多くの機能を持った素材

「多機能素材」という用語はミサワホームの造語です。住宅建築は構造材、断熱材、防水材、仕上げ材などで構成されていますが、これらを単一の材料すべてを含まないかということが発想の原点となり、ここから「多機能素材」という言葉が生まれました。

一般的に住宅の壁、屋根等は数種の材料で構成され、この組立て手間と材料費が建築費の大きな割合を占めています。ミサワホームでは昭和46〜47年にかけて自動車工業等のエンジニアを多数受け入れ、まったく新しく新しい構造材料の開発〜多機能素材の開発に取り組みました。

当時の米沢社長から、研究責任者への指示は、「ドロドロしたものを固めて、建物として必要なすべての機能を持つ材料を開発して欲しい」という単純なものでした。つまり、生産性が高いこと、多機能であること、ケア布では必須条件である軽量化であること、人間が楽しみにしてること、以上4点が開発のポイントでした。

Multi-functional Material

The special terminology “Multi-functional Material” was coined by Misawa Homes Company Ltd. The original idea for the terminology meant a single material that has various functions such as structural, insulating, waterproofing and finishing.

Generally, a wall or roof is composed of many kinds of materials. Labour and material costs occupy the largest percentage of construction costs. Therefore, from 1971 - 1972, we tackled the problem of developing a new construction material in cooperation with a number of car engineers. At that time, president Misawa set a simple objective that of creating a new multi-functional building material, by hardening slurry into a mass. Its specifications were high productivity, multi-function, light weight and comfortable feeling.
目標1 多機能材

今までの建物は、要求する機能の目的域材が従来と異なっていた。また、構造をし
ての積み重ねにより、この積み重ねをなすための
の耐水性を確保し、防犯性、耐水性を満たすために
耐水性に優れた防犯性の材料を選んだ。

目標3 軽量

工業用材質の性能を上げることとのいうこ
の多機能性を持たせることが目的です。市内から建材業者に部
品を供給される場合、金銭と時間のコストが大き
くなり、さらに耐水性を確保できず、建材業
のメリットを失ってしまいます。これに対
するコンポジット製大型パネルは大型化を求める
程度かもしれませんが、耐水性の高い材
料を選定しました。さらに、このコンポジット製
材質は、亜鉛製品の代替として注目されています。

目標4 親しやすい

住宅用に適した材料は、建物の寿命に関
係が深い。適切な材質を選ぶことが重要
です。しかし、材料選定においては、材料の
用途が限定されると、材料選定が難しいこと
があります。また、耐水性、耐火性が不足すると
の結果、金銭的にも時間的にも問題が生じ
ることがあります。したがって、耐水性、耐火性
を兼ね備えた材料を選定することが重要です。

Target 1 Multi-functional Material

A conventional building is constructed of various materials, each with its own purpose. There are pillars and beams for strength, waterproof materials to shield from the wind and rain, and insulation materials to protect habitants from the outside hot or cold air. Furthermore, consideration of beauty is given to interior and exterior materials. In other words, there are five functions: windproofing, waterprooﬁng, insulating, finishing of both interior and exterior. Multi-func-
tional Material possesses all of these properties in single material. In addition the material should be incombustible, ﬁreproof and durable. This may be a variegated target.

Target 2. Productivity

When processing low cost materials, the processing time will be a critical con-
sideration. For example, steel plate can be processed promptly by press-forming
machinery, thereby leading to high pro-
ductivity. This has greatly contributed
to the success of machine made indus-
trial products.

On the other hand, forming a hard mass of concrete can be taken anywhere from
several hours to a day.

In Miawo Homes, it takes about one hour to form a wooden panel.

Due to lengthy production time, we cannot achieve high-productivity rates and
consequently cannot invest in facili-
ties and equipment on a large scale.

On the other hand, the ability to lead to large-scale investment, by which we can promote mass production and reduction of cost (cost-down).

It was found that the target 3, i.e., 3:4, was achieved.

Target 3. Light Weight

Light weight is the first prerequisite for materials in industrialized housing. Heavy weight materials led to high transportation costs, thereby reducing the range of transportation. Generally, only two sheets of large-sized concrete panel can be carried on a large truck. Therefore, we wanted to develop the new materials with light weight or low

Target 4. Familiarity

We could not use any housing material that gave a sense of incompatibility to a
dweller. We needed a soft material to protect children from serious injury in case they
should fall against the paneling.

In addition, we needed a material with low heat conductivity to ensure a warm comfortable feeling.

In this connection, wood is the most familiar and harmonious with human life.

Therefore, it was our ﬁnal target to develop a multi-functional material as
similar to wood as possible.

With these targets in mind, we started our research and development in 1971.

We persistently examined a variety of materials and conducted many experi-
ments on a life-sized scale. In 1973, as a result of joint research with Showa
Denko K.K., we decided to select porous inorganic material as the base of the
multi-functional material.

As inorganic raw materials, we chose cement-like material and silica sand
because of their low cost and availability. To obtain a light weight material, we mixed it with a fine and

uniform air bubble. Stability and durability were considered through a careful process of hardening. Specifications were that the inter-
mediate form which is fluid, could be casted easily into various shapes, and that it has quick-hardening properties
of raising productivity and to enable it to be handled during hardening.

We therefore examine a way of pro-
ducing both small-sized and large-sized panels by pouring slurry into a mold and allowing it to harden quickly.

We achieved the ﬁrst steps toward our goal though there remained some problems on the combination of materials and the manufacturing tech-
nique of parts material.

By this there has been deﬁnitely shown physical properties or performance of material and features of parts material and house.

Specific gravity can be chosen arbitrarily between 0.3 and 1.0. There has been clearly shown such required features for construction materials as an insulating material, respiratory capacity, humidity-adjusting, anti-freezing and forming properties.

Contrary to this, there occurred some problems.

Now, let’s make an interim assessment of this material. With regard to functions stated in Target 1, we could overcome some diﬃculties, ex-
ternal appearance of interior, exterior material and insulating material, and furthermore, its incombustibility, ﬁreproof and anti-corrosion.

From now on, we need to reinforce an inorganic frame as construction material and to devise a proper surface-process as water-proof material.

This is due to the fact that we introduc-
ed light weight, insulating, respiratory and humidity-adjusting properties.

With regard to productivity, light weight and further, familiarity, we reached the favorable level.

If this material was put in the right place, the house must be comfortable to
live in. For this purpose, we will make further effort to develop an ideal house.
Inorganic Wood

Of all the construction materials, wood is the most versatile. However, wood is combustible and corrosive. For the purpose of overcoming these weaknesses, we have been developing an inorganic wood with incombustible and anti-corrosive properties.

At present, our products don’t measure up to our intended level. Finally a lot of problems in regard to the interwinedment of cellulose and its organic or physiological effect are reflected on the physical properties and performance of the products.

However, we are going to make further efforts to put this kind of material to practical use by improving on conventional methods or by developing new methods.

As stated above, we have been developing the “multifunctional material” since 1971 and we have already made considerable progress in its development.

It seems that HOUSE 55 PROJECT encouraged us in developing a multifunctional material.