長尺パネルの開発
（114開発時代 昭和51年～現在）

DEVELOPMENT OF LONG-SIZED PANEL (period of 114 development from 1976)

パネルの連続生産

ハウス55の開発目標の主要な一つは、住宅の低価格化であり、実現する手段として多機能素材の開発があるわけです。これと同時にパネルの合理的な生産技術が強く要求されています。このため具体的技術の一つとして連続生産が検討されました。従来のパネル生産は、使用材料の寸法の制約もあって適当な大きさで一枚ずつ加工する方法であったが、この方法では、板厚の圧縮荷重に対し強く曲げ、引張り荷重に対して抵抗しないというコンクリートと同様の欠点があります。これを利用できない強力なパネルを得るためには、ねばり強い材料の補強（補強材）が必要となります。この補強材は細い鋼線（鉄筋）が適しており、一般の鉄筋コンクリートに見られるものです。この開発では、鉄筋よりも安価で高い生産性を持ち、多機能素材の連続生産に合致する材料が必要と求められ、これのために全く新たなロールコーティングの開発を行ったことになりました。

ロールコーティングは写真2に示す様な網目状の鋼板であり、コイル状に巻かれた鋼板をロール加工によって網目状に折りしながら、しかも高速度で加工されるものです。多数列の網目を圧延によって加工した例はこれまでになく、全く新規な試みです。日新製鋼の技術陣を中心に多くの試行錯誤を重ねた結果、基礎的技術を完成し、連続加工の目指しを達成することができました。しかしながらパネル部品として実用化するには、加工技術に一定のパネル性能を必要とする連続生産技術が残されております。主なものは長期耐久性を保証する防錆技術、多機能素材と工房内の良い網目の形状の選択などがありません。

Continuous Production of Panelling

One of the principal goals for developing HOUSE 55 was to supply quality houses at a low cost. For this reason, the development of multifunctional materials and a workable technique for producing a practical panelling was required. In this connection, we examined the continuous production of panelling. Up to now these panels were produced one by one, each possessing a limited size. The new technique aimed at continuously producing the panel and arbitrarily changing its size according to design. Multi-functional material is suited for this type of production because it is in the state-of-slurry before forming. Multifunctional material is composed of inorganic material with a high incompressibility. However, it has weakpoints in its tensile strength and bending strength, just like concrete.

To tide over these weaknesses, reinforcing materials are required. As seen in a ferro-concrete building, a fine steel-wire is suitable for reinforcing the panel. Such a steel-wire is low in cost and has high productivity, compared with a steel reinforcing rod. Therefore, the production of a fine steel-wire corresponding to the continuous production of multi-functional material was needed.

Under these circumstances, we set about developing a roll-core material. As shown in the photograph, roll-core material is composed of steel plate netting. This coil-like steel is changed into netting by rolling at high speed.

This was a completely new method. The fundamental experiments were repeated many times by engineers of Nisshin Steel Co., Ltd., resulting in the completion of a basic technique. Following this, we tackled the problem of continuous forming or machining. At present, there remains the more important problems of performance of the paneling. Above all, we need to develop an anticorrosive technique guaranteeing long-term durability and to select the shape of netting best suited for the multi-functional material.
■自由設計

ハウス55の完成時点で，住宅内部の設計の自由度が高いことは言うまでもなく，開発
目標の重要なテーマの一つとなっていました。設計上的因子は数多くあり，住宅の
完成に至るまで，数多くの部屋，床の形状，柱の配置，天井の高さ，などの変更が
可能な設計手法として採用されました。この手法は，開発者の自由度を高めるため
と，消費者のニーズに応えるための手法として採用されました。

■パネル建築実験

パネル建築実験は，従来のパネル建築と異なり，現場でパネルを組み立て，建築
を行う方法として，高速率で建築を可能としました。この手法は，従来のパネル建
築と異なる点は，現場でパネルを組み立て，建築を行うことである。パネル建築は，
多機能性の高いパネルを用意し，現場で組み立て，建築を行うことで，建築効率を
向上させることができるためです。

■実大建物試作

パネル建築の製造，工場での組み立て，現場での組み立て，建築過程においての
効率化を図るための試作を行いました。結果，建築効率を向上させるための手法
として，パネル建築が採用されました。この手法は，現場での組み立てを可能とし
るため，建築効率を向上させることが可能であると示唆されました。

Free Planning

In the proposal of HOUSE 55 PRO-
JECT, a wide range of choice for hous-
ing designs was required. This was also
one of our development goals, based on
the idea that each house has to meet the
demands of the dweller for design,
shape of site and the size of family.
However, it is common sense that such
free planning will raise the cost of
housing, especially of industrialized
housing.

Because of this situation, we introduced
a new system called The Order Entry System. This system has already been
adopted in the car industry as a new
type of mass production technique.
The car industry is producing effectively
various kinds of cars, each possessing
different specifications, according
to customer request. Each customer can
arbitrarily select his favorite model or
specifications among all the models
offered. In adopting this new system, a
large-sized computer is used in order
to quickly process the enormous amount
of information and to give proper
information to the customer, just like
the ticket-reservation window in the
Japanese National Railways.

In addition, a house plan can be drawn
by the customer TV, and further through the exchange of information
between the customer and the sales
people, it can finally send its finished
specifications immediately to the
production plant.

At first the necessity of this system was
in dispute, considering the present hous-
ing demand in view of its economy. It appears, however, that it is a good idea
and will possibly be a technical reality.

Reflecting upon this situation, we
adopted a panel system with as much
freedom of choice as possible.

After a few twists and turns of policies,
we reached the long-sized paneling plan
which is different from the paneling
initially developed and proposed, and
started its more specific research and
development.

Developmental Experiments of Paneling

The merit of long-sized paneling is that
we can use one long panel as the wall
for a two-storied house instead of join-
ting the conventional two wall panels
of one story height.

For a prefabricated house, the joint
section is one of the most important
factors in the aspects of safety, penetra-
tion of wind and rain and external
appearance. Therefore, we gave much
consideration to the joint section, and
the cost of construction.

As it is very difficult to improve a joint
section, we cannot easily obtain satis-
factory results. Long-sized paneling ex-
cludes completely these difficulties. In
a sense, this is similar to a through pillar
used for a wooden house. However
some problems also remained in the
long-sized paneling. Prior to practical
use, we had to check its structure and
safety or durability theoretically and
experimentally.

According to our experimental results,
the long-sized paneling was sturdier in
comparison with the conventional con-
crete panel and was unique as an inor-
ganic material. For example, it was
reliable even when exposed to a large
scale earthquake.

Full-sized House

For the purpose of checking practical
conditions of the paneling, we made
a preliminary model in the laboratory and
then built a full-sized house outdoors
(shown in the photograph No. 5). This
house was built several years ago to use
in connection with experiments on
wooden paneling.

As a result of many experiments, we
reached the conclusion that the long-
sized paneling was excellent in many
aspects and could be put to practical
use. We will have to make further
efforts to devise a way of experimenting
on a small construction site and a way
of completing interior finish and design,
thereby leading to a wide range of free
planning.
今後の研究課題

多機能素材による長尺パネル工法は、基礎的技術の試作段階を終り、おおたの目的を仮設したが、今後の研究としてロールコアの長期耐久性等の問題を解決しなければならない。現在の内容をさらに実用化したものにしなければならないと考えています。次に実用化にあたっては、ロールコアのコストダウン、および専用設備の投資に関する目途をつける必要がある問題として残されています。このような未解決の問題があるため、長期の実現性という点でハウス55は別途のシステム（カプセルシステム）を考慮することになりました。

長尺パネル工法の今後の発展としては、一つの方向性が考えられております。一つは工場で多機能素材パネルとして展開する方向であり、他の現場においてロールコアを組み立て、多機能素材を充填する現場打ちの方向です。現場打ち工法では建物全体を一体化することがができ、鉄筋コンクリートと同じ方法になります。今後この方向で、カプセルタイプと並行して長尺パネル工法の開発を進めていく予定です。

Future Subjects

The initial steps in the construction methods of multi-functional long sized paneling have been completed. In the future, we have to solve the problem of ensuring long-term durability of the roll-core. For this purpose, we will continue to experiment and develop better methods.

In addition, we will have to continue to search for ways to reduce costs of the roll-core and investments in facilities and equipment. Because of these remaining problems, we could not put the HOUSE 55 Project to practical use within the specified time limit. As a result, we shifted to another system, the Capsule System.

The construction method of long-sized paneling is being pursued along the following two lines. One is to produce the multi-functional paneling at the plant. Another is to assemble the roll-core at the construction site, and afterwards fill the core with the multi-functional material. The latter is called “on site construction”, which is similar to the construction method of ferro-concrete buildings. In this way, we can speed up the construction period in an unified way.

In the future, we are planning to proceed with the development of a construction method using the long-sized paneling in addition to the development of a capsule type.