The Complete Guide To SIPs

VERSION 1

Contents

About Formance

At Method, we believe the time to take energy-efficiency and healthy building to the next level is now.

What are SIPs?

Structural Insulated Panels (SIPs, or SIP panels) are high-performing thermally efficient composite panels that consist of a sandwich of two layers of structural board with an insulating layer of foam in between.

Formance SIPs can be used as walls, roofs, and floors in residential and commercial buildings.

The simple panel replaces the three sparate elements of framework, plywood bracing and insulation batts. Not only stronger and more resistant to earthquakes, they offer many benefits:

- Superior Insulation Performance
- Increased Airtightness
- Energy-efficiency
- Faster Installation
- Freedom of Design
- Stength & Seismic Ductility
- Environmental Sustainability

Formance Panel Applications

Formance SIPs are typically used for the external envelope (external walls and roof/ceiling in SIPs with internal loadbearing walls usually constructed from timber frame). Using timber frame internally is the most cost effective solution for running services.

CodeMark Certified

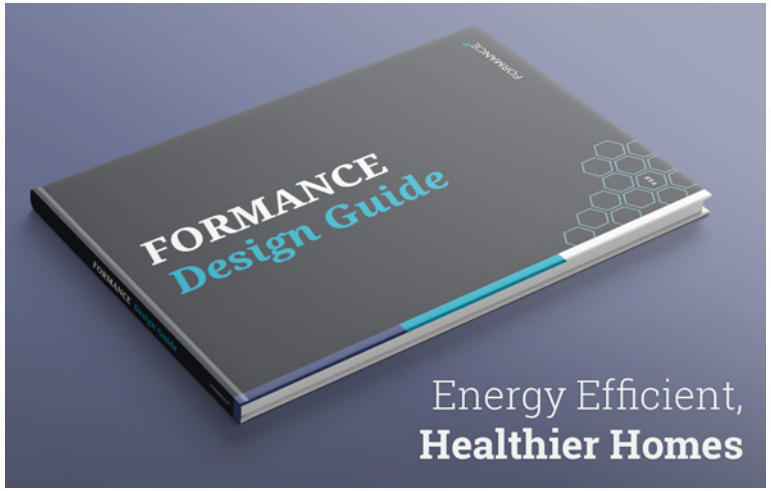
CodeMark is a voluntary scheme for a product manufacturer to demonstrate compliance with the NZ Building Code.

CodeMark is an unchallengeable form of product assurance. Building consent authorities (BCAs, usually councils) must accept a product certificate as evidence of compliance with the Building Code, as long as the product is used in accordance with the use and limitations defined on the certificate.

Specific Engineering Design is only required for items that fall outside of the scope of the certificate. For everything covered within the certificate, no additional engineering justification is needed to demonstrate compliance with the NZBC for the code clauses referenced.

Gaining CodeMark Certification involves a rigorous investigation into the product and the systems behind it, including the manufacture and installation. Regular audits by authorised third parties ensure the requirements of the scheme are adhered to. Requirements that include the need to have a full quality system in place. A CodeMark certificate doesn't just cover the product performance but also ensures the company behind the product has the systems and measure in place to consistently deliver a system that that meets the performance requirements of the certificate.

CODEMARK™



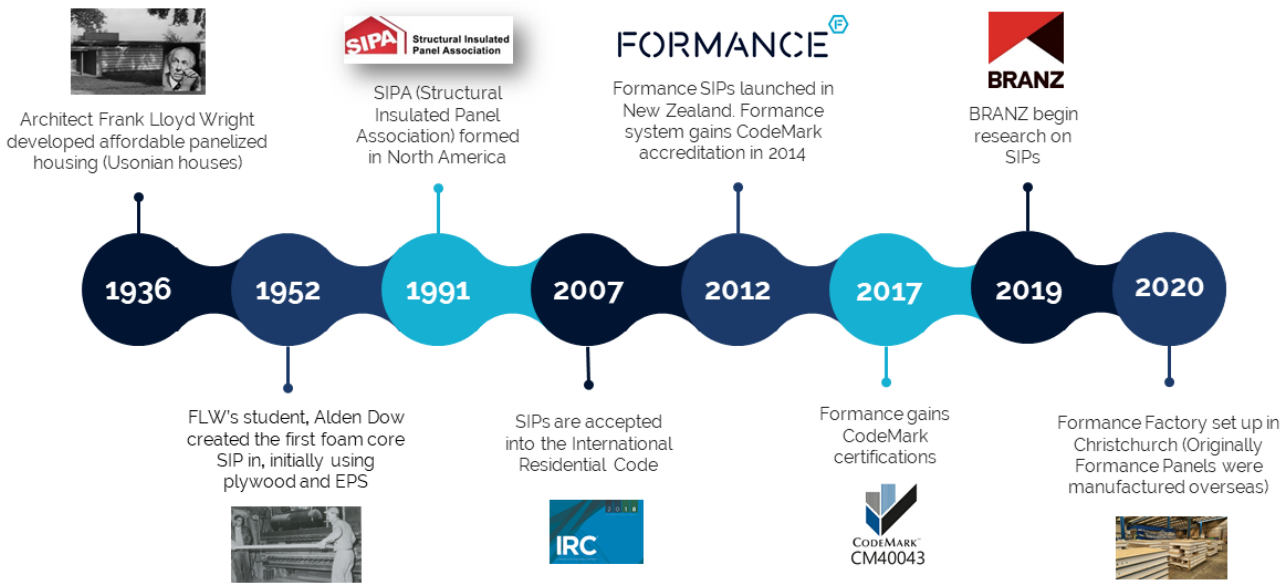
The Formance Design Guide is certified under the CodeMark Scheme and is all an architect needs to design a Formance Home.

The History of SIPs

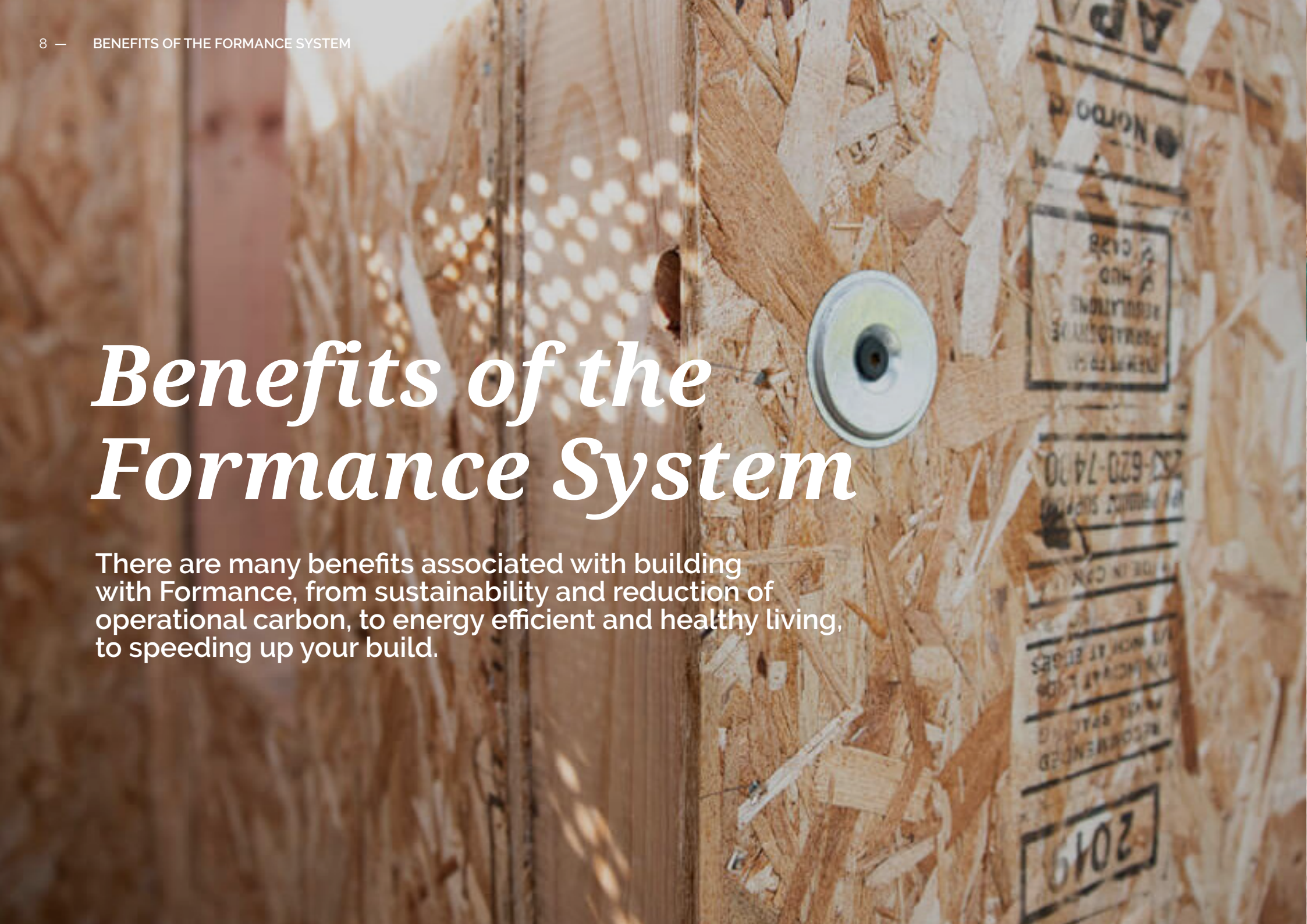
SIPs seem like a new idea due to their timeless & innovative nature, but they're a widely used alternative construction material with a proven record for over 50 years in the US, Europe and the UK.

SIPs seem like a new idea due to their timeless & innovative nature, but they've got a proven record for over 50 years in the US, Europe and the UK.
In the 1930s and 1940s well known American architect, Frank Lloyd Wright, used some of the earliest examples of sandwich-panel technology in the Usonian houses.

In these innovative structures Wright endeavored to incorporate beauty and simplicity into relatively low cost houses. Some of the walls were built using three layers of plywood as structural elements together with two layers of tar paper but lacked any insulation and were never produced on a large scale.



The concept of a structural insulated panel began in 1935 at the Forest Products Laboratory in Wisconsin, USA looking for products from the abundant forests of North America. Their prototype structural insulated panels were constructed using timber framing within the panel combined with structural sheathing and insulation. The panels were used to build test homes which were continually monitored for over thirty years, then disassembled and re-examined. During this time FPL engineers continued to experiment with new designs and materials.
Alden B. Dow , an architectural student of Frank Lloyd Wright and son of the founder of the Dow Chemical Company, continued to experiment with Wright's panel design concept. Dow was concerned by the lack of insulation in the Usonian houses and created the first foam core SIP in 1952. Alden B. Dow is generally credited with producing the first structural insulated panels.



Benefits of the Formance System

There are many benefits associated with building with Formance, from sustainability and reduction of operational carbon, to energy efficient and healthy living, to speeding up your build.

Superior Insulation

Formance Panel R-Values are higher than batts - and the true performance is through the airtightness of the envelope and the integrity of the insulation within a panel over time will not be compromised in the same way batts are, through slumping or gaps.

Formance Structural Insulated Panels come in various standard thicknesses and associated R values. If you're wanting to go the extra step with higher R-Values, Formance offers graphite-infused (Neopor®;) EPS which has approximately 18% higher R-value than standard EPS.

PANEL THICKNESS	115mm	165mm	215mm	265mm	315mm
STANDARD EPS	R2.8	R4.3	R5.7	R7.2	R8.6
NEOPOR ® EPS	R3.3	R4.9	R6.6	R8.3	R9.9

Airtightness

An air-tight, well insulated building envelope is an efficient barrier separating the inside of your home with the outdoor elements. A well-insulated home is not efficient unless it is air-tight and may actually cause structural problems and structural deterioration over time if not built properly.

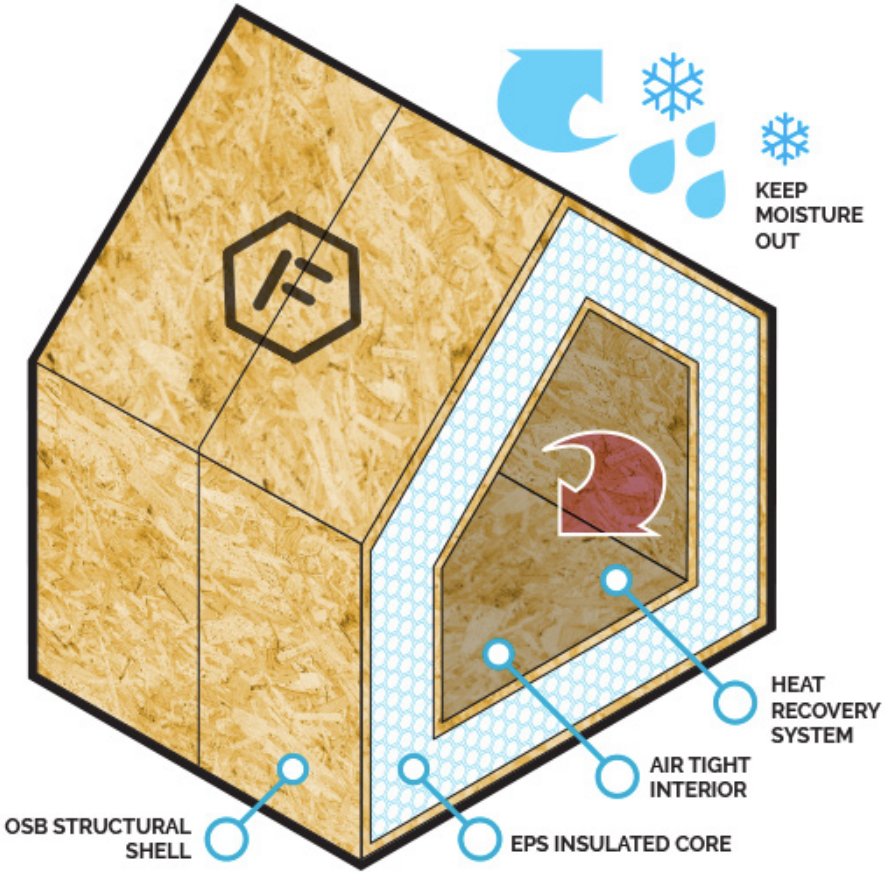
Uncontrolled air movement contributes to heat loss in winter, heat gain in summer, presence of allergens and compromises the performance of insulation.

An airtight building minimises heat loss and therefore it is easy to maintain an even indoor temperature with the minimum amount of active heating. This means that savings of up to 90% on heating can be made whilst enjoying a healthy even temperature throughout the whole building (assisted by MHRV - Mechanical Heat Recovery Ventilation - a system that uses the heat in stale exhaust air to preheat incoming fresh air).

A combination of an airtight building with a continuous layer of insulation ensures that energy is kept within your home, rather than being wasted by escaping into the atmosphere.

The nature of SIPs makes them more conducive to airtight construction. The 3 factors that increase SIP home airtightness are:

- Sheathing inside and out
- Solid insulation
- Air-sealed connections



Energy Efficiency

Living in a highly energy-efficient home means higher levels of comfort, lower energy bills and lower carbon emissions. More than any part of your home, the building envelope has the biggest impact on how energy efficient your home will be.

The better we separate the outside environment from the inside environment the better we can control it. Now you can have it how you like inside, independent from outside conditions. This improves your health and wellbeing, while at the same time, saving lots of wasted money and energy.

There are two primary ways that a building structure loses energy.

The first one is through convection (air leakage). In a traditional frame and truss home, insulation fails because gaps and cavities along the walls or roof allow air from the interior to escape while also allowing exterior air to enter the structure.

The second one is through conduction (heat loss through solid objects). Formance Panels alone are capable of meeting and exceeding recommended R-values for every climate. When combined to create the structure, the continuous insulation with fewer studs means the Formance system has less thermal bridging and a higher whole-wall R-value compared to timber framing.

Building for Climate Change

Increasing focus on climate change puts the spotlight on lowering energy consumption in housing.

NZ WILL BE CARBON-NEUTRAL BY 2050. EFFECTS WILL BE SEEN IN CHANGES TO THE NZ BUILDING CODE

FORMANCE PROVES 60% MORE ENERGY-EFFICIENT THAN TIMBER FRAMING

90% OF TREE WOOD IS UTILISED IN FORMANCE OSB, COMPARED TO AROUND 25% UTILISATION IN TIMBER FRAMING

EPS (EXPANDED POLYSTYRENE) USED IN FORMANCE SIPS IS 100% RECYCLABLE.

SUSTAINABILITY OF FORMANCE PANELS

Formance™ use OSB (Oriented Strand Board) sourced from responsibly managed forests. Around 85%-90% of the tree wood can be used to make high-quality structural panels, and the remaining wood (bark, saw trim & sawdust) can be converted into energy.
We can hear you asking, “How can Formance™ SIPs be eco-friendly if you use EPS (expanded polystyrene)?” The fact is EPS is recyclable, and it’s the only rigid foam product that is. Production of the EPS panel core uses 24% less energy than fiberglass insulation of equivalent R-value.
While the panels themselves are eco-friendly and sustainable, the Formance system goes one step further with energy efficiency when a project is complete.

CARBON REDUCTION

In accordance with the Paris Treaty of 2016, New Zealand has committed to being carbon-neutral by 2050. The two parts to carbon reduction are embodied carbon, which is all the carbon emissions that go into the building itself, including emissions from the manufacture and supply of the building and the emissions generated through the building of it. The other part of carbon reduction is operational carbon emissions which are all the emissions produced during the life of the building. Heating and cooling accounts for around a third of energy use in an average New Zealand home- meaning energy-efficient building envelopes are a key focus. Formance homes are energy-efficient, meaning your home will use less energy to heat and cool. SIP homes will not release any greenhouse gases into the environment.

REDUCING ENERGY USE & COSTS

Energy Efficient Homes in New Zealand are becoming increasingly considered by homeowners, builders and architects. And rightly so, because New Zealanders are spending over 34% of their power bill on space heating, due to so much of the warmth being lost through the walls and ceiling.
Due to the insulation/thermal properties and airtightness of a Formance SIP home, the home will use minimal energy to heat and cool.. Based on the total energy demand calculation from PHPP Modelling, compared to the current minimum standard in NZBC, Formance proved approximately **60% more energy efficient than traditional timber frame construction with batts.**

Faster Builds

Whether you're planning a build for your own home or you're planning to build several, the sooner its built, the better.

SIPs can be a lot faster than traditional framing, particularly when you consider prenailed walls and roof sections.
If you're building one home or several, time is of the essence so the faster you build the sooner you can make use of the homes.
Project managers will understand the time advantage of closing a home sooner, as this means work can be completed outside as well as inside the home at the same time.

STANDING PANELS INDIVIDUALLY

Choose this option if your project involves complications, such as the presence of steel, or the build is generally a "technical build". Panels are supplied individually on pallets, along with a pallet manifest showing you which panels are where, and installation takes place one panel at a time. If you're new to panels and want to understand a bit more about they work this is the option for you. It is generally slower then prenailed sections.

PRENAILED PANELS

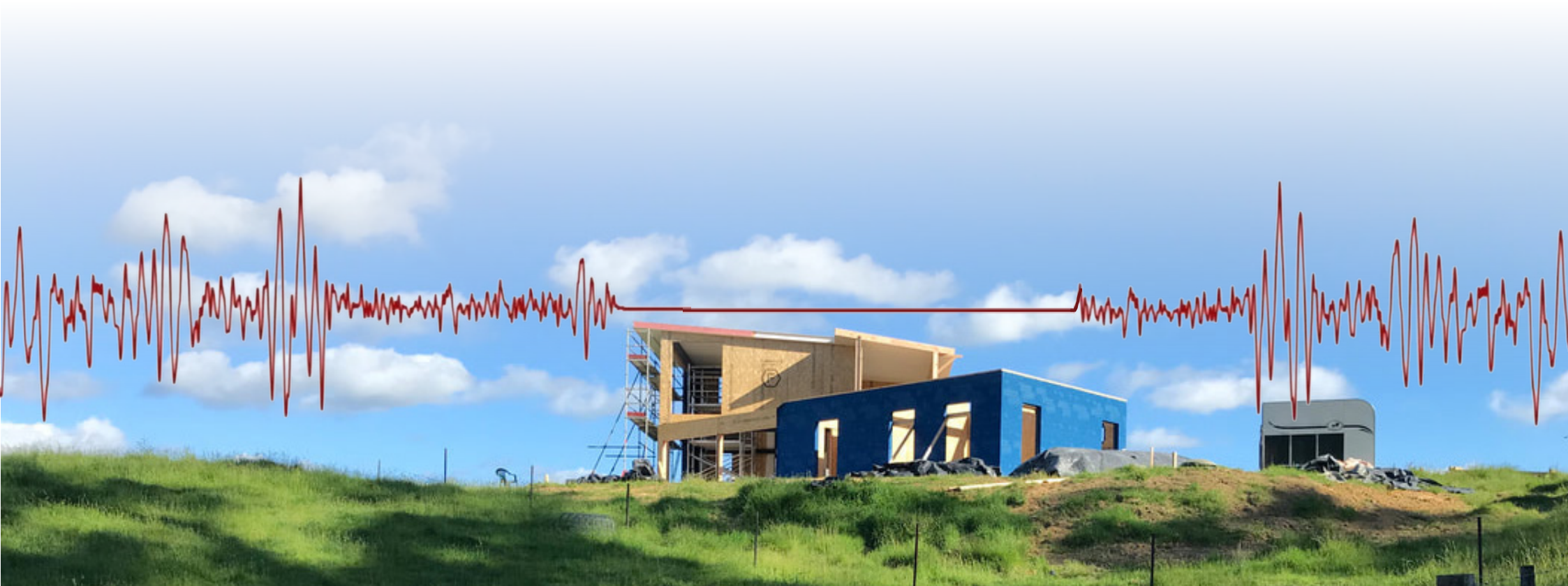
For true offsite manufacturing speed, choose the Formance prenail option. Panels are assembled into larger sections at the Formance factory and supplied in walls, or sections of roof or ceiling. The panels are cut to the precise shapes required, and go straight to the prenail station where timber inserts, thermal splines, straps and other fixings are fitted. The resulting panel is ready to simply drop onto the bottom plate and be nailed off. Builders report savings of 1-3 weeks on a standard residential build program when adopting prenail.

Strength & Seismic Resistance

Formance SIPs have two key attributes that really stand out; they have huge strength and they have great ductility.

Bonding the foam core to the stiff outer skins creates a web-and-flange structural strength (along the same principle as an I-beam) across the length and breadth of the panel. With the capacity to handle axial, bending, racking, and shear loads, properly designed and assembled Formance™ panels not only replace conventional framing, but will withstand high wind, and seismic forces.

SIP homes have the unique ability to take the shock out of the movement by allowing some non-permanent flex in the stucture. Engineers call this ductility. It's small but enough to significantly reduce the impact of the multi-directional earthquake cycle. More rigid and brittle materials like concrete tend to fail abruptly without warning and once gone they require extensive remediation or replacement.



Design Freedom

Even complex designs are made simple with Formance.

What designs work with Formance?

Formance SIPs are manufactured and engineered in our factory under controlled conditions and can be fabricated to suit nearly any building design. Being custom-made any engineered timber or steel solution can be accommodated. SIPs rely on beams and purlins for support, Formance SIPs can therefore span large distances, allowing a minimal amount of structural support to be used.

Projects Formance SIPs are most commonly used on:

BESPOKE & RESIDENTIAL

MULTI-UNITS

EDUCATION & COMMERCIAL

MODULAR & TINY HOMES

Exterior Cladding

All Formance SIP builds require a cavity to meet 'Building Code' Requirements. All cladding options can be used as you would with traditional frame construction. For more information about cladding with Formance SIPs click here for our Technical Bulletin, or head to: formance.co.nz/technical/design/cladding-and-roofing-fixing/

Interior Finishing

Typically, a cavity batten is used to allow space to run services, the same as with traditional frame construction.

Any sheet material including plasterboard can be directly fixed to the interior face of the Formance Panels.
Formance panels are straight so direct fixing is easy. Then you're able to decorate with paint/wallpaper as usual.
Direct fixing reduces flexibility for services, so you will need to consider the logistics and cost of running services without a cavity batten.

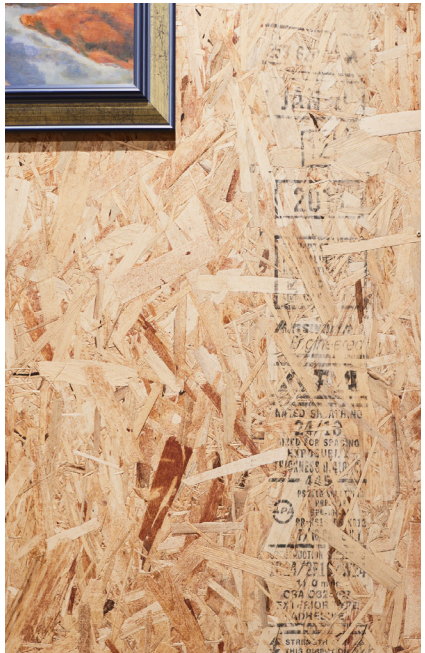
Some like the look of leaving the OSB (Oriented Strand Board) exposed. Formance SIP Interior OSB can also be painted. Leaving the OSB exposed saves money and labour in lining the interior with plasterboard.

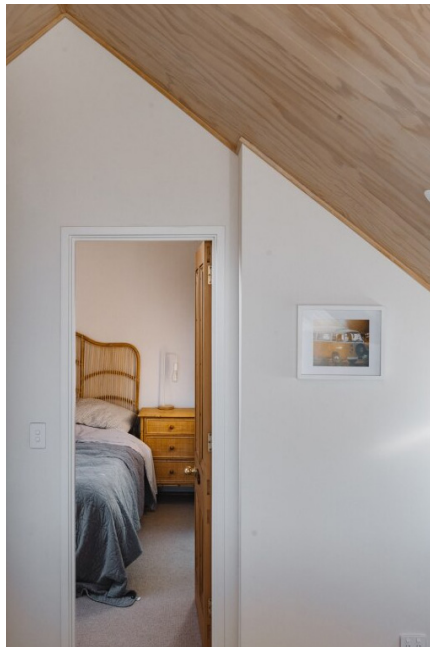
However there are many things to consider when you choose to leave the OSB exposed such as:

- The raw OSB usually has a millmark (black mill markings) on it
- The raw OSB is textured
- Leaving panels exposed does mean you'll need to think about where you'll run services.

For more on Interior Finishing go to our Online Technical Bulletins: formance.co.nz/technical/design/

Examples of different interior finishes on Formance homes.




New Zealand Made

Formance Structural Insulated Panels had been manufactured by our Codemark Certified offshore factory, but the year 2021 saw Method establish a world-class manufacturing facility in Woolston, Christchurch, providing further capabilities and more flexible supply options for projects throughout New Zealand.

FORMANCE IN CHRISTCHURCH

THE FORMANCE TEAM

FORMANCE PANELS READY
FOR PROJECT DELIVERY

FORMANCE PANELS
LEAVING OUR FACTORY

Further Information

What is the cost of a Formance Home?

Choosing Formance is the most cost-effective way of building energy-efficient.

THE COST OF UPGRADING THE BUILDING ENVELOPE TO FORMANCE

The cost of using Formance on your project is usually around 3% to 5% on your total build cost. Considering a Formance build means you will also need to consider:

- Lifetime energy savings
- An always comfortable, warm & healthy home
- A strong durable structure where the insulation does not slump or decrease over time.
- Environmental impact.

THE COST OF DESIGNING A FORMANCE HOME

Designing a Formance home will be the same or similar cost to designing a traditional timber frame home. For a designer that has never used the Formance System before, it may take a few hours to familiarise with the system but our Design Guide and support makes it easy.

THE COST OF INSTALLATION

Cost to install panels is about the same as traditional timber framing. However savings in labour time and the ability to close the project in early should not be underestimated!

What is the best way to run services through SIPs?

Formance panels can have electrical wiring run within the EPS core where required to reduce the need for a cavity on the internal side of the panel.
Plumbing is a little different, we recommend that this is put on internal framing walls where possible, and not through the EPS core.

Acoustic Benefits of SIPs

Testing and feedback from our clients demonstrate excellent acoustic properties of a SIP home a result of the continuous solid block insulation and airtightness qualities of the panels.

Ventilating a SIP home

SIP buildings are very airtight so they require a mechanical heat recovery ventilation (MHRV) system. Ventilation systems remove stale air and bring fresh air into the building in controlled amounts. A ventilation system works 24/7 and allows for all incoming air to be filtered from any pollutants & allergens.

Indoor Air Quality

Formance panels do not contain any VOCs or other harmful chemicals that can affect occupant health. The components used to make SIPs (foam, oriented strand board, and adhesive) meet some of the most stringent standards for indoor air quality. SIP homes made using identical components to Formance panels have qualified under the American Lung Association's Health House® indoor air quality standard

EPS uses pentane, a non-CFC blowing agent that dissipates shortly after production.
EPS has no offgassing.

The adhesives used in Formance panel production do not contain any measurable amounts of volatile organic compounds (VOCs) that can be harmful to occupants

Oriented strand board (OSB) does not contain urea formaldehyde adhesives and meets the world's leading formaldehyde emissions standards, including the U.S. HUD, Manufactured Housing Standard, the California Air Resources Board (CARB) Air Toxic Control Measure for Composite Wood Products and the European EN-300 Standard.

How does Moisture Control work with the Formance System?

Moisture is the enemy of durability so having an effective moisture control system is essential for a long lasting home. Dr Joe Lstiburek, Building Science guru, states that 80% of construction problems are related to water.

Contrary to traditional wisdom in the NZ construction industry today, a rigid air barrier on the outside of the external frame is not a good idea from a moisture control perspective. In most areas of NZ at most times of year, the inside of the home is warmer than the outside; this generates a gentle positive pressure from the inside of the building to the outside. If the inside is not airtight, any moisture in the air is carried through the wall assembly towards the outside.

When it arrives at the outside of the building and meets the cold surfaces it can condense and cause durability issues. That is if the outside is also sealed. Most rigid air-barriers are required to be sealed - we call them a sweat jacket. In a nutshell this is the issue that councils are facing in the colder South Island, durability issues from poor control of internal moisture.

The solution is two fold and beautifully dealt with by Formance panels.

We ensure the inside of the panels is sealed - we do this with tape (if the walls are to have an additional lining) or silicone (if the walls are to be the finished surface).

Ensure the outside of the panels are not sealed - so no taping or self-adhesive wraps on the outside to seal moisture in.

This means that the building will last forever - internal moisture is prevented from entering the structure and external moisture that beats the weather-tight system (cladding) will be allowed to escape through the unsealed external. This includes any moisture picked up during construction.

How do I obtain building consent for a Formance build?

The Formance System is a complete pre-engineered system certified for compliance with the New Zealand Building Code under the CodeMark scheme. Designs must comply with the Formance Design Guide (there is a link to obtain this at the bottom of the page). Designs are submitted along with a copy of the guide and the designer's checklist found within the guide.

There have been many Formance projects consented throughout New Zealand. Formance projects have been through all major councils and most of the regional councils as well so you can specify Formance with confidence.

Does the Formance system require additional engineering?

No, Formance homes do not require additional engineering input (and cost) unless the design is outside of the scope of the Design Guide. The Design Guide is pre-engineered.

Interested to see the Formance system in action?

Contact our team to arrange a viewing or subscribe to our updates online to hear about our latest news and events.

Finding a builder for your project

We're working with forward-thinking builders around the country to ensure high-quality installation of Formance SIP homes. To find out if there is a builder in your area, visit the **find your builder** page on the Formance website.
formance.co.nz/find-your-builder

We're very happy to provide support and training to builders looking to build to a better standard with Formance SIPs.

FORMANCE

www.formance.co.nz

0800 000 527