



## Vermiculite in the Construction Market

### A Multitude of Uses

#### **Building Boards**

Building boards incorporate exfoliated vermiculite because of its low density and good insulation properties. Boards containing exfoliated vermiculite are often used as a 'core' in firedoors, to build fire barriers, to encase or construct ductwork and to protect steel building elements from the effects of cellulosic fires.

Binding systems such as sodium silicate, potassium silicates or calcium silicate are used to produce boards containing exfoliated vermiculite. Other materials used to bind vermiculite in the manufacture of building boards include resins, portland cement and other proprietary inorganic binders.

Some vermiculite concentrate is also used in the production of fire resistant gypsum plasterboard.



Boards containing vermiculite being used to encase structural steel to provide fire protection

Photo: Reppel BV

#### ***Potassium Silicate or Sodium Silicate bound boards***

This process involves the mixing of exfoliated vermiculite with potassium and/or sodium silicate to produce an 'earth damp' mixture. This material is then hydraulically pressed into shape in a mould, and then heat cured at temperatures up to 180° C for up to 24 hours depending upon the thickness of the board. Boards produced in this way can withstand service temperatures of up to 1150° C and are often used in the aluminium smelting industry as back-up insulation behind the carbon cathode in the potcells which contain the molten mixture of cryolite and alumina.

This process can be also used to manufacture acoustic panels which reduce reverberation time, and given a carefully designed support system and correct installation; these panels can also form the basis of fire barrier systems. Altering the design and dimensions of the mould can produce different sizes and shapes of board, including curved 'half shells'.

#### ***Calcium silicate boards***

In the production of calcium silicate bound boards exfoliated vermiculite is added to a calcium silicate slurry, this is then dewatered by pressing or by using one of the Fourdriner/Magnani/Hatschek processes to form a flat board which is then heat cured under pressure (typically 10-15 bar) for periods up to 24 hours.

### **General Building Plasters**

Exfoliated vermiculite is used in both hand and spray applied general building plasters to improve coverage, ease of handling, adhesion to a wide variety of substrates, fire resistance, and resistance to chipping/cracking/shrinkage. Vermiculite can also be combined with other aggregates such as perlite to produce plasters.

Vermiculite based plasters used in the building industry can be batched on site by adding exfoliated vermiculite and water to a suitable gypsum material, or they can be proprietary mixes that only require the addition of water. Both site mixed and proprietary plasters that contain vermiculite can be applied (generally by hand with a hawk and trowel, rather than by machine) to a variety of substrates including concrete, blockwork, expanded metal lath and other plasters or renders.

### **Specialist Plasters**

Acoustic and fire protection products often use vermiculite combined with a binder such as gypsum, portland cement or more rarely an air setting clay, plus fillers and rheological aids.

Structural steel fire protection products use exfoliated vermiculite to improve the application (which is generally by low pressure spray) and to impart a high degree of fire resistance. Exfoliated vermiculite is very efficient at retaining moisture, and in the event of a fire this turns to steam which has a cooling effect on the steel substrate and thus delays its temperature rise.



Sprayed fire protection

Photo: Isolatek

Acoustic plasters provide reverberation (echo) control by the mechanism of absorbing sound energy and changing it into heat.

### **Roof and Floor Screeds and Insulating Concretes**

Exfoliated vermiculite (typically the finer grades) can be added at site to portland cement and other aggregates, rheological aids and water to produce roof and floor concrete screeds or lightweight concrete which have the benefit of being lightweight and insulating. In many cases vermiculite based roof screeds are often used in conjunction with other insulation materials such as polystyrene board to form a total roofing system.

Similarly finer grades of exfoliated vermiculite plus portland cement may be combined either on site or a factory premix to provide a base for swimming pool vinyl liners. These mixes are either pumped into place using a rotor stator pump or hand poured.



Vermiculite based roof screed being placed

Photo: The Strong Company, Inc

A bituminous binder can also be used with exfoliated vermiculite can to produce a dry, lightweight roof screed which has the advantages of low thermal conductivity, low moisture content and ease of placement by pouring from the bag and then tamping.

### **Loose-fill Insulation Uses**

Exfoliated vermiculite treated with a water repellent is used to fill the pores and cavities of masonry construction and hollow blockwork to enhance fire ratings (eg. Underwriters Laboratories Wall and Partition designs), insulation and acoustic performance.

Coarse grades of exfoliated vermiculite can be used to insulate lofts and attics. Exfoliated vermiculite has the benefit of being easy to use with application consisting of pouring the vermiculite between the joists and then levelling.

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