by the thermoplastic trim, contribution of the thermoplastic trim to smoke layer temperatures and freeburn analysis, with and without the thermoplastic trim. All the analyses conducted suggested that the addition of 10% thermoplastic trim has a minor effect on the fire safety of the environment, and that this effect is small compared to the effect of the products already present in the cafeteria. It was recommended that the use of the thermoplastic trim should be allowed, and the local code official agreed. 8 refs.

USA

Accession no.662221

Item 332

**Journal of Vinyl and Additive Technology**

3, No.3, Sept.1997, p.200-4

**FOURIER TRANSFORM INFRARED MICRO SPECTROSCOPY MAPPING. APPLICATIONS TO THE VINYL SIDING INDUSTRY**

Garcia D; Black J  
Elf Atochem NA

Applications of FTIR microspectroscopy mapping to the vinyl siding industry were examined. Particular attention was paid to determination, in single mapping experiments, of the compositional changes associated with capstock to substrate transition and to evaluation of the degradation species and level observed during weathering exposure throughout the thickness of the siding panel. 4 refs.

USA

Accession no.661984

Item 333

**Advanced Materials News**

No.101, Nov.1997, p.5

**COOLING TOWERS WARM TO STRUCTURAL PLASTICS**

From its beginnings less than a decade ago, the use of composites in cooling towers has grown into a high-volume business. Composites are now moving into some of the biggest structures of their kind. Over 1,000 ft in length, and 54 ft wide, the Barrick Goldstrike Mine tower, which was completed in 1997 in Nevada, is the largest in the world to use structural composites throughout. Traditionally, the bulk of such a structure would be made in wood, but project engineers opted for structural plastic because of shorter lead times and quicker installation. Also, even though wood is cheaper, composites are more attractive when long-term durability and maintenance costs are taken into account. Some composites are also naturally flame resistant, which in the case of wood can only be achieved with expensive post-treatment. Most industrial or power plant cooling towers are designed to return water back to the process loop. In the case of the mining tower the reasons were purely environmental. The hot water coming out of the Nevada operation had to be cooled before being discharged into a nearby river. Details are given.

BEDFORD REINFORCED PLASTICS INC.  
USA  
*Accession no.661767*

*Item 334*

**Advanced Materials News**

No.101, Nov.1997, p.1-2

**CARBON FIBRE ROLLS ON...**

The industry is reported to have commenced with a few technical demonstration projects, notably along the US West Coast. These have soon given way to smallscale commercial contracts, which in turn have recently led to carbon fibre composites being used in some of the biggest renovation jobs of their kind. Throughout industry, carbon fibre plastics are still synonymous with high tech aerospace and premium sports goods. The fact that this material is being used at all in heavy-duty concrete renovation, let alone formed the basis for a potentially huge-volume business, has surprised many. Some of the latest contracts are already beginning to stretch the industry's supply capacity. In the USA, a team of contractors recently chose carbon fibre rather than steel to renovate a major structure in Oklahoma City. Claimed to be the biggest contract of its kind in the US, renovation of the Myriad Convention Center will use up to 35,000 sq.m of carbon fibre overwrap to reinforce large areas of concrete that no longer meet current design codes on shear and flexural strength. Details are given.

XXSYS TECHNOLOGIES INC.  
USA

*Accession no.661766*

*Item 335*

**China Rubber Industry**

44, No.11, 1997, p.670-4

Chinese

**NR BEARING AND ITS APPLICATION TO ANTI-EARTHQUAKE OF BUILDINGS**

Guang L

South China, Tropical Crops Products Res.Inst.

The structure, design parameters, processing technology, new progress in application and research, and anti-earthquake mechanisms of NR bearings are introduced. It is proposed that the NR bearing is more effective than the strengthening element to protect the buildings and the people in the buildings. 8 refs.

CHINA

*Accession no.661734*

*Item 336*

**Macplas International**

No.9, Aug. 1997, p.68

**VENTILATED ROOFS**

The insulation of ventilated roofs by the use of rigid polyurethane foam panels is examined. Polyurethane panels are compatible with all materials used for waterproofing, and are also suitable for use over metal external roofing

elements to provide summer comfort. An example of ventilated metal roof coverings used for the Centro Alimentare Piceno at San Benedetto del Tronto is noted.

EUROPEAN COMMUNITY; EUROPEAN UNION; ITALY;  
WESTERN EUROPE

*Accession no.660568*

*Item 337*

**European Adhesives & Sealants**

14, No.3, Sept.1997, p.24/8

**50 YEARS OF THE UK CONSTRUCTION SEALANT INDUSTRY**

Collins D

The development of sealants for building applications is described, from oleoresinous mastics and polysulphide sealants, through to acrylics, PUs and silicones. By far the top performer is the silicone sealant. Product benefits include exceptional thermal stability, excellent weathering capabilities, and superior bond strength and adhesion to a wide variety of substrates. A guide to a selection of Dow Corning Hansil's silicone sealants is given.

DOW CORNING HANSIL LTD.

EUROPEAN COMMUNITY; EUROPEAN UNION; UK;  
WESTERN EUROPE

*Accession no.654646*

*Item 338*

**Plastics News(USA)**

9, No.21, 21st July 1997, p.4

**OHIO CHRISTENS 1ST ALL-COMPOSITE BRIDGE**

Renstrom R

It is reported that short-span polymer-matrix composite bridges entering service in Ohio and Idaho may give Martin Marietta Materials an entree to transportation and infrastructure markets. Butler County in Ohio this week plans to open a permanent replacement for a concrete bridge on a two-lane road over a creek in Hamilton. A prototype span is scheduled for use in Idaho beginning in early August. In each case, Martin Marietta is supplying the bridge without charge. Mechanical and optical fibre devices will monitor material performance and provide a base line for future structures. An opening ceremony for 'Ohio's first all-composite vehicle bridge' is set for July 1997. A civil engineering company has dealt with site details, including substructure and railings. Details are given.

MARTIN MARIETTA MATERIALS INC.

USA

*Accession no.654454*

*Item 339*

**Plastics News(USA)**

9, No.24, 11th Aug.1997, p.7

**GROUP SEEKS BROADER PS INSULATION MARKET**

Urey C

An expanded market for foamed PS insulation will open up if an industry group succeeds. The Washington-based Foamed Polystyrene Alliance, a business unit of the SPI, is asking building code organisations to approve the use of expanded and extruded PS foam insulation for direct application on steel roof panels. For years, building codes have dictated that foamed PS insulation be separated from a steel roof by an impermeable barrier - often gypsum. The alliance hopes by removing the need for a barrier, foamed PS insulation will become a less expensive and more attractive option for steel roofing. Fire codes do not require barriers with thermoset foams like polyisocyanurate when applied as insulation directly to steel roofs. The codes are based on results from a flame-spread test method that uses a small-scale model of a building, but FPSA has argued that tests using larger-scale buildings be used because they more accurately depict the fire performance of PS in actual applications. The larger-scale tests show the insulating panels meet fire performance standards according to the FPSA. Details are given.

FOAMED POLYSTYRENE ALLIANCE; SPI  
USA

*Accession no.653699*

*Item 340*

Reprint (Exteriors, Summer 1987), pp.6. 28cms. 4/7/97

**SBS MODIFIED BITUMENS**

Blanchard W K; Daniels P; Perini J

Tamko Asphalt Products Inc.; Shell Chemical Co.

The development of styrene-butadiene-styrene modified bitumens for roofing applications is examined. These materials have evolved to meet the waterproofing, strain energy and fatigue criteria necessary for modern building design, and this paper concentrates in particular on the use of Kraton SBS/asphalt blends with multiple reinforcement layers. These systems have good load bearing capabilities and help to dissipate strain energy while maintaining waterproofing integrity, even in the face of extreme roof movements. Information is presented on load strain, service temperature intervals, fatigue resistance, surfacing, installation, and design options.

USA

*Accession no.653526*

*Item 341*

**Injection Molding**

5, No.8, Aug. 1997, p.62/9

**BUILDING AND CONSTRUCTION. MARKET FOCUS**

Sloan J

The use is described of vinyl injection moulded plastic parts in construction and building applications. It is stated that moulders looking for opportunities in this market should be seeking applications for ancillary parts and components such as endcaps, top pieces and corners,

particularly on fences, decks, windows and doors. Market shares of moulding materials are indicated. In addition, product announcements are included for tools used in the construction and building industries, which use moulded plastics. These include a cordless nailer made from impact-modified nylon 66, a polyacetal tap, a gas assist moulded roof for a revolving shed, a moulded PVC patio door, and faux brick and stone siding in PP.

USA

*Accession no.652387*

*Item 342*

**Modern Plastics International**

27, No.10, Oct.1997, p.41-2

**PROCESS MAKES "WOOD" FROM SCRAP FILM AND WASTE PAPER**

Moore S

The Cooperative Research Centre for Polymers, Australia, has developed a process that combines PE film scrap and cellulose fibres from waste paper to produce alternatives to timber-based building materials. The Centre has found a method that enables the rapid wetting and dispersion of fibres in plastic, allowing continuous compounding of large amounts of fibres and plastics. The newsprint/PE composite, with paper content of 60-80%, has similar appearance, density and mechanical properties to hardboard.

COOPERATIVE RESEARCH CENTRE FOR  
POLYMERS

AUSTRALIA

*Accession no.652336*

*Item 343*

**European Adhesives & Sealants**

14, No.2, June 1997, p.16

**SAVING THE OLD WITH THE NEW**

Ford P

Ciba Specialty Chemicals Ltd.

Ciba Polymers has assisted in the repair of the ancient Egyptian temple of Luxor with the use of its Araldite adhesive. The temple is one of the most significant and best preserved examples of XVIII Dynasty work. However, soils settlement was causing 22 of the sandstone columns to lean precariously, and there was a danger that the entire court area would eventually collapse. Ciba collaborated with ISMES, a company specialising in restoration work, and Egyptian contractors ORASCOM, to save the temple. Initial consolidation of the 13 m columns was achieved by the injection of Araldite 2011 and Araldite 2015 into gaps in the stonework. Weak elements were reinforced by using stainless steel bars, bonded inside the stone with low-viscosity Araldite LY554/HY956.

ISMES SPA

EGYPT; EUROPEAN COMMUNITY; EUROPEAN UNION;  
ITALY; UK; WESTERN EUROPE

*Accession no.651771*

*Item 344*

Watford, 1997, pp.3. 12 ins. 28/8/97.

**UNIBOND PLASTERING PVA ADHESIVE AND PRIMER**

British Board of Agreement; Henkel Home Improvement & Adhesive Agreement Board. Certificate 97/3321

The use and performance of Unibond plastering PVA adhesive and primer is described. It is a modified one-part polyvinyl acetate emulsion containing a minimum of 39% solids which is mixed with water. Unibond is used as a bonding agent for gypsum plaster in dry service conditions. Its characteristics and installation are detailed.

EUROPEAN COMMUNITY; EUROPEAN UNION; UK; WESTERN EUROPE

*Accession no. 650992*

*Item 345*

Polyurethanes Expo '96. Conference Proceedings. Las Vegas, Nv., 20th-23rd Oct. 1996, p.439-47. 43C6

**INFLUENCE OF TEMPERATURE ON COMPRESSIVE PROPERTIES AND DIMENSIONAL STABILITY OF RIGID POLYURETHANE FOAMS USED IN CONSTRUCTION**

Burns S B; Singh S N; Bowers J D  
ICI Polyurethanes  
(SPI, Polyurethane Div.)

The compression properties of rigid, closed-cell PU and polyisocyanurate foams used as thermal insulation in building applications were measured over a wide range of temperatures in three orthogonal directions. The data were fitted into a model based on fundamental material parameters, and the relationship between dimensional stability and compression strength in an anisotropic foam was examined. Foams expanded with CFC, HFC, HCFC and hydrocarbon blowing agents were evaluated, resulting in a methodology for predicting field performance under a wide variety of environmental exposure conditions. 18 refs.

USA

*Accession no. 649922*

*Item 346*

**Kunststoffe Plast Europe**

87, No.7, July 1997, p.16-7

**SANDWICH ELEMENTS FOR PASSIVE FIRE PROTECTION**

Friedl W

A laminated construction of metal outer layers, PU adhesive and mineral wool provides sandwich elements with good fire resistance. These elements can be produced continuously and hence cost-effectively on a further developed twin-belt conveyor unit originally designed for PU sandwich elements.

SIEMPELKAMP HANDLING SYSTEME GMBH & CO.

EUROPEAN COMMUNITY; EUROPEAN UNION; GERMANY; WESTERN EUROPE

*Accession no. 648054*

*Item 347*

**Plastics and Rubber Weekly**

No.1701, 29th Aug. 1997, p.3

**PVC PUSHED OUT IN LONGEVITY SOLUTION**

PTFE-coated glass fibre is being used on the canopy for the Millennium Dome at Greenwich peninsula instead of the PVC coated polyester originally specified. The announcement was made in the light of the Government decision to extend the life of the dome structure to at least 25 years.

NEW MILLENNIUM EXPERIENCE CO.

EUROPEAN COMMUNITY; EUROPEAN UNION; UK; WESTERN EUROPE

*Accession no. 647996*

*Item 348*

Utech Asia '97. Conference proceedings.

Suntec City, 18th-20th Feb. 1997, Paper 40. 43C6

**POLYURETHANES CORED COMPOSITE PANELS: SOLUTIONS FOR TODAY'S CONSTRUCTION PROBLEMS**

Rosbotham I D; Evans D A C  
ICI Polyurethanes

Edited by: Reed D; Ward S

(Crain Communications Ltd.; Rapra Technology Ltd.)

The requirements of commercial and industrial buildings with respect to energy conservation and fitness for purpose remain the same in all regions of the world. European construction trends have been influenced by costs and environmental pressures. Cost savings in the form of reduced energy requirements have led to a 30% reduction in carbon dioxide emissions. The stringent requirements now laid down for commercial and industrial buildings with respect to energy conservation has led the trend towards factory engineered PU cored composite panels meeting ISO 9000 standards and away from on site built up panels employing mineral fibre as the core insulant. Composite panels do not display the problems normally associated with built up systems, namely interstitial condensation, insulation failure, complex construction and air leakage. As a result buildings constructed using the built up technique employing mineral fibre are likely to have a poor thermal performance, a particular risk of interstitial condensation and are unable to provide for flexibility of use should the need arise in the future. PU foam cored composite panels are characterised by integrity in manufacture which results in no gaps or missing components, giving consistent insulation and vapour barriers. For both continuous and discontinuous production methods, ICI Polyurethanes has made available systems meeting the requirements of the Montreal Protocol. Details are given.

SINGAPORE

*Accession no. 645371*

*Item 349*

Utech Asia '97. Conference proceedings.  
Suntec City, 18th-20th Feb.1997, Paper 37. 43C6  
**GLOBAL CONSTRUCTION - LOCAL ISSUE**

Sewell R

Dow Benelux NV

Edited by: Reed D; Ward S

(Crain Communications Ltd.; Rapra Technology Ltd.)

The global market for insulation products in the construction industry has experienced a tremendous period of growth over the past decades as customers demand ever increasing temperature control - from warming or cooling of their homes through water, pipe and district heating to fresh produce in the supermarket. At the same time the cost and environmental acceptability of excessive energy use have become more and more of an issue. PU, due to its versatility and high efficiency, has become a major player in this market. This versatility has allowed PU to fit a wide variety of applications from pipe insulation to cold stores; from reefer insulation to on-site spray foam insulation. Local requirements, whether due to regulations and/or conventions, have resulted in the need for different blowing agent, foam properties, insulation thickness and method of application. Some of these differences are highlighted, focusing on foam manufacturing applications, such as discontinuous panel (DCP), double band lamination (DBL) and pipe insulation with special relevance to the Asia Pacific region. 2 refs.

EUROPEAN COMMUNITY; EUROPEAN UNION;  
NETHERLANDS; WESTERN EUROPE

*Accession no.645368*

*Item 350*

Utech Asia '97. Conference proceedings.  
Suntec City, 18th-20th Feb.1997, Paper 35. 43C6  
**INNOVATIVE SANDWICH PANEL PLANTS**

Taverna M; Spanio G

Cannon Group

Edited by: Reed D; Ward S

(Crain Communications Ltd.; Rapra Technology Ltd.)

'Polyurethane panels' is a general term covering a wide family of products that can be very different for application, aspect, composition and properties. The progressive replacement of CFCs with different blowing agents proposes different alternatives, to be chosen in accordance with the main properties required. Some recent developments in the manufacturing technologies most commonly used to produce the various configurations of rigid-faced panels available on the market are highlighted, with especial emphasis on the automatic manufacture of large panels for reefers (insulated containers). Recent developments from Cannon allowing for the use of liquid carbon dioxide in continuous and discontinuous applications are also illustrated: increasing interest is demonstrated amongst the panel producers towards the use of this safe and inexpensive blowing method.

EUROPEAN COMMUNITY; EUROPEAN UNION; ITALY;  
WESTERN EUROPE

*Accession no.645366*

*Item 351*

Utech Asia '97. Conference proceedings.  
Suntec City, 18th-20th Feb.1997, Paper 34. 43C6  
**RIGID PU FOAM FOR CONSTRUCTION AND ASIA PACIFIC**

Lang R

Bayer AG

Edited by: Reed D; Ward S

(Crain Communications Ltd.; Rapra Technology Ltd.)

The PU industry has recently experienced tremendous growth, especially in rigid foam and its applications in the construction sector. CFC has been successfully replaced and, at the same time, regulations for energy consumption have become more stringent in order to protect natural resources and the environment. In view of this, rigid foam for construction has acquired a more important role than ever due to its excellent and unique combination of thermal insulation and mechanical properties. In the western hemisphere, rigid PU foam has made rapid inroads into construction markets during the last few decades. Now it is due to grow strongly in Asian markets as well in order to complete the refrigeration chain, conserve valuable energy and improve standards of living. Details are given.

EUROPEAN COMMUNITY; EUROPEAN UNION; GERMANY;  
WESTERN EUROPE

*Accession no.645365*

*Item 352*

High Technology Composites in Modern Applications.  
Symposium proceedings.  
Corfu, 18th-22nd Sept.1995, p.241-7. 627

**INNOVATIVE APPLICATIONS OF COMPOSITE MATERIALS IN CONSTRUCTION**

Triantafillou T C

Patras,University

(Patras,University)

Two innovative applications of fibre reinforced plastics in construction are presented. First, the concept of strengthening existing structures, especially monument-type masonry, with unidirectional composite laminates, in the form of either externally attached unbonded tendons or strips epoxy-bonded to the facades of masonry buildings, is presented. An innovative concept for hybrid beams made of GRP box profiles, combined with a layer of concrete in the compression zone and a CFRP laminate bonded to the tension zone, are described, resulting in cost-effective composite parts with pseudo-ductile characteristics and high stiffness and strength properties. 7 refs.

EUROPEAN COMMUNITY; EUROPEAN UNION; GREECE;  
WESTERN EUROPE

*Accession no.645056*

*Item 353*

Polyurethanes Expo '96. Conference Proceedings.  
Las Vegas, Nv., 20th-23rd Oct.1996, p.343-8. 43C6  
**SPRAYED POLYURETHANE FOAM ROOFING:  
OVERCOMING AESTHETIC BARRIERS**  
Smith T L; Dupuis R M  
US,National Roofing Contractors Association;  
Structural Research Inc.  
(SPI,Polyurethane Div.)

An examination is made of factors influencing the acceptance of sprayed PU foam roofing systems, including surface irregularities, discolouration, degradation, moisture absorption, mechanical damage and blistering. Some procedures for overcoming these problems are put forward. 11 refs.

US,NATIONAL ROOFING FOUNDATION  
USA

*Accession no.643074*

*Item 354*

Polyurethanes Expo '96. Conference Proceedings.  
Las Vegas, Nv., 20th-23rd Oct.1996, p.2-7. 43C6  
**DEVELOPMENT OF A SUSTAINABLE  
ROOFING SYSTEM: SPRAY POLYURETHANE  
FOAM**  
Benedict D; Mergner A; Knowles M  
SPI; Stepan Co.  
(SPI,Polyurethane Div.)

The advantages of sprayed PU foam roofing systems in terms of energy efficiency, environmental impact and durability are discussed. 13 refs.

USA

*Accession no.643025*

*Item 355*

Antec 97. Volume III. Conference proceedings.  
Toronto,27th April-2nd May 1997,p.3588-92. 012  
**FOURIER TRANSFORM INFRARED MICRO  
SPECTROSCOPY MAPPING. APPLICATIONS  
TO VINYL SIDING INDUSTRY**  
Garcia D; Black J  
Elf Atochem North America Inc.  
(SPE)

Fourier transform IR (FTIR) spectroscopy is a powerful analytical technique capable of yielding high quality information with a spacial resolution as low as 10 microns. When coupled with an automated mapping stage, it can offer unique evaluation capabilities. A number of applications of FTIR spectroscopy mapping to the vinyl siding industry are described. Examples focus on determining, in single sample mapping experiments, the compositional changes associated with capstock to substrate transition and evaluating the degradation species and level observed during weathering exposure throughout the thickness of the siding panel. 4 refs.

USA

*Accession no.639927*

*Item 356*

Antec 97. Volume III. Conference proceedings.  
Toronto,27th April-2nd May 1997,p.3554-9. 012  
**EFFECT OF EXTRUSION CONDITIONS ON  
RIGID PVC FOAM**  
Rabinovitch E B; Isner J D; Sidor J A; Wiedl D J  
Geon Co.  
(SPE)

There is a growing demand for rigid vinyl foam as a wood replacement in window frames, blind trimming and other applications. While rigid PVC foam has existed for many years, additional understanding of its processability and required conditions for good quality extruded profile would be invaluable. The effect of extrusion conditions, such as melt temperature, screw speed, and drawdown on process morphology of rigid vinyl foam and the properties of the extruded profile, including density, cell structure and surface appearance are examined. 15 refs.

USA

*Accession no.639922*

*Item 357*

Antec 97. Volume III. Conference proceedings.  
Toronto, 27th April-2nd May 1997, p.3136-40. 012  
**THERMOPLASTIC COMPOSITE FROM  
RECYCLED PLASTIC AND WOOD FLOURS**  
Pramanik P K; Dickson W  
Canuck Compounders Inc.  
(SPE)

An investigation is undertaken for the preparation of thermoplastic composites by incorporating wood flour (WF) into recycled plastic. Post-industrial recycled PP (RPP) is used as the plastic matrix phase. Four different compatibilisers (Cs) are used to improve the adhesion between the polymer matrix and dispersed WF. The property of the prepared composites is found to depend on the loading of WF and the WF/C compositions. The melt viscosity of prepared composites is increased. The addition of compatibilisers registers improvement in mechanical properties of some composites. One of the WF/C compositions is effective in significantly improving tensile strength and flexural modulus, respectively, 24% and 134% of RPP matrix. This improvement in properties is believed to be due to the increase in interfacial adhesion. 10 refs.

CANADA

*Accession no.639845*

*Item 358*

Antec 97. Volume III. Conference proceedings.  
Toronto, 27th April-2nd May 1997, p.3128-34. 012  
**CREEP BEHAVIOUR OF COMMERCIALY  
PRODUCED PLASTIC LUMBER**  
Van Ness K E; Nosker T J; Renfree R W; Sachan R D;  
Lynch J K; Garvey J J  
Washington & Lee,University; Rutgers,University  
(SPE)

Short-term creep tests are performed upon samples of lumber manufactured from recycled plastics by four different companies. In addition, stress-strain tests are carried out at various rates of strain over shorter intervals of time in comparison with the duration of the creep tests. A simple model uses data from the strain-rate tests to calculate creep strain as a function of time. Calculated values are in good agreement with experimental creep data. The results are examined in terms of morphological features. The feasibility of finding a method to calculate long-term creep properties is discussed. 3 refs.

USA

Accession no.639844

*Item 359*

Antec 97. Volume III. Conference proceedings.  
Toronto, 27th April-2nd May 1997, p.3091-7. 012

**FOAMED THERMOPLASTIC LUMBER  
PRODUCED FROM RECYCLED COMPUTER  
AND BUSINESS MACHINE HOUSINGS**

Malloy R A; Maffeo C; Parasnis S  
Lowell,Massachusetts University  
(SPE)

Plastics materials are widely used in the building and construction industry, in both virgin and recycled format. In recent years, there has been a growing interest in the use of waste or recycled thermoset material as the feed stream for the production of lumber-like plastic products. The specific material formulation and degree of mixing used in production will determine the properties of the plastic lumber. Properties such as toughness, moisture, corrosion resistance, rigidity, creep resistance at various temperatures, specific gravity, dimensional stability, flammability, surface quality, colour, assembly characteristics and cost are all important factors. The performance of business machine housing lumber as compared to the more conventional HDPE and pressure-treated wood lumber is evaluated. 13 refs.

USA

Accession no.639837

*Item 360*

**Plastics in Building Construction**

21, No.2, 1997, p.2-3

**MILLIONS OF SQUARE YARDS (OR SQUARE  
METERS) OF PLASTICS BEING USED FOR  
BARNs**

This article discusses the use of plastics in the construction of greenhouse dairy barns, reporting that over a million yards of PE film, nearly a million of polyolefin netting, and several kilometres of PVC pipe have been put in place already.

PENNSYLVANIA,UNIVERSITY; ATLAS AMERICA  
INC.; AET SPECIALTY EXTRUDED PROFILES;  
INTERNET; TENSAR

USA

Accession no.639600

*Item 361*

**Pitture e Vernici**

73, No.9, May 1997, p.20/6

Italian; English

**ROLE OF SILICONES IN CONSTRUCTION  
PROTECTION**

Garcin E

Rhone-Poulenc Chimie

This paper discusses the use of silicone in the protection of the facades of buildings from water penetration. It looks at the causes and consequences of damp, polysiloxane water repellents, silicone paint coatings, impregnation, and emulsion for paints. 6 refs.

EUROPEAN COMMUNITY; EUROPEAN UNION; FRANCE;  
WESTERN EUROPE

Accession no.639528

*Item 362*

**Plastics News(USA)**

9, No.8, 21st April 1997, p.3/24

**ARIZ. BAN TARGETS PLASTIC PIPE**

Toloken S

The move to ban plastics piping in buildings over three storeys high by Arizona plumbers, is discussed. Lobbyists for plumbers claim the law will not hurt the plastic pipe industry because fire code restrictions currently limit the use of plastics in taller buildings. The Uniform Plumbing Code does not prohibit pipes in taller buildings, but requires that they can handle expansion. Plastics industry officials hope to convince a new statewide plumbing commission to allow plastic pipes when it begins to implement the law which requires that municipalities adopt the Uniform Plumbing Code by August 1, 1998.

USA

Accession no.637852

*Item 363*

**Journal of Thermal Insulation**

Vol.20, April 1997, p.278-96

**VARIATIONS IN AIRTIGHTNESS OF HOUSES  
CONSTRUCTED WITH POLYETHYLENE AND  
ADA AIR BARRIER SYSTEMS OVER A THREE-  
YEAR PERIOD**

Proskiw G; Eng P

Proskiw Engineering Ltd.

Periodic airtightness test were carried out on twenty-four new residential houses over a three-year period to evaluate their air barrier systems and to search for air barrier degradation. Ten of the houses were constructed with PE air barriers while the remainder used an early version of the Airtight Drywall Approach (ADA). 10 refs.

CANADA

Accession no.637411

*Item 364*

Antec 97. Volume I. Conference proceedings.



Toronto, 27th April-2nd May 1997, p.1171-5. 012

**STEEL GIRDER REHABILITATION THROUGH ADHESIVE BONDING OF COMPOSITE MATERIALS**

Gillespie J W; Mertz D R; Edberg W M; Ammar N  
Delaware, University  
(SPE)

A complete system approach to the rehabilitation of degraded steel bridge girders through the adhesive bonding of composite materials is presented and demonstrated. The flexural characteristics of steel bridge girders are shown to be improved through testing of various reinforcement schemes on scale steel sections and testing of a selected scheme on corroded bridge girders taken out of service. Applications to bridge girders with corrosion damage and fatigue crack damage are demonstrated. 3 refs.

USA

Accession no.636814

Item 365

**International Polymer Science and Technology**

23, No.12, 1996, p.T/46-51

**ROOFING AND DAMP-PROOFING MATERIALS BASED ON ELASTOMERS**

Spektor E M

Research and experimental studies are reviewed on roll-type roofing and damp-coursing materials based on elastomers (RRDPMEM) and plastics. 62 refs. Translation of *Kauchuk i Rezina*, No.3, 1996, p.37

CARLISLE SINTEX SYSTEMS

JAPAN

Accession no.635176

Item 366

**Plastics World**

55, No.5, May 1997, p.8

**GE EXHIBIT TO EMPHASISE WEATHERABLE PLASTICS**

Miller B

GE Plastics' exhibit at NPE will include foul weather simulation including thunderstorms and winter blizzards in order to demonstrate its portfolio of weatherable plastics. The materials consist of grades of Geloy ASA, Valox thermoplastic polyester, Xenoy PC/PBT alloys and Cyclocac for applications such as building siding, automotive exteriors, and outdoor telecommunications equipment. The company's display areas will contain four demonstration areas featuring automotive, computer and information technology, building and construction. A simulated assembly line with three vehicles in various stages of construction will be included, which will focus on the use of thermoplastics for exceptionally large automotive parts. Brief descriptions are given of new products slated for introduction at the show.

GE PLASTICS

USA

Accession no.634973

Item 367

**Japan Chemical Week**

38, No.1927, 29th May 1997, p.4-5

**APPLICATION FIELDS EXPANDING STEADILY; CLOSER ATTENTION ON HOUSING APPLICATION**

The growth of the adhesives industry in Japan is discussed with particular reference to the automotive and construction industries. Trends in the car industry involve the cutting of costs and the need to provide a competitive product by the development of high performance products which can provide added value. Renovation of houses provides the largest demand for adhesives, it is claimed, with particular demand for adhesives for use with wood. Problems relating to emission from adhesives in air-tight rooms are discussed.

JAPAN

Accession no.634849

Item 368

**Progress in Rubber and Plastics Technology**

13, No.1, 1997, p.56-76

**RECYCLING OF PVC SUPERMARKET TRAYS INTO RIGID FOAM EXTRUSIONS**

Thomas N L; Quirk J P; Cretney H

European Vinyls Corp.(UK) Ltd.

Recycled PVC supermarket trays have been used successfully in production-scale trials to make the foamed layer in coextruded cladding. The extruded product had satisfactory foam density, foam structure and colour. Impact properties were better than those of the control made from virgin PVC: this is attributed to the high levels of impact modifier used in tray formulations. These trials demonstrated that PVC straight-on trays can be recycled into foamed extrusions for wood replacement products. 8 refs.

EUROPEAN COMMUNITY; EUROPEAN UNION; UK; WESTERN EUROPE

Accession no.634092

Item 369

**Journal of Reinforced Plastics & Composites**

16, No.5, 1997, p.414-24

**BUILDING OF A COMPOSITE TRANSMISSION TOWER**

Hsein-Yang Yeh; Yang S C

California, State University

The feasibility of building a transmission tower from a composite E-glass/vinyl ester resin material was investigated. The tower was fabricated using pultrusion. Instead of using the conventional fastener method to join the cross members to the leg members, the design team used a slip joint developed by Goldsworthy Engineering. The lamina of the leg member and the cross bracing were tested and compared with two analytical failure criteria, the Yeh-Stratton criterion and the quadratic (strain space)

criterion. In addition to ply failure analysis, full-scale tower tests were performed at the Electrical and Power Research Institute. 5 refs.

GOLDSWORTHY ENGINEERING INC.;  
ELECTRICAL POWER RESEARCH INSTITUTE  
USA

Accession no.632837

Item 370

**New and Advanced Materials**

No.3, 1996, p.3-29

**COMPOSITE MATERIALS USING LOCAL RESOURCES**

Gupta T N

United Nations Industrial Development Organizat.

A detailed report is presented on the research, development and application of composite materials for low-income group mass-housing in developing countries. The two broad categories of composites which have potential for wide application in buildings are discussed, i.e. natural fibre-polymer/cement composites (based mainly on locally available fibres (sisal, jute, mesta, cotton, coir, flax, kenaf) and a polymer (polyester, epoxy, urea-formaldehyde) or cement as matrix), and particulate/aggregate composites, based mainly on inorganic wastes and by-products (fly ash, slag, mine tailings, lime sludges, by-product gypsum, red mud) and a hydraulic binder (cement or lime pozzolana). Details are given of resources and composites, physical and mechanical properties, pilot plant data and their potential for commercialisation. The problems of technological developments and constraints in popularising the use of composites in housing, which must be addressed by planners and builders, are also considered. 42 refs.

INDIA

Accession no.632473

Item 371

**Modern Plastics Encyclopedia**

73, No.12, Nov.1996, p.A28-9

**GROWING OPPORTUNITIES FOR PLASTICS IN WORLD CONSTRUCTION MARKETS**

Roman R H

Roman R.H.,& Associates

In North America about 7 million tons of plastics are now consumed in building and construction applications and this is projected to grow to 9 million tons by 2000. With close to a 50% share, PVC continues to be the major plastic used in this sector in North America. Next in volume are the thermosets used mainly for bonding plywood, particleboard and GRP. Remodeling accounts for about 20% of all construction dollars and is one of the fastest growing segments of the construction industry.

NORTH AMERICA

Accession no.632210

Item 372

**Reinforced Plastics**

41, No.4, April 1997, p.72/8

**BRIDGES ARE BEST AT SPI**

Details of composite bridge projects featured on many stands at the ICE 97 exhibition in Nashville in January and one of them picked up the Counterpoise grand design award. The winner was a 7.1m long road bridge comprising of composite panels made from 60% polyester resin and 40% reinforcement, bonded to a composite honeycomb core. An award in the electrical/electronic category went to Zehrco Plastics' roadway lighting system which consists of components made from SMC. Other projects included stairwells and hand rails, a vehicle drive shaft, aircraft seats, tools, a truck cab roof, bicycles and an innovative leg socket prosthetic.

USA

Accession no.630318

Item 373

**Chemical Week**

159, No.12, 26th March 1997, p.28

**BOOM IN BUILDING**

Kemezis P

Sales of adhesives and sealants in the US construction sector are running at a strong pace. Owners of buildings built during the mid-1980s tend to be turning more to high-durability silicone sealants for renovation jobs to get results lasting up to 20 years. One key area of product development in both silicones and PUs is aesthetics. Dow Corning has been marketing a high-performance silicone that uses surface modification chemistry to prevent seepage into porous substrates that can cause discolouration. Bostik's ChemCalk 916 is a "textured" PU product which blends in with wood siding and cement finishes.

USA

Accession no.630264

Item 374

Bristol, 1995, pp.50. 12ins. 25/2/97.

**ONE-PIECE TANKS**

Dewey Waters Ltd.

The range of insulated GRP water storage tanks from Dewey Waters is described, and also GRP modular building systems. Technical specifications are given for the products which comply with the requirements of the DHSS and Byelaw 30. The water tanks are moulded in one piece with integral steel reinforcement, and insulated with foam which is overlaminated with GRP.

EUROPEAN COMMUNITY; EUROPEAN UNION; UK;  
WESTERN EUROPE

Accession no.629867

Item 375

**Modern Plastics International**

27, No.3, March 1997, p.31-2

**INFRASTRUCTURE CONTINUES TO OFFER  
SIZEABLE OPPORTUNITIES**

Grande J A

Demand for composites is being buoyed by new opportunities emerging in building and repairing infrastructures. Significant advancements have been made in composite reinforcing bars for concrete. Owens Corning's Advantex glass fibre is claimed to set a standard for enhanced heat and corrosion resistance. PPG Industries has introduced a needled-mat reinforcement to replace roving in SMC applications. In automotive applications, the 77kg cab roof of the Kenworth Class 8 heavy truck is compression moulded using low-pressure, low-profile polyester SMC from Alpha/Owens Corning.

SPI, COMPOSITES INSTITUTE

USA

*Accession no. 628896*

*Item 376*

Journal of the Adhesive and Sealant Council. Volume 2. Fall 1996. Conference proceedings.

San Francisco, Ca. 3rd-6th Nov. 1996, p.309-45. 6A1

**OVERVIEW OF CHEMISTRY OF WINDOW  
GLAZING SYSTEMS**

Krysiak G

Tremco Inc.

(US, Adhesives & Sealants Council)

In order for windows to continue functioning effectively, both the seal between the glass and the sash and the seal between the sash and the rest of the building structure must remain intact in spite of exposure to the elements, such as temperature cycling, driving rain and UV light exposure. Products used in maintaining these seals are butyl based. The chemistry and formulations of butyl glazing tapes and sealants and their application are addressed, commencing with a discussion of butyl glazing tapes. 3 refs.

USA

*Accession no. 626511*

*Item 377*

Journal of the Adhesive and Sealant Council. Volume 2. Fall 1996. Conference proceedings.

San Francisco, Ca. 3rd-6th Nov. 1996, p.295-308. 6A1

**CONSTRUCTION ADHESIVES**

Benjamin L; Lassiter B

ChemRex Inc.

(US, Adhesives & Sealants Council)

Construction adhesives may be used in the manufacture and assembly of factory built homes, modules or components such as doors, cabinets, all designated for building. The total construction adhesive market volume is estimated to be 1.4 billion US dollars and 3.4 lb pounds of solids. With the lower interest rates of the past few years, the housing industry market has been steady, at

about 1.1-1.4 million residential housing starts and steady, 1-3% growth in total commercial construction. With increased interest and new applications for adhesives, growth in the construction adhesives has been about 3%, growing from 1.1 billion US dollars in 1986 to 1.4 billion US dollars in 1995. The adhesives used in a range of construction adhesives categories are examined.

USA

*Accession no. 626510*

*Item 378*

Journal of the Adhesive and Sealant Council. Volume 2. Fall 1996. Conference proceedings.

San Francisco, Ca. 3rd-6th Nov. 1996, p.181-95. 6A1

**HANSHIN-AWAJI GREAT EARTHQUAKE IN  
1995: OBSERVATION ON ITS DAMAGE TO  
CONSTRUCTION SEALING MATERIALS IN  
DISASTER AREA**

Kobayashi S

Hitachi Kasei Polymer Co. Ltd.

(US, Adhesives & Sealants Council)

A devastating earthquake with a magnitude of 7 occurred in January 1995 in the Hanshin area of Japan. This earthquake, known as the Great Hanshin Awaji Earthquake, struck directly below the surface and its severity caused serious damage to more than 1,500,000 buildings and private homes. The number of lives lost exceeded 5,500, thus making this disaster the worst Japan has suffered in the past fifty years. The Hanshin area, located in the western part of Japan, is filled with both urban housing and buildings reflecting modern industrialisation. This area is home to various big cities, heavy industry, an international harbour and various buildings (including, but not limited to both high-rise buildings and authentic Japanese housing). Shortly after this terrible disaster, the Japan Sealant Industry Association (JSIA) was able to carry out field surveys on the sealants used in those buildings which suffered damage. The main purpose of these field surveys was to receive information which may contribute to future sealant technology regarding damage to buildings, especially earthquake damage. Field surveys were conducted in co-operation with the Hyogo prefecture government as well as with support the JSIA team received from the Support Committee for Damage Assessment of Buildings (Japanese Ministry of Construction). Details are given.

JAPAN

*Accession no. 626503*

*Item 379*

Journal of the Adhesive and Sealant Council. Volume 2. Fall 1996. Conference proceedings.

San Francisco, Ca. 3rd-6th Nov. 1996, p.161-80. 6A1

**CASES OF ADHESIVE BONDING AT 1995  
GREAT HANSHIN-AWAJI EARTHQUAKE  
DISASTER**

Matumoto H; Enomoto S; Yonezawa A; Sugimori H;  
Kurihara T  
Cemedine Co.Ltd.; Konishi Co.Ltd.; Tilement Corp.;  
Sunstar Engineering Inc.; Sho-Bond Chemical Co.Ltd.  
(US,Adhesives & Sealants Council)

The 1995 Great Hanshin-Awaji Earthquake which took place in January 1995, in the southern part of Hyogo Prefecture in Japan, was an urban earthquake of magnitude 7.2, and affecting extremely populated cities like Kobe, Ashiya and Nishinomiya. It was such a disaster that recorded the death toll exceeding 5,000, thoroughly destroying the urban functions of the area. This report describes the cases of adhesive bonding in the 1995 Great Hanshin-Awaji Earthquake. The situations of disaster and damage are described, focusing on adhesive bonding for construction, cite examples of repair and remodelling, and emphasising the need for development of better aseismatic adhesives, and for improvement of adhesive bonding processes. 5 refs.

JAPAN

Accession no.626502

Item 380

*Journal of Vinyl and Additive Technology*

2, No.4, Dec.1996, p.304-309

**FOAMED RIGID VINYL FOR BUILDING PRODUCTS**

Schipper P S; Black J; Dymek T  
Elf Atochem North America

PVC foamed building products have seen good growth recently because of favourable properties and economics. Market trends, advantages, raw material considerations, processing methods and parameters and final physical properties of these materials are discussed. 12 refs.

EUROPE-GENERAL; USA

Accession no.625210

Item 381

*Journal of Materials Science*

32, No.1, 1st Jan.1997, p.147-56

**DURABILITY OF COMPOSITE REHABILITATION SCHEMES FOR CONCRETE: USE OF A PEEL TEST**

Karbhari V M; Engineer M; Eckel D A  
San Diego,University of California

A modified peel test was used to evaluate the durability of the bond between concrete and composites under five different environmental exposure regimes. Two different epoxy resins were used with glass and carbon fibre reinforcement. Differences in peel force and interfacial fracture energies based on material and environmental influences are discussed and modes of failure are presented. 41 refs.

USA

Accession no.623175

Item 382

Leverkusen, 1989, pp.2. 12 ins. 19/2/96.

**INNOVATIONS IN THE MANUFACTURE OF ROOF WINDOWS. BAYER 110 - THE ENGINEERING MATERIAL**

Bayer AG

The use is described of Baydur 110 as an engineering material in the production of roof windows. The microcellular polyurethane material, in a composite construction with glass, polycarbonate or polymethyl methacrylate, is shown to provide all the necessary properties such as durability, thermal insulation, weathering resistance, whilst facilitating economical production and simple assembly.

COMICO SRL

EUROPEAN COMMUNITY; EUROPEAN UNION; GERMANY; ITALY; WESTERN EUROPE

Accession no.623123

Item 383

SPI Composite Institute 51st Annual Conference. Conference proceedings.

Cincinnati, Oh., 5th-7th Feb.1996. Paper 20-E. 627

**CONSTRUCTION OF MULTI-CELLULAR FIBRE-REINFORCED PLASTIC BUILDING**

GangaRao H V S; Lopez-Anido R; Williams D L; Winegardner T

West Virginia,University; Creative Pultrusions Inc. (SPI,Composites Institute)

A large scale, multi-cellular reinforced plastic (RP) structure, intended for use as a multi-purpose facility by West Virginia Department of Transportation, Division of Highways, is constructed. It will also house equipment for installation and maintenance of pavement markings and signs. The main design requirements are non-corrosiveness, low maintenance, fast erection and environmental durability. The entire RP wall system is constructed using multi-cellular panels connected with wide flange sections. All RP sections are made of E-glass fibres and polyester resin, and were manufactured by Creative Pultrusions. The procedure for assembly of wall modules, erection techniques, construction difficulties, and cost evaluation of the R-P building are presented, outlining construction issues pertaining to the assembly and erection of the building. Basic concerns of contractors regarding time required for construction and potential difficulties are discussed based on experience gained. A realistic assessment of RP construction and a comparison with conventional construction are presented. This application unveils the potential of RP cellular panels for building construction.

USA

Accession no.621956

Item 384

SPI Composite Institute 51st Annual Conference. Conference proceedings.

Cincinnati, Oh., 5th-7th Feb.1996. Paper 7-C. 627

**APPLICATIONS AND PERFORMANCE OF SANDWICH PANEL COMPOSITES FOR TRANSPORTATION FACILITIES**

Gentry T R

Catholic University of America  
(SPI,Composites Institute)

Sandwich panel composites manufactured for use in the transportation industry are introduced. Core and skin architectures available for the production of composite sandwich panels are reviewed. The structural performance of roadplates, composite sandwich panel plates used to cover roadway excavations, is discussed. The results of static and fatigue testing of 60 in. x 72 in. roadplates are presented. The purpose of the tests was to demonstrate fatigue life of the roadplates and to determine the ultimate mechanisms of fatigue failure. Static overload capacity is shown to be 190% of static H-20 loading. Fatigue performance shows that the composite roadplates are capable of resisting 538,000 cycles of H-20 wheel loading. The end of service life corresponds to a significant and instantaneous loss in stiffness and reduction in load capacity. At the end of service life, post-damage displacement and load capacity are significant; the composite plate continues to resist loading well beyond the onset of skin damage. 6 refs.

USA

Accession no.621929

*Item 385*

SPI Composite Institute 51st Annual Conference.  
Conference proceedings.

Cincinnati, Oh., 5th-7th Feb.1996. Paper 7-B. 627

**DESIGN OF ADVANCED COMPOSITE MATERIAL SPACE FRAME SYSTEM**

Johansen G E; Wilson R W; Roll F; Olson N; Morrison C; Sweet R D

E.T.Techtonics Inc.; Creative Pultrusions Inc.  
(SPI,Composites Institute)

Covering over one-third of an acre at Creative Pultrusions, the proposed design of the world's largest advanced composite material (ACM) space frame canopy system demonstrates the structural possibilities of ACM as a major building material. The stringent design criteria posed interesting structural problems for the design team. A three-dimensional computer model using STAAD3 was developed and evaluated to determine the above structural members. The feasibility of the design and proposed construction of a prototype space frame bay at Creative Pultrusions is investigated. 10 refs.

USA

Accession no.621928

*Item 386*

SPI Composite Institute 51st Annual Conference.  
Conference proceedings.

Cincinnati, Oh., 5th-7th Feb.1996. Paper 3-C. 627

**THERMOSET POLYMER PERFORMANCE UNDER HARSH ENVIRONMENTS TO EVALUATE GLASS COMPOSITE REBARS FOR INFRASTRUCTURE APPLICATIONS**

Altiser S D; Vijay P V; GangaRao H V S; Douglass N; Pauer R

West Virginia,University; Reichhold Chemicals Inc.  
(SPI,Composites Institute)

Corrosion of steel bars in concrete infrastructure facilities such as bridges, buildings, marine constructions and chemical plants is a serious problem. Various solutions have been tried in the past to counter the threat of corrosion in steel bars by using epoxy coatings, cathodic protection, increased concrete cover thickness and use of polymer concrete. None of the measures have provided a long term solution. The US Department of Transportation estimates the cost of repairing deteriorated infrastructure facilities to be billions of dollars. GRP) bars have the potential to replace steel bars in concrete structures due to their superior mechanical and chemical properties such as non corrosiveness, non magnetic properties, high strength and light weight. The accelerated tests conducted on 13mm and 19mm E-glass fibre reinforced bars, manufactured with different durable resins, to evaluate the effect of environmental factors are described. 3 refs.

USA

Accession no.621918

*Item 387*

SPI Composite Institute 51st Annual Conference.  
Conference proceedings.

Cincinnati, Oh., 5th-7th Feb.1996. Paper 3-B. 627

**FRP GRIDS REINFORCE AND CORRUGATED SHEETS ROOF SALT STORAGE FACILITY**

Goodspeed C H; Cronin D; Henry R M; Thibodeau K

New Hampshire,University; Harvey Construction  
(SPI,Composites Institute)

Highway departments are facing tighter budgets and more stringent environmental regulations pertaining to salt storage. Highway departments are considering innovative alternatives to store road salt. The use of fibre reinforced plastics (FRP) to reinforce concrete components and a hyperbolic paraboloid, hyper, roof to build a storage facility is described. The FRP consisted of a two-dimensional grid manufactured with carbon and glass fibres in a vinyl ester matrix. The hyper roof is field fabricated using 20 gauge metal corrugated sheets to span 61 feet with no supporting frame.

USA

Accession no.621917

*Item 388*

**Plast' 21**

No.49, Feb.1996, p.64-5

Spanish

**BUILDING APPLICATIONS: SAFETY COMES INTO PLAY**

Applications of plastics in vandalproof and earthquake resistant glazing and of EVA elastomers in flame resistant flooring are examined. Materials developments by Atohaas, BASF, Bayer and GE Plastics are reviewed.

GE PLASTICS; GE SILICONES; ACTUAL MASCHINENBAU AG; ROTO FRANK AG; ATOHAAS; BASF AG; BAYER AG  
AUSTRIA; EUROPEAN COMMUNITY; EUROPEAN UNION; GERMANY; ITALY; NETHERLANDS; USA; WESTERN EUROPE

*Accession no.621161*

*Item 389*

**Materials World**

4, No.11, Nov.1996, p.634-6

**BUILDING A REPUTATION: WOOD-LIKE PRODUCTS FROM POLYSTYRENE**

Shaughnessy H  
Extrudawood Ltd.

Extruded polystyrene products that replicate the look and performance of wood are being made by Extrudawood Ltd. using recycled and virgin polystyrene. These products are designed for use in the building and furniture industries. The products are described in terms of costs, processing and properties.

EUROPEAN COMMUNITY; EUROPEAN UNION; UK; WESTERN EUROPE

*Accession no.618483*

*Item 390*

**Reinforced Plastics**

41, No.1, Jan.1997, p.6

**REINFORCED POLYMER HONEYCOMB CORES MAKE BRIDGES LIGHT AND STRONG**

Kansas Structural Composites has developed a process for creating strong, low-cost, lightweight composite structures by adapting cardboard geometry and manufacturing techniques to create fibre-reinforced polymer honeycomb (FRPH) cores. The first full-scale demonstration of this technique took place last year with the successful installation of a 7m long FRPH composite bridge over No-Name Creek in Kansas. About 30% of the bridge weight was fabricated from recycled plastics.

KANSAS STRUCTURAL COMPOSITES INC.  
USA

*Accession no.618193*

*Item 391*

**Advanced Materials News**

No.82, April 1996, p.6-8

**SCALING NEW HEIGHTS**

Pultruded composites are creating new trends in metal replacement across the industrial spectrum. This

comprehensive article discusses the latest trends and developments in the use of reinforced plastics as a construction material.

MMFG

USA

*Accession no.617698*

*Item 392*

**Plastics News International**

Dec.1996, p.14

**CSIRO REPORT DELIVERS FACTS ON PVC**

A new study released by the CSIRO has concluded that the adverse environmental effects of using PVC in building products are very small and no greater than those for other materials. The article supplies details of the report's findings.

CSIRO

AUSTRALIA

*Accession no.617665*

*Item 393*

**Journal of Reinforced Plastics & Composites**

15, No.12, Dec.1996, p.1194-216

**EFFECT OF ENVIRONMENTAL EXPOSURE ON EXTERNAL STRENGTHENING OF CONCRETE WITH COMPOSITES - SHORT TERM BOND DURABILITY**

Karbhari V M; Engineer M  
California, University

The pressing need for rehabilitation and retrofit strategies that encompass new and emerging materials and technologies, results from the need to simultaneously repair existing structures while attempting to increase both their performance levels and life spans. A large number of techniques currently exist for strengthening highway bridges ranging from the use of external post-tensioning to the addition of epoxy bonded steel plates to the tension surface. The use of composite plates for the purpose of external reinforcement has considerable potential. However, there is a critical need to investigate the degradation of the composite-concrete interface after exposure to environmental conditions that include moisture, sea water, freezing and freeze-thaw. The effect of five different environmental conditions on the performance of plated beams is considered from aspects related to materials and durability. It is shown that the selection of the appropriate resin system is critical to success, and the dangers of selecting systems with low glass transition temperatures and drastic drops in instantaneous modulus as a function of temperature are discussed. Two different resin systems are compared using the same fibrous reinforcement and an overall view of durability at the concrete-composite interface is elucidated. 28 refs.

USA

*Accession no.617572*

*Item 394*

**SAMPE Journal**

32, No.6, Nov/Dec.1996, p.23-31

**3D-KNITTED FABRICS FOR SANDWICH PANELS**

Philips D; Verpoest I  
Leuven,Catholic University

Three-dimensional knitted fabric preforms can provide a cost-effective alternative for existing sandwich structures. Additionally, they also provide a cheap and easy way to produce complex double-curved surfaces. This was not possible until recently, or was difficult to achieve with the more common sandwich panels. The excellent deformability of 3D knitted fabrics is a direct result of the looped structure of the yarns. Because of this, the yarns can bend freely and can slip over each other. Another advantage of the 3D knitted composites is the relatively high impact resistance caused by the presence of many pile fibres. A good damage tolerance is found for these composites, due to the specific nature of the integrally knitted structure. Finally, these complex structures also seem to exhibit interesting ventilation properties. 4 refs.

BELGIUM; EUROPEAN COMMUNITY; EUROPEAN UNION;  
WESTERN EUROPE

*Accession no.617525*

*Item 395*

Recycle '95. Conference proceedings.

Davos, 15th-19th May 1995, paper 24. 8(13)

**RECYCLING OF CONSTRUCTION/  
DEMOLITION WASTE FROM BUILDING MATERIALS**

Bureau J-P  
Waste Management France  
(Maack Business Services)

Following a list of abbreviations, it is explained that this paper focuses upon the first large-scale recycling operation of construction and demolition waste from building materials in France, by a process known as "Valordib." This process is described and details of its operating principles are included. French recycling statistics are also included.

EUROPEAN COMMUNITY; EUROPEAN UNION; FRANCE;  
WESTERN EUROPE

*Accession no.617403*

*Item 396*

**Annales des Composites**

No.2, 1995, p.97-108

French

**COMPOSITE STRUCTURE FOR A CLASSICAL DANCE FLOOR**

Landjerit B; Simon G; Barrey E  
CER-ENSAM; INRA

Three types of composite structure, i.e. wooden beams and plates with foam supports and sandwich structures

consisting of glass fibre-reinforced epoxy resin skins with foam or honeycomb cores, were evaluated for use as classical dance floors. The investigation involved computer modelling and accelerometry studies, and the vibration frequency and response to dynamic loading of the different floors were analysed. The combination of wooden beams and plates with elastic and vibration damping supports gave floors with good stiffness and damping characteristics. Sandwich structures with honeycomb cores also gave good results, but at a higher cost compared with wooden composites. Results for foam core sandwich structures indicated that they were not as suited to this application. 6 refs.

ANGST & PFISTER

EUROPEAN COMMUNITY; EUROPEAN UNION; FRANCE;  
GERMANY; WESTERN EUROPE

*Accession no.611892*

*Item 397*

**Plast' 21**

No.44, June/July 1995, p.46

Spanish

**CALCIUM-ZINC STABILISED PVC WINDOW FRAME PROFILES**

Developments in the use of calcium-zinc stabilisers in place of barium, cadmium and lead based systems in PVC window frame profiles are reviewed, with particular reference to the findings of studies by BASF. Statistics show the German market for wooden, aluminium and PVC window frames in 1994 with forecasts for 1995 and 1996.

BASF AG

EUROPEAN COMMUNITY; EUROPEAN UNION; GERMANY;  
WESTERN EUROPE

*Accession no.611879*

*Item 398*

PVC '96. Conference proceedings.

Brighton, 23rd-25th April 1996, p.407-16. 42C382

**NATURAL AND ARTIFICIAL WEATHERING OF WHITE PVC WINDOW PROFILES - REPORT ON A ROUND ROBIN TEST WITHIN CEN/TC 33/WG 1/TG 5**

Gardiner D; Pepperl G; Wisse J D M  
UK, Building Research Establishment; Vinnolit  
Kunststoff GmbH; TNO Plastics & Rubber Research  
Institute  
(Institute of Materials)

Within CEN TC 33/WG 1/TG 5, the most comprehensive Round Robin Test for natural and artificial weathering of one specific material class - white PVC window profiles - that has ever been published has been carried out. The observed effect of weathering can be explained from the known degradation reactions. Natural weathering can be simulated by artificial weathering, but not all climates

which exist in Europe can be simulated by the same weathering conditions. Recommendations are made for the product standard for PVC window profiles and the method of test for artificial weathering. 3 refs.

EUROPEAN COMMUNITY; EUROPEAN UNION; GERMANY; NETHERLANDS; UK; WESTERN EUROPE

Accession no.611176

*Item 399*

PVC '96. Conference proceedings.  
Brighton, 23rd-25th April 1996, p.369-78. 42C382  
**INFLUENCE OF ACRYLIC IMPACT  
MODIFIERS ON THE WELD STRENGTH OF  
RIGID PVC**

Weier J E  
Rohm & Haas Co.  
(Institute of Materials)

The weld strength of a PVC window profile is a function of complicated interactions among many contributing variables. Major determinants of weld strength include the PVC formulation profile processing conditions and welding parameters. Impact modifiers enhance weld strength due to their well-known effects on PVC mechanical properties. For modifiers having similar impact efficiency, the contribution to improved weld strength is maximised through optimisation of the PVC viscosity and blend morphology at the weld line. 12 refs.

USA

Accession no.611173

*Item 400*

PVC '96. Conference proceedings.  
Brighton, 23rd-25th April 1996, p.361-8. 42C382  
**FE ANALYSIS OF STRESSES IN WELDED  
CORNERS OF PVC-U PROFILES**

Holownia B P  
Loughborough,University  
(Institute of Materials)

British Standard BS7413:1991 specifies the test method for PVC-U profiles based on the 900 welded section. The stress calculations use a simple plane bending theory which is rather simplistic for deep sections such as PVC-U window and door profiles. A close correlation was found between the actual failure load and those predicted using FE analysis. In particular, different sizes of 'T', 'Z' and 'L' shape profiles were investigated and the maximum stresses in the welded corner obtained by simple formula as used in BS7413 and by FE method were compared. The results show that for deep profiles the BS7413 formula underestimates the true corner stress in some profiles by nearly 30%. 5 refs.

EUROPEAN COMMUNITY; EUROPEAN UNION; UK; WESTERN EUROPE

Accession no.611172

*Item 401*

PVC '96. Conference proceedings.  
Brighton, 23rd-25th April 1996, p.355-8. 42C382  
**WEATHERABILITY OF TiO<sub>2</sub> FILLED PVC  
WITH CA/ZN STABILISING SYSTEM**

Henrio F; Mur G M  
Rhone-Poulenc Recherches  
(Institute of Materials)

Rigid PVC for window frames is required to achieve a high level of light resistance. Our concern is to describe the role of additives, mainly thermal stabilisers on PVC photoageing. Until now, PVC stabilisation has been based on heavy metal soaps in the European PVC building industry. Although their efficiency was not questioned, problems of toxicity have been raised. In order to offer a good performing and non-toxic alternative, many investigations into Ca/Zn stabiliser systems have been made. The suitability of Ca/Zn stabilisers for outdoor usage is shown. Results of PVC photodegradation from two routes - photooxidation and photoelimination - are presented. The influence of thermal stabilisers on the evolution of ageing inducts is shown. Allowing for these results, a new generation of heat stabilisers has been developed in order to ensure a high light resistance to rigid PVC. 2 refs.

EUROPEAN COMMUNITY; EUROPEAN UNION; FRANCE; WESTERN EUROPE

Accession no.611171

*Item 402*

PVC '96. Conference proceedings.  
Brighton, 23rd-25th April 1996, p.23-32. 42C382  
**ECOLOGY AND ECONOMY OF PVC WINDOW  
FRAMES**

Roder H  
Austrian Plastics Institute  
(Institute of Materials)

The use of PVC in window profile construction, with emphasis on the ecology and economy aspects, is discussed. The issue of possible substitute materials is examined. It is concluded that PVC window profiles pose no health hazard, and energy and raw material requirements are relatively low. They are completely recyclable. An evaluation of economic efficiency shows that PVC window profiles make the ideal choice for technical, ecological and economical applications. 16 refs.

AUSTRIA; WESTERN EUROPE

Accession no.611140

*Item 403*

Kibbutz Sha'alvim, c.1996, pp.1. 12 ins. 6/9/95.  
**KORNED PANELS**

Mivned

Dimensions and technical specifications are presented for Korned panels which are designed for the exterior walls of refrigerated warehouses to provide thermal insulation. The double interlocking of one panel with the other and



the resulting pressure from the polyurethane/polyurethane contact are said to ensure the complete sealing of the building so that absolutely no outside air may penetrate.

ISRAEL

Accession no.610922

Item 404

**Chemical Marketing Reporter**

250, No.21, 18th Nov.1996, p.24

**POLYVINYL BUTYRAL IS GROWING AS ARCHITECTURE USE TAKES OFF**

Shearer B

Rising consumption for polyvinyl butyral by the two major applications, automotive windshields and architectural glass, is driving an increase in 1996 sales by as much as 10% over last year. One of the two US producers, Monsanto, has also launched a price increase of 5% for its Saflex PVB line effective January 1. The company is also expanding three of its PVB production facilities. Monsanto will also increase by 8% the price of specialty grades of PVB, including grades used as aircraft windows, multi-laminates and mirror mounts. DuPont is marketing a new three-layer auto window glass laminate consisting of Butacite PVB, PETP film and polysiloxane hard coating.

MONSANTO CO.; DU PONT CO.

USA

Accession no.610634

Item 405

**Journal of Fire Sciences**

14, No.5, Sept./Oct.1996, p.367-78

**TOXICITY CLASSIFICATION OF THERMAL DEGRADATION PRODUCTS OF CHEMICAL MATERIALS USED IN CONSTRUCTION**

Czerczak S; Stetkiewicz J

Lodz,Nofer Institute of Occupational Medicine

A classification of acute toxicity of smoke from combustion of chemical materials used in the construction industry is presented. The materials include PAN, polyester, rubber, PU foam, polyamide and PS. In the classification, the amount of polymer required to produce sufficient smoke to result in 50% mortality is taken into account. The classification will be useful for selection of materials to be used in construction. 31 refs.

EASTERN EUROPE; POLAND

Accession no.609536

Item 406

Antec '96. Volume III. Conference proceedings.

Indianapolis, 5th-10th May 1996, p.3151-5

**INNOVATIVE STRUCTURAL DESIGN CONCEPTS FOR PLASTIC LUMBER MATERIALS**

Lampo R; Nosker T; Kerns R; Renfree R; McLaren M

US,Army; Rutgers,University; McLaren M.G. (SPE)

Plastic lumber is a viable application for the recovery of post-consumer mixed plastic containers. The current path of manufacturers is to modify the mechanical properties of plastic to more closely resemble those of wood. The primary motivation to produce plastic lumber products with properties as similar as possible to wood is that design methods for wood already exist. However, these wood design methods are based on the mechanical properties for that material, and even though modified, the plastic lumber products still retain a plastic behaviour. An innovative arch design concept for plastic lumber has been developed which shows that the present approach is not the most efficient or cost effective way to design structures with plastic. 5 refs.

USA

Accession no.609111

Item 407

Utech 96. Conference Proceedings.

Hague, 26th-28th March 1996, Paper 68, pp.6. 43C6

**DEVELOPMENT OF CFC-FREE POLYURETHANE MODIFIED ISOCYANURATE FOAMS WITH IMPROVED PROCESSABILITY FOR CONTINUOUS LAMINATION**

Bonapersona V; Javarone C

ICI Polyurethanes

(Crain Communications Ltd.; Rapra Technology Ltd.)

CFC-free polyurethane-modified isocyanurate foam systems and the use of polyester polyols can meet the processability requirements of the European insulation laminate producers. HCFC-141b blown and hydrocarbon blown formulations have been developed. These systems can maximise foam fire resistance or reduce the need for expensive flame retardants. 6 refs.

EUROPE-GENERAL; EUROPEAN COMMUNITY; EUROPEAN UNION; ITALY; USA; WESTERN EUROPE

Accession no.609007

Item 408

Utech 96. Conference Proceedings.

Hague, 26th-28th March 1996, Paper 67, pp.4. 43C6

**IMPACT OF THE CFC-ISSUE ON RIGID POLYURETHANE FOAM FOR CONSTRUCTION APPLICATIONS**

Van den Bosch R

Dow Benelux NV

(Crain Communications Ltd.; Rapra Technology Ltd.)

The impact on construction applications of replacing CFCs as blowing agents for rigid PU foam is discussed with reference to the thermal efficiency, dimensional stability, combustion modification and cost of rigid PU foam insulation products. 4 refs.

EUROPEAN COMMUNITY; EUROPEAN UNION; NETHERLANDS; WESTERN EUROPE

Accession no.609006

*Item 409*

Utech 96. Conference Proceedings.  
Hague, 26th-28th March 1996, Paper 65, pp.4. 43C6  
**THERMAL INSULATION IN BUILDINGS: UK  
GUIDANCE FOR PRESENT STANDARDS AND  
FUTURE REQUIREMENTS**

Stirling C M  
UK, Building Research Establishment  
(Crain Communications Ltd.; Rapra Technology Ltd.)

Increased levels of insulation in buildings, introduced as a result of UK building regulation requirements to reduce energy usage, lead to potential risks from condensation and increased moisture in building materials which may lead to early deterioration of some materials and components. The Building Research Establishment's guidance relating to higher levels of insulation is summarised. 8 refs.

EUROPEAN COMMUNITY; EUROPEAN UNION; UK;  
WESTERN EUROPE

*Accession no.609005*

*Item 410*

Utech 96. Conference Proceedings.  
Hague, 26th-28th March 1996, Paper 44, pp.2. 43C6  
**DEVELOPMENT OF POLYURETHANES IN  
BUILDING WATERPROOF**

Jyh-Cherng Guo; Chun-Gwo Chen  
Elastogran Headway Urethanes Co.Ltd.  
(Crain Communications Ltd.; Rapra Technology Ltd.)

three types of PU materials are used to produce waterproof membranes for buildings. These are two-component casting coating, two-component spraying coating and one-component moisture curing elastomer. The mechanical properties of these materials are discussed. 4 refs.

TAIWAN

*Accession no.608984*

*Item 411*

**Modern Plastics International**  
26, No.11, Nov.1996, p.68-71  
**ALTERNATIVE PUR FOAMING AGENTS GAIN  
IN CONSTRUCTION**

O'Neill M

Process technology for fabricating rigid PU foam for construction applications has undergone a radical shift in recent years, due primarily to the replacement of CFC blowing agents. Elastogran has developed polyols for PUR foamed with alternative blowing agents that are claimed to provide the flow rate necessary to coat heating pipe up to 18m long. Pre-insulated pipe for district heating is a growing market in Europe. Consumption of panels for floor, wall, roof and ceiling insulation is growing quickly in northern Europe due to energy-saving requirements. Some applications are well suited for alternative blowing agents. Metal sandwich elements, like those used on building

exteriors, overcome problems with carbon dioxide-blown foam.

WESTERN EUROPE-GENERAL; WESTERN EUROPE

*Accession no.608963*

*Item 412*

**Construction & Building Materials**  
10, No.6, 1996, p.475-80  
**EXPANDED PS COMPOSITE DOOR SHUTTERS.  
AN ALTERNATIVE TO WOODEN DOOR  
SHUTTERS**

Asthana K K; Lakhani R; Aggarwal L K  
India, Central Building Research Institute

Details are given of the development of expanded PS composite door shutters as a material replacement for wooden shutters. Physicomechanical properties of the sandwich structures are discussed. 12 refs.

INDIA

*Accession no.608518*

*Item 413*

**Plastics News(USA)**  
8, No.27, 2nd Sept.1996, p.1/30  
**FEDS PROBE PVC SIDING, WINDOWS FOR  
LEAD HAZARD**

Bregar B

Following findings of the use of lead stabilisers in foreign-made plastic miniblinds, the federal Consumer Product Safety Commission is turning its attention to PVC windows and sidings. An American Architectural Association survey found only 2 of the top 24 window profile extruders in North America use lead stabilisers, and these companies are to replace it with other substances by the end of this year, it is reported. Unlike the miniblinds investigated earlier in the year, window profiles are designed to resist long term weathering, whereas the miniblinds deteriorated in hot sunlight, creating a chalk-like dust harmful to children when ingested.

US, FEDERAL CONSUMER PRODUCT SAFETY  
COMMISSION

USA

*Accession no.608240*

*Item 414*

**Plastics in Building Construction**  
20, No.8, 1996, p.7-10  
**LESS FLAMMABLE MATERIALS**

Gann R G

US, National Inst. of Standards & Technology

A summary is presented of a talk entitled "NIST Research on Less-Flammable Materials" by R.G. Gann of the Building & Fire Research Laboratory, National Institute of Standards & Technology. The BFRL has underway a research programme regarding a new generation of building and furnishing materials and products that

contribute less to a fire, maintain their fire safety performance over the product life and are environmentally friendly. Research under the Advanced Technology Program at NIST relating to polymeric materials with potential concerns about flammability include composite production risers, seismic upgrades of bridge columns, structural composites for large commercial structures and bridge retrofitting with phenolic composites.

USA

Accession no.606009

Item 415

**Injection Molding**

4, No.7, July 1996, p.59/63

**MARKET FOCUS - BUILDING AND CONSTRUCTION**

Plastics are increasingly replacing metal in the building and construction industry, which requires long life and considerable performance from the materials and components it uses. This article highlights some examples of injection moulded parts in this market, including a thermoplastic PU window pivot pin (Pivot True), a rotary hammer housed in glass-reinforced nylon (Thunderbolt), a pressure assisted toilet (PF/2 Energized Flush), a roofing system, recessed lighting (Advantage Insta-Lite), and a shower head (universal Spa AE 2001.)

ASHLAND PRODUCTS; DOW; MILWAUKEE ELECTRIC TOOL CORP.; W/C TECHNOLOGY CORP.; GE PLASTICS; LITHONIA LIGHTING; DUPONT; ENERGY TECHNOLOGY LABORATORIES; BASF

USA

Accession no.603680

Item 416

**Plastiques Modernes et Elastomeres**

47, No.3, April 1995, p.68

French

**TOWARDS A NEW ART OF CONSTRUCTION**

Vasselle J B

Developments in plastics laminates, composites, sandwich structures and foams for use in the cladding of buildings are examined. Materials produced by Elf Atochem, GE Plastics and Alphacan are described.

ELF ATOCHEM SA; ALPHACAN SA; GE PLASTICS

EUROPEAN COMMUNITY; EUROPEAN UNION; FRANCE; USA; WESTERN EUROPE

Accession no.598443

Item 417

**Plastiques Modernes et Elastomeres**

47, No.3, April 1995, p.64-7

French

**PLASTICS IN BUILDING: A SUCCESSFUL PENETRATION**

Vasselle J B

Building and related applications of plastics are examined, and developments by a number of companies are described. Particular attention is paid to the use of PVC in water pipes, floor coverings, water insulation and window frames, PS and PU foams in thermal and acoustic insulation, and transparent polymers such as PMMA and polycarbonate in glazing applications.

ELF ATOCHEM SA; ALPHACAN SA; ALKOR-MARECHAL; BASF AG; VEKA AG; CSTB; KNAUFF; PLATRES LAFARGE; ISOBX-HENRY; BAYER AG; DOW CHEMICAL CO.; ICI; ONDEX BELGIUM; EUROPEAN COMMUNITY; EUROPEAN UNION; FRANCE; GERMANY; UK; USA; WESTERN EUROPE

Accession no.598442

Item 418

**Kunststoffe Plast Europe**

86, No.6, June 1996, p.22-3

**CARBON FIBRE-PLASTICS COMPOSITES**

Noisterning J F

High, adjustable tensile strength and rigidity, high corrosion resistance, and low weight are decisive factors accounting for the increased use of carbon fibre-plastics composites throughout the construction industry. These benefits, however, are compromised by the disadvantage of comparatively high expenses. While glass fibre-reinforced plastic rods were initially developed for use in pre-stressed concrete construction, more recent developments have focused on carbon fibre-reinforced plastics (carbon fibre composites). In Switzerland, subsequent reinforcement of buildings with carbon fibre composite laminates is now state-of-the-art. Rod-like and cable-shaped carbon fibre composite elements, on the other hand, are successfully used for buildings, primarily for bridges. Rod-like elements made of carbon fibre composite, due to their anisotropic material properties, behave differently toward reinforcing steel respectively pre-stressing steel. The high lateral pressure sensitivity, combined with low resistance to fretting, creates considerable problems in the anchor area. Empirical and numerical investigations yield information concerning the load bearing performance of various different anchor systems for carbon fibre composite cables.

EUROPEAN COMMUNITY; EUROPEAN UNION; GERMANY; WESTERN EUROPE

Accession no.596173

Item 419

Utech '92. Conference proceedings.

Hague, 31st March-2nd April 1992, p.118-21. 43C6

**RIGID POLYURETHANE SYSTEMS FOR METAL-FACED SANDWICH PANELS**

Bagaglio G; White T

ICI Polyurethanes

(Crain Communications Ltd.)

Metal-faced sandwich panels with PU foam-filled cores have become increasingly successful in construction applications, especially with the growing emphasis on system building and energy conservation. Global awareness of environmental protection is also growing, and foam-cored panels have an important role to play in this respect, providing energy savings through building insulation and contributing significantly to the preservation of food supplies. To maintain their contribution to the environment, however, traditional CFC blowing agents must be replaced with more acceptable alternatives. Although it has not been possible to identify a single universal replacement for CFC-11, a variety of PU foam systems is developed for use with the alternatives in order to comply with, and possibly anticipate, the phase-out programmes. The industry already has the means to overcome most of the immediate problems posed by the need to eliminate CFCs. CFC II can, for instance, be replaced in the next few years by HCFCs, without losing the properties required by sandwich panel manufacturers. Ongoing development for the longer term is reviewed, looking at systems which will enable sandwich panels to continue to develop and for their energy saving characteristics to be fully utilised.

EUROPEAN COMMUNITY; EUROPEAN UNION; ITALY;  
WESTERN EUROPE

*Accession no.594641*

*Item 420*

Utech '92. Conference proceedings.  
Hague, 31st March-2nd April 1992, p.96-108. 43C6  
**INTELLIGENT DECISION ENVIRONMENT FOR  
POLYURETHANE FOAM ROOF SYSTEMS-THE  
APPLICATION OF ARTIFICIAL  
INTELLIGENCE**

Kashiwagi D T; Moor W C; Nuno J P; Badger W W  
US,Air Force Institute of Technology; Arizona,State  
University  
(Crain Communications Ltd.)

An investigation has been carried out into PU foam roof performance, failure mechanisms, component requirements, and economic feasibility for the past seven years. Details are given of the only large scale, longitudinal database of roof performance in the construction industry. The database consists of 250 roofs that have been inspected in ten different geographical areas in the United States. The objective is to introduce the Intelligent Decision Environment (IDE) - an artificial intelligence tool that specifies a PU foam roof system by its performance and evaluates the "added value" of new technology in the application of PU foam roof systems. A secondary objective is to propose a methodology utilising the IDE to identify and confirm the failure mechanism of PUF roof systems, thereby avoiding the misdiagnosis of PU foam roof failures. The research reported may be broken down into six main divisions. 8 refs.

USA

*Accession no.594638*

*Item 421*

Utech '92. Conference proceedings.  
Hague, 31st March-2nd April 1992, p.93-5. 43C6  
**RIGID URETHANE FOAM - IS THERE A  
FUTURE IN CONSTRUCTION AFTER CFCs?**  
Harper D  
Celotex Ltd.  
(Crain Communications Ltd.)

The ways in which rigid PU foams have achieved their share of the construction market are described, together with some of the key pointers for the future technical development of this material.

EUROPEAN COMMUNITY; EUROPEAN UNION; UK;  
WESTERN EUROPE

*Accession no.594637*

*Item 422*

*Magazine of Concrete Research*  
48, No.175, June 1996, p.79-93  
**EXPERIMENTAL STUDY OF ADHESIVELY  
BONDED ANCHORAGES IN CONCRETE**

Zavliaris K D; Kollias S; Speare P R S  
Athens,National Technical University; London,City  
University

Details are given of a study of the failure mechanisms of anchors bonded to concrete with an epoxy resin, when tested in direct tension. Emphasis is given to the determination of the stress-strain properties in each structural component. 17 refs.

EUROPEAN COMMUNITY; EUROPEAN UNION; GREECE; UK;  
WESTERN EUROPE

*Accession no.593990*

*Item 423*

*Advanced Materials & Processes*  
149, No.6, June 1996, p.6  
**SECOND-GENERATION GLUED-LAMINATED  
TIMBER**

Glue-laminated timber (glulam) has been a widely used engineered wood composite construction material for more than 65 years due to its good strength and cost effectiveness. Higher grades of conventional glulam require higher grades of lumber, material originating from an older growth forest that is relatively homogeneous. However, such lumber is becoming more expensive and less available in larger sizes as pressures increase from forestry constraints and population growth. Glulam reinforced with fibre-reinforced plastics may solve this problem. A product invented by a Canadian engineer is expected to have an impact on the future of the glulam industry and the use of composites in infrastructure and building construction. The second generation glulam is manufactured commercially under the tradename FIRP Glulam by American Laminators and Duco-Lam. Details are given.

WOOD SCIENCE & TECHNOLOGY INSTITUTE;  
AMERICAN LAMINATORS INC.; DUCO-LAM INC.  
USA

Accession no.592859

Item 424

**Plastics in Building Construction**

20, No.6, 1996, p.2

**BUILDING CONSTRUCTED WITH  
PULTRUSIONS**

The design and dimensions are described of a building for the West Virginia Department of Transportation made from pultrusions by Creative Pultrusions Inc., and according to designs and supervision of the Constructed Facilities Center of West Virginia University. Although the initial cost of the materials is more expensive when compared with traditional materials, its reduced maintenance and labour costs, together with the use of a tongue and groove construction, would considerably narrow the cost.

CREATIVE PULTRUSIONS INC.; WEST  
VIRGINIA, UNIVERSITY  
USA

Accession no.592415

Item 425

**Reinforced Plastics**

40, No.6, June 1996, p.46-9

**QUALITY GRP USED IN LEGOLAND  
CONSTRUCTION**

Starr T

Technolex

The Legoland family park in Windsor will provide an excellent showcase for GRP. To gain acceptance for the project, GRP had to prove that it could meet the high standards associated with Lego's products. GRP has been used for kiosks, building cladding, play helicopters, battery-powered cars and water-powered boats. Wherever possible, GRP Lego bricks 40 times full-size have been assembled into set-pieces. These are made from inner and outer layers formed by hand lay-up or resin transfer moulding.

LEGO GROUP

EUROPEAN COMMUNITY; EUROPEAN UNION; UK;  
WESTERN EUROPE

Accession no.592280

Item 426

**Modern Plastics International**

26, No.6, June 1996, p.65

**COMPOSITE EXTRUSION TAKES AIM AT  
WOOD, PVC PROFILES**

Leaversuch R D

Complex exterior building profiles, made of a crosslinked polymer/cellulosic composite and using a

novel extrusion process, are being deployed in windows, doors and other applications. The profiles are designed and extruded by Crane Plastics, which licenses the process from Strandex. Strandex profiles use a 30% polyolefin-based matrix to encapsulate and crosslink a 70% cellulose fibre loading. Composite crosslinking is triggered in the process by special ingredients during the low temperature extrusion. Cincinnati Milacron twin-screw, counter-rotating extruders are favoured.

CRANE PLASTICS INC.

USA

Accession no.591245

Item 427

**Shell Chemicals Europe Magazine**

No.4, Nov.1995, p.13-5

**RAISING THE ROOF**

Shouten M

Shell Chemicals Europe

The use is discussed of Kraton D SBS in modifying bitumen roofing felts to provide improved thermal stability and durability. An improved grade has been developed, designated KX219C which is currently being evaluated. It is claimed to have a lower viscosity and a unique chemical structure which provides faster production speeds and increased durability.

EUROPE-GENERAL

Accession no.590999

Item 428

Polyurethanes '95. Conference Proceedings.

Chicago, Il., 26th-29th Sept.1995, p.314-23. 43C6

**FIVE YEAR FIELD STUDY CONFIRMS  
ACCELERATED THERMAL AGEING METHOD  
FOR POLYISOCYANURATE INSULATION**

Christian J E; Desjarlais A; Graves R; Smith T L

Oak Ridge National Laboratory; US, National Roofing  
Contractors Association  
(SPI, Polyurethane Div.)

Permeably faced polyisocyanurate foam laminated board insulation blown with HCFC-141b and CFC-11 was subjected to continuous field thermal performance monitoring for 5.5 years. Thin sliced specimens were prepared from these boards and laboratory k-factors were periodically measured on these core foam specimens. An accelerated method was developed for predicting full thickness lifetime thermal conductivities (in-service R-values) of permeably faced boards. The predictions of the accelerated ageing procedure are compared to the actual field performance of loose-laid boards under EPDM membranes in a low sloped roof installed in a Roof Thermal Research Apparatus at Oak Ridge National Laboratory. 33 refs.

USA

Accession no.588968

Item 429

*Journal of Vinyl and Additive Technology*

2, No.1, March 1996, p.37-43

**ANALYSIS OF THE MAIN PARAMETERS AFFECTING THE CHANGE OF COLOUR AND PHYSICAL PROPERTIES OF WEATHERED PVC PROFILES**

Gervat L; Morel P

Elf Atochem SA

A review is presented of good weatherability requirements for PVC profiles, and analytical tools to assess these requirements are recalled and justified. Detailed analysis is made of the various parameters that may affect PVC weatherability, and it is claimed that except for a few additives, the key point is the level of thermal degradation undergone by PVC during its processing. 12 refs.

EUROPEAN COMMUNITY; EUROPEAN UNION; FRANCE; WESTERN EUROPE

Accession no.588369

Item 430

*Composites & Adhesives Newsletter*

12, No.2, Jan-March 1996, p.6

**SPECIAL REPORT ON RETROFIT STRENGTHENING OF CIVIL STRUCTURE**

The article supplies details of a report on the retrofit strengthening of civil structures with carbon fibre reinforced plastics illustrated with specific structures in Japan, Switzerland and the USA. The article assesses the progress and development of the use of CFRP in building structures such as earthquake-damaged chimneys, bridges and strengthening beams and floors.

MITSUBISHI CHEMICAL CO.

USA

Accession no.587148

Item 431

*Plastics News(USA)*

7, No.52, 26th Feb.1996, p.4

**ROYAL UNVEILS MULTISTOREY VINYL HOUSE PROGRAM**

Lauzon M

Royal Plastics Group is reported to have commenced construction of multistorey vinyl houses after developing a 6 in. thick, extruded hollow vinyl panel that provides extra rigidity to its modular housing system. The company announced the programme at its recent annual meeting, where it reported its sales are outpacing overall activity in housing construction. Details are given.

ROYAL PLASTICS GROUP LTD.; MIDLAND WALWYN CAPITAL INC.; NOVO INDUSTRIES INC.

USA

Accession no.586171

Item 432

*Construction & Building Materials*

10, No.1, 1996, p.77-82

**POLYMER-BASED MATERIALS FOR REPAIR AND IMPROVED DURABILITY: JAPANESE EXPERIENCE**

Ohama Y

Nihon,University

Countermeasures against the deterioration of reinforced concrete structures and composite materials are reviewed, with particular reference to the polymers being used to improve their durability and repair their damage in Japan. The durability-improving materials include finish coatings, barrier penetrants, linings, liquid-applied membrane waterproofing materials, permanent forms, polymer-coated reinforcing bars and fibre-reinforced plastics reinforcements. The repair materials include corrosion-inhibiting coatings for surface preparation and protection, finish materials and grouts for concrete cracks. 8 refs.

JAPAN

Accession no.584624

Item 433

*Plastics in Building Construction*

20, No.4, 1996, p.8-10

**PLASTIC LUMBER DESIGN**

This article describes an arch design concept that, when further developed and implemented, will make plastic lumber a cost-effective alternative for structural projects. Since the primary constituent in the tailings used for plastic lumber is HDPE, the characteristics of the product most closely resemble those of HDPE. The mechanical properties of plastic lumber are compared with those of wood. An innovative design methodology is being developed which takes advantage of inherent mechanical properties of plastics, that is their relatively low stiffness and high elongation to failure. 4 refs.

USA

Accession no.584464

Item 434

*Journal of Coated Fabrics*

Vol.25, July 1995, p.59-68

**DEVELOPMENT OF HEAT AND COLD INSULATING MEMBRANE STRUCTURES WITH PHASE CHANGE MATERIAL**

Pause B

Materialforschungs und Prufungsanstalt fuer Bauwesen  
Tests carried out to develop a roofing membrane with improved thermal properties showed that the application of Phase Change Materials (alkanes) resulted in a marked improvement in the thermal insulation of the material. Tests were carried out on the original membrane material (polyester fibre coated with PVC), the membrane material coated with foam and different contents of the Phase

Change Material. The results obtained presented possibilities for enhancing the indoor climate of a structure and for significantly reducing energy consumption in structures using the materials. 6 refs.

EUROPEAN COMMUNITY; EUROPEAN UNION; GERMANY; WESTERN EUROPE

Accession no.584395

*Item 435*

Vinyl Retec '95: What's New in PVC? Retec proceedings.

New Brunswick, N.J., 24th-25th Oct.1995, p.85-92.  
42C382

**FOAMED RIGID VINYL FOR BUILDING PRODUCTS**

Schipper P S; Black J; Dymek T  
Elf Atochem North America Inc.  
(SPE,Palisades Section; SPE,Vinyl Div.)

PVC foamed building products have seen good growth recently due to their favourable properties and economics. Continued good growth is seen for the future. Expanding application areas, especially in the US market have created a need for knowledge on formulation and processing parameters. Application areas are explored as well as raw material considerations, processing methods and parameters, and final physical properties. 12 refs.

USA

Accession no.583868

*Item 436*

SPI Composites Institute 50th Annual Conference. Conference Proceedings.  
Cincinnati, Oh., 30th Jan-1st Feb.1995, paper 21E. 627

**AMERICAN CONCRETE INSTITUTE COMMITTEE 440 STATE-OF-THE-ART REPORT**

Ehsami M R  
Arizona,University  
(SPI,Composites Institute)

A summary is presented of the chapters of the report, including history, composite materials and processes, mechanical properties and test methods, design guidelines, behaviour of structural elements, prestressed concrete elements, external reinforcement, field applications, and research needs. 6 refs.

AMERICAN CONCRETE INSTITUTE  
USA

Accession no.583361

*Item 437*

**Informations Chimie**

No.363, Nov.1994, p.105-7  
French

**CONTRIBUTION OF THE CHEMICAL INDUSTRY TO BUILDING**

Applications of polymers in building are reviewed, with particular reference to thermal insulation, glazing and PVC window frames. Details are given of some research projects being undertaken by Centre Scientifique et Technique du Batiment (CSTB) into the use of polymers and other materials in the building industry.

ELF ATOCHEM SA; RHONE-POULENC SA;  
BAYER AG; CSTB; TEC HABITAT  
EUROPEAN COMMUNITY; EUROPEAN UNION; FRANCE;  
GERMANY; WESTERN EUROPE

Accession no.583057

*Item 438*

**Materie Plastiche ed Elastomeri**

Nos.11/12, Nov./Dec.1994, p.544-52

Italian

**HOUSE OF WONDERS**

Latorre C

Details are given of the Living Environments Europe Programme, a project initiated in the Netherlands by GE Plastics to draw attention to innovative uses of engineering plastics in the building sector. Applications described include roof coverings, glazing, window frames, kitchen and bathroom fittings, solar panels and air conditioning systems.

GE PLASTICS BV; GE SILICONES; ROYAL PLASTICS GROUP

CANADA; EUROPEAN COMMUNITY; EUROPEAN UNION; NETHERLANDS; WESTERN EUROPE

Accession no.583048

*Item 439*

**Plastics in Building Construction**

20, No.3, 1996, p.2

**REINFORCED PLASTICS IN REINFORCED WOOD BEAMS**

Western Wood Structures and Fiber Technologies have combined to introduce high strength fibre reinforced Glulams or FiRP Glulams. The FiRP Glulam is a composite of wood, plastic, and high strength synthetic fibres. The fibres are oriented in a thin plastic matrix laminated into the Glulam beam using standard gluing procedures. Their mechanical properties in terms of compressive, load bearing and tensile strength are described.

WESTERN WOOD STRUCTURES INC.; FIBER TECHNOLOGIES INC.

USA

Accession no.582680

*Item 440*

**Waste News**

1, No.19, 8th Jan.1996, p.4

**BORN-AGAIN TYRES**

McCarron K

The building of a chapel from scrapped tyres and construction debris, by three Auburn University

architectural students, is described. The tyres were filled with soil which had been removed for the foundations, which was compacted until it had the hardness of concrete.

USA

*Accession no.582271*

*Item 441*

**Construction & Building Materials**

9, No.6, 1995, p.379-87

**SEALING AND RESEALING OF JOINTS IN BUILDINGS**

Hutchinson A R; Pagliuca A; Woolman R  
Oxford, Brookes University

A review is given of the nature of joint movements in buildings and the requirements of sealants to maintain weather-tightness. Aspects of economics, joint design, sealant system selection and joint preparation are discussed. New guidelines are given in terms of resealing of joints. 5 refs.

EUROPEAN COMMUNITY; EUROPEAN UNION; UK;  
WESTERN EUROPE

*Accession no.582030*

*Item 442*

**Construction & Building Materials**

9, No.6, 1995, p.353-64

**GLASS FIBRE REINFORCED PLASTIC REBARS FOR CONCRETE STRUCTURES**

Benmokrane B; Chaallal O; Masmoudi R  
Sherbrooke, University; Montreal, Ecole de Technologie Superieure

Details are given of a large-scale experimental and theoretical programme on the application of glass fibre-reinforced unsaturated polyester, epoxy resin, and polyvinyl ester reinforcement for concrete structures. Flexural results are compared with conventional steel reinforced concrete beams. 39 refs.

CANADA

*Accession no.582028*

*Item 443*

**Textile Horizons**

16, No.1, Feb/March 1996, p.12-6

**TEXTILE ARCHITECTURE**

Hearle J W S

A brief review is given of the use of textiles such as PVC-coated polyester and glass fibre-reinforced PTFE for tent structures in architectural applications. Mention is made of considerations of mechanical properties of fabric any fibres. 4 refs.

*Accession no.581985*

*Item 444*

**High Performance Textiles**

Feb.1996, p.5-6

**CONSTRUCTION INDUSTRIES TO BE TARGETED BY NONWOVENS SECTOR**

The European Disposables and Nonwovens Association (EDANA) is forecasting a major thrust by international nonwoven companies towards developing applications in the construction industries. Nonwovens are now the most widely used base material in high performance, bitumen-treated waterproof roofing sheeting. Thermal and acoustic insulation are provided by a range of different bulky nonwovens. If a flat roof is to provide a roof garden, for example, then a waterproof nonwoven layer can provide a filter and a drainage layer. When used as a protective interlayer during casting of concrete floors on poor subsoil, a layer of nonwoven will prevent any mingling of the subsoil and the new concrete.

EDANA

BELGIUM; EUROPEAN COMMUNITY; EUROPEAN UNION;  
WESTERN EUROPE

*Accession no.581626*

*Item 445*

**Plastics in Building Construction**

20, No.2, 1996, p.3-4

**LARGE POTENTIAL FOR COMPOSITES IN INFRASTRUCTURE**

The article describes the large potential for composites in maintaining the infrastructure. Information is included on costs of maintenance and corrosion of roads, bridges, pipelines and railway lines in the USA, together with costs of dealing with fatigue and chemical attack in the infrastructure. At present, composites represent a minor portion of the materials usage in such structures, but their use, as an alternative to metals and concrete, is growing. The US construction industry is the largest untapped market for new material.

COMPOSITES WORLDWIDE INC.

USA

*Accession no.581274*

*Item 446*

**Insulation Journal**

Jan.1996, p.14-5

**HIGH PERFORMANCE INSULANT**

The article supplies a comprehensive assessment of rigid polyurethane foam, as one of the most effective and practical forms of insulation in the building industry. The article includes information on the properties of PU foam, in terms of density, thermal conductivity, compression and shear strength and moisture absorption. Information is also included on environmental developments, energy conservation and global consumption and potential markets.

ICI PLC

EUROPEAN COMMUNITY; EUROPEAN UNION; UK;  
WESTERN EUROPE

*Accession no.581271*



Item 447

**Insulation Journal**

Jan.1996, p.10-1

**CAVITY WALL INSULATION - ANSWERING THE QUESTIONS YOU'RE ALWAYS ASKED**

The article supplies a comprehensive assessment of the use, advantages, potential market and applications of cavity wall insulation. Information is provided in a question and answer format and covers a range of issues, including the materials used, service life, cost, energy saving and possible problems associated with the insulation. The article also supplies a list of associations connected with cavity wall insulation, who may be applied to for further information.

**BUILDING RESEARCH ENERGY CONSERVATION UNIT**

EUROPEAN COMMUNITY; EUROPEAN UNION; UK; WESTERN EUROPE

Accession no.581270

Item 448

**SAMPE Journal**

32, No.1, Jan/Feb.1996, p.30/6

**THREE STEPS TOWARD A COMPOSITES REVOLUTION IN CONSTRUCTION**

Loud S

Composites Worldwide Inc.

Three examples of active projects which offer opportunities for fibre composites to displace significant amounts of steel, concrete and timber in building applications are discussed. These are Marshall Industries Composites' C-bar composite concrete reinforcing bar for solution of corrosion problems, reinforced glued laminated beams, and applications in bridge construction. Infrastructure renewal in the U.S. is considered and additional composites applications are listed.

**MARSHALL INDUSTRIES COMPOSITES**

USA

Accession no.580090

Item 449

Elastomer Technology Handbook.

Boca Raton, Fl., CRC Press, 1993, p.947-73 011

**POLYMER-CONCRETE COMPOSITES**

Hussein R

New York,State University

Edited by: Cheremisinoff N P

(SciTech Technical Services)

A detailed account is given of polymer-impregnated concrete, properties of polymer-impregnated concrete, polymer cement concrete, polymer concrete, synthetic fibre-cement composites, and glass fibre-reinforced cement and its microstructure.

USA

Accession no.579416

Item 450

Elastomer Technology Handbook.

Boca Raton, Fl., CRC Press, 1993, p.909-45 011

**POLYMERS IN SANDWICH STRUCTURE**

Hussein R

New York,State University

Edited by: Cheremisinoff N P

(SciTech Technical Services)

Sandwich panels, as a form of composite materials, are being used in building applications. Several features of sandwich panels were discussed. The use of polymers to meet with construction requirements was elaborated through several examples. For structural design of sandwich panels, simple formulae were given. Numerical values for the coefficients in these formulae may be obtained from the tables and graphs presented.

USA

Accession no.579415

Item 451

Elastomer Technology Handbook.

Boca Raton, Fl., CRC Press, 1993, p.875-907 011

**POLYMER APPLICATIONS IN THE CONSTRUCTION INDUSTRY**

Hussein R; Cheremisinoff N P

New York,State University; SciTech Technical Services

Edited by: Cheremisinoff N P

(SciTech Technical Services)

Advantages and disadvantages of polymers in the construction industry are examined. Structural glass fibre-reinforced plastics and their applications, attributes and limitations are described in detail, as are the range and scope of foams in the building industry. A comprehensive account is given of flooring, including many materials and applications.

USA

Accession no.579414

Item 452

**Plastics in Building Construction**

20, No.1, 1995, p.6

**US SIDING MARKET TO EXPAND OVER 3% ANNUALLY**

US demand for siding materials is forecast to rise by 3.3% annually to the year 2000, according to a new study from the Freedonia Group. The article supplies details of the growth in demand from 1985, and describes the factors contributing to the rise, namely (1) improvement in building construction outlays particularly non-residential; and (2) the ageing of US housing stock, creating demand for renovation and repair.

FREEDONIA GROUP INC.

USA

Accession no.579208

*Item 453*

**China Rubber Industry**

43, No.1, 1996, p.34-7

Chinese

**DEVELOPMENT OF NON-CURING TYPE IIR RECLAIM ROOF MEMBRANE**

Fu Y; He S; Zhang Y; Chen K

Beijing, Research & Design Inst. of Rubber Ind.;

Qingyang, General New Construction Material Factory

Details are given of the use of reclaim butyl rubber for making roof membranes. Data are given for tensile properties, elongation, chemical resistance, corrosion resistance, and ageing resistance.

CHINA

*Accession no.579035*

*Item 454*

**International Journal of Materials & Product Technology**

10, No.3-6, 1995, p.338-43

**CONCRETE COLUMNS REINFORCED WITH FRP RODS**

Castro P F; Howie I; Karbhari V

Rio de Janeiro, Universidade Federal Fluminense;

Delaware, University; California, University

Results are presented of compressive tests carried out on Portland cement concrete structural elements reinforced with fibre-reinforced plastic (FRP) rods. The specimens had a square cross-section of 100 mm and heights of 800 and 1600 mm. The concrete compressive strengths were 20 and 40 MPa, Test results were compared with theoretical values so that the potential use of FRP rods could be assessed. 10 refs.

BRAZIL; USA

*Accession no.578252*

*Item 455*

Antec 95. Volume III. Conference proceedings.

Boston, Ma., 7th-11th May 1995, p.4369-72. 012

**POLYESTER FIBRE AS A REINFORCEMENT IN PLASTIC LUMBER**

McMullin K J

Penn State Erie Plastics Technical Center

(SPE)

Extruded plastic lumber exhibits orientation of the chains in the direction of flow, increasing the tensile strength in that direction. In addition to this, properties such as flexural modulus are increased transverse to flow. By adding a reinforcing fibre, the lumber's properties can be further enhanced. A study is presented on maximising the rigidity of extruded plastics lumber, by adding a reinforcing fibre. The effects of the polyester fibre as a reinforcement while noting changes in tensile and Izod strength are presented. 5 refs.

USA

*Accession no.577990*

*Item 456*

Antec 95. Volume III. Conference proceedings.

Boston, Ma., 7th-11th May 1995, p.4232-6. 012

**COMPOUNDING PROCESSED OLD NEWSPRINT WITH RECYCLED HIGH DENSITY POLYETHYLENE TO MAKE A SUBSTITUTE LUMBER PRODUCT**

Dale B T

Penn State Erie Plastics Technical Center

(SPE)

With the size of landfills increasing at an alarming rate, recycling has become a pertinent issue. Paper and plastic are the two largest contributors by volume to landfills. One way to reduce the amount of these material in landfills is to combine the two to produce a substitute lumber product. By compounding recycled HDPE with processed old newsprint, mechanical properties can be improved and part cost reduced. However, an optimum process must be first determined before a commercially acceptable compounded material can be produced. 4 refs.

USA

*Accession no.577960*

*Item 457*

Antec 95. Volume III. Conference proceedings.

Boston, Ma., 7th-11th May 1995, p.3690-5. 012

**COUNTER PRESSURE INTRUSION OF FOAMED PLASTIC LUMBER**

Malloy R; Cooper C; Berkok B

Lowell, Massachusetts University

(SPE)

The results of a study show that the counter pressure intrusion process can be used to produce foamed plastic lumber (or other more complex shapes) with good density reduction, good surface finish and fine cell structure. Reinforced or filled lumber with relatively low specific gravities can be obtained when the plastic lumber is foamed. While the counter pressure intrusion process requires sealed moulds, and is somewhat more complex than conventional intrusion processes, significant quality improvements can be obtained. 12 refs.

USA

*Accession no.577862*

*Item 458*

Antec 95. Volume III. Conference proceedings.

Boston, Ma., 7th-11th May 1995, p.3670-2. 012

**RECYCLING OF VINYL WINDOWS: PVC, GLASS AND COMPONENT HARDWARE**

Spaulding C H

Veka Inc.

(SPE)

One problem common to the recycling of plastics has been the cost effectiveness or inability to separate contaminants such as metals, glass, wood and other components from the desired recycling stream. A computer integrated

manufacturing facility is described, together with the processes developed for the automated recycling of extruded PVC window and door units. The recycling operation discussed is constructed in Germany by Veka AG.

VEKA AG

EUROPEAN COMMUNITY; EUROPEAN UNION; GERMANY;  
USA; WESTERN EUROPE

Accession no.577859

*Item 459*

Byfleet, 1993, pp.4. 12ins. 25/7/95. 45C-6A2

**DOW CORNING 787 GLAZING AND  
CONSTRUCTION SILICONE SEALANT.  
PRODUCT DATA**

Dow Corning Hansil Ltd.

Details are given of the use of Dow Corning 787, a one component, low modulus silicone sealant that gives high performance in glazing and construction applications. Its main uses include weathersealing of high movement glazing and curtain wall systems. It is also useful for sealing joints around glass, wood, plastic and various metals. Joint designs are illustrated in a curtain wall application and also a shear joint. Substrate preparation, typical properties and product limitations are detailed.

EUROPEAN COMMUNITY; EUROPEAN UNION; UK;  
WESTERN EUROPE

Accession no.576819

*Item 460*

Byfleet, 1994, pp.4. 12ins. 25/7/95. 43H-6A2

**DOW CORNING 201 ONE PART  
POLYSULPHIDE SEALANT. PRODUCT DATA**

Dow Corning Hansil Ltd.

Dow Corning 201 is a one-part, polysulphide sealant based on Thiokol LP liquid polymer. It possesses adhesive and weathering properties, and cures to a tough, flexible sealant. Applications include sealing against pre-cast facing and cladding panels, wall tiles, granite, metal or timber window frames, masonry and certain glazing systems. Details are included of joint design and preparation, limitations to its use, and typical properties.

EUROPEAN COMMUNITY; EUROPEAN UNION; UK;  
WESTERN EUROPE

Accession no.576817

*Item 461*

**Reinforced Plastics**

39, No.12, Dec.1995, p.10

**HONEYCOMB MAKER TARGETS INDUSTRIAL  
MARKETS**

Euro-Composites has developed in-house capacity to make aramid fibre/phenolic, aluminium and paper/phenolic honeycomb materials. The company also makes skinned honeycombs and produces the adhesives and potting compounds it uses in its honeycomb

manufacturing process. Euro-Composites' first step into non-aerospace applications was with an aluminium honeycomb, suitable for flooring in high speed trains. The latest application to be explored by the company is building cladding panels. The aluminium skinned honeycomb is painted with a vandal-resistant paint.

EURO-COMPOSITES SA

EUROPEAN COMMUNITY; EUROPEAN UNION;  
LUXEMBOURG; WESTERN EUROPE

Accession no.576492

*Item 462*

**Elastomers Times**

No.13, 1995, p.3

**WATERPROOF FOR DECADES**

The choice of Hypalon synthetic rubber for a variety of demanding tasks is examined with reference to typical applications. These include waterproofing roofs, automotive and industrial hoses, and roller covers. In particular its use by Sika in roofing applications is described.

DUPONT DE NEMOURS E.I.,& CO.INC.

USA

Accession no.576402

*Item 463*

**Plastics in Building Construction**

19, No.11, 1995, p.5

**MARKET FOR ROOFING MATERIALS TO  
REACH 320 MILLION SQUARES IN 2000**

A new study from the Freedonia Group Inc. reports that demand for roofing materials will rise annually through the year 2000 to reach 320 million squares. The article supplies a brief summary of the report and includes US demand for roofing materials and percentage annual growth from 1985 to the year 2000.

FREEDONIA GROUP INC.

USA

Accession no.574493

*Item 464*

**Plastics in Building Construction**

19, No.11, 1995, p.4

**POLYESTER FILM PROTECTS GLASS  
AGAINST GRAFFITI**

National Glass & Gate Service Inc. of Lincoln, RI, are now marketing their patented Graffiti Protector window film, which is made with a base of polyester film in a laminate. The film protects glass from etched graffiti and vandalism and increases the shatter-resistance of windows during natural disasters. The article supplies brief details of the product.

NATIONAL GLASS & GATE SERVICE INC.

USA

Accession no.574492

*Item 465*

Antec '95. Vol.II. Conference Proceedings.  
Boston, Ma., 7th-11th May 1995, p.2071-3. 012

**IMPROVING THE STRUCTURAL PROPERTIES  
OF PLASTICS LUMBER**

Koch F E  
Recycling Technology Assistance Partnership  
(SPE)

An examination is made of the relationship between the shape and strength of structural members made from recycled plastics lumber. It is shown that the load bearing capacity of plastics lumber, the elastic modulus of which is less than that of wood, can be doubled by using an H-beam in place of a standard rectangular shape. 4 refs.

USA

*Accession no.571282*

*Item 466*

**Chemical Marketing Reporter**

248, No.19, 6th Nov.1995, p.34

**PVB PRODUCERS PROMOTE USE IN  
ARCHITECTURAL GLASS**

Monsanto has established a new information centre to help sell the safety and security benefits of laminated architectural glass to members of the professional building trade. Laminated glass consists of a tough plastic interlayer made from polyvinyl butyral sandwiched between two panes of glass. Aside from the safety and security benefits, laminated glass also blocks UV rays and reduces outside noise levels better than ordinary glass. The industry believes that most growth in future demand for laminated glass is likely to come as the building trade responds to growing concern over the risk of devastating natural disasters, such as hurricanes, and terrorist bombings.

MONSANTO CO.

USA

*Accession no.570835*

*Item 467*

SPI Composite Institute 49th Annual Conference.  
Conference Proceedings.  
Cincinnati, Oh., 7th-10th Feb.1994, paper 14-D. 627

**CRACK RESISTANCE OF GFRP  
WATERPROOFING STRUCTURES**

McClaskey C R; Tsuji S; Sagawa A  
Reichhold Chemicals Inc.; Dainippon Ink &  
Chemicals Inc.  
(SPI,Composites Institute)

GRP is seeing greater use as a waterproofing material in Japan. This material has now been used in about 2.5 million sq.m of waterproofing membrane for the floors and roofs of concrete buildings. Around 10 million lb of resin was consumed for this application in 1992. Advantages of GRP in this particular use include excellent mechanical load characteristics, rapid installation due to

fast curing properties, and light weight with good durability. As GRP usually has relatively limited elongation, resultant waterproofing materials can crack over underlying cracks in the concrete. The relationships between the matrix resin, reinforcement type and crack resistance are presented. A newly-developed PU/GRP composite system is also introduced offering improved crack resistance.

JAPAN; USA

*Accession no.568728*

*Item 468*

SPI Composite Institute 49th Annual Conference.  
Conference Proceedings.  
Cincinnati, Oh., 7th-10th Feb.1994, paper 14-A. 627

**DESIGN AND CONSTRUCTION OF  
FIBREGLASS TRUSS FOR A LONG-SPAN  
FIBREGLASS BUILDING**

Morsi E A; Larralde H  
IMCO Reinforced Plastics Inc.; Drexel,University  
(SPI,Composites Institute)

The analysis, design and construction of reinforced plastics trusses utilised in an all-reinforced plastics building are illustrated. The analysis is conducted assuming linear elastic behaviour for all of the reinforced plastics building. The design of the individual members is executed utilising the allowable stresses recommended by the manufacturer of the reinforced plastics structural shapes used in the trusses. Special consideration is given to the design and fabrication of the connections which are critical components of the trusses. Also presented are the results of a load test performed on one of the trusses to verify the deflection expected under service load. 9 refs.

USA

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*Item 469*

SPI Composite Institute 49th Annual Conference.  
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**CONNECTION AND REINFORCEMENT  
DESIGN DETAILS FOR PULTRUDED FIBRE-  
REINFORCED PLASTIC (PFRP) COMPOSITE  
STRUCTURES**

Mosallam A S  
Washington G.,University  
(SPI,Composites Institute)

Some design details for connections and stiffeners for pultruded fibre-reinforced plastics (PFRP) structural shapes are suggested. They serve as a practical design reference for PFRP fabricators in selecting the appropriate connection configurations. The anisotropic nature of the material is considered in preparing these structural details. Emphasis is placed on connection design details for PFRP frame structures, simplified stiffening details to reinforce

and increase the structural capacity of PFRP open-web profiles, and experimental evaluation of stiffened PFRP beams. 21 refs.

USA

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***Macplas International***

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**BUILDING INSULATION**

Details are presented of developments in building insulation from three different sources. Isopan's Isodeck 1000 prefabricated PU foam panels have been used in the construction of an Italian factory for the production of road signs, Brianza Plastica has introduced the Isotec insulation panel characterised by a rigid PU foam insulating layer, and Baxenden has developed a PU cavity reinforcement foam, designated Isofoam.

EUROPEAN COMMUNITY; EUROPEAN UNION; ITALY;  
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***Du Pont Magazine European Edition***

No.4, 1995, p.36-7

**SAFETY FIRST**

Romag Holdings is reported to be one of Europe's leading suppliers of laminated glass and plastics composites for specialised applications. Romag Security Laminators, one of two companies operated by Romag Holdings, manufactures electronic security products, including radio frequency shielded architectural windows, and bullet- and blast-resistant glass composites for the construction industry. The use of DuPont materials in its range of laminates is described.

DUPONT DE NEMOURS E.I.,& CO.INC.; ROMAG  
HOLDINGS PLC; ROMAG GLASS PRODUCTS  
LTD.; ROMAG SECURITY LAMINATORS LTD.

EUROPEAN COMMUNITY; EUROPEAN UNION; UK;  
WESTERN EUROPE

*Accession no.568330*



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