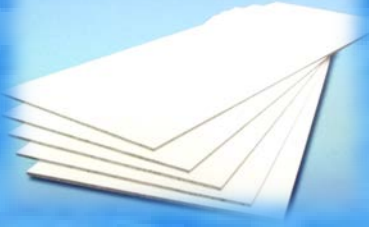


NF Board[®] & *Pellet*



Contributing to building resource recycling-based society through our plastic container and packaging recycling business.



JFE Plastic Resource Corporation

About NF Board®

NF board

What is NF Board®?

Recycled plastic board made from **used plastics** discharged by households.

We promote **resource recycling** by effectively utilizing **used plastic** as a substitute for virgin plastic.

Used NF Board® products are also collected after use and recycled again.

Households



Sorted discharge



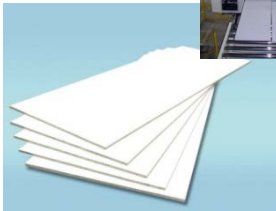
Sorted collection

Local governments



Recycling

JFE Plastic Resource Corp.



NF Board®



Recycled pellets



Recycled plastic chips

***Recycled pellets are NF Board material, and quality of the pellets is controlled under ISO 18263, as one of recycled products.**

Sale

Contributing to the “visibility” of recycling and building of a resource recycling-based society through diversification of applications.

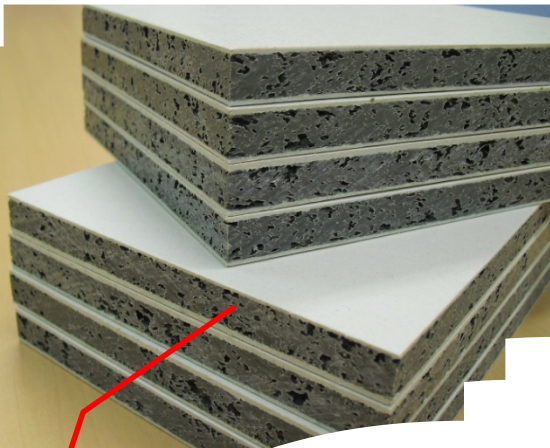


For a “friendly” future for the global environment

1. CO₂ reduction
2. Cascade recycling
 - ① Material recycling as boards
 - ② Collection and secondary recycling of used boards

Features of NF Board®

NF board



1. Economy

- Excellent durability; greatly reduces total cost.
- High abrasion **resistance**, virtually no surface deterioration.

2. Free workability

- Same workability as virgin plastic boards is possible.
- Can be cut, drilled and nailed like wood materials.

3. Easy handling

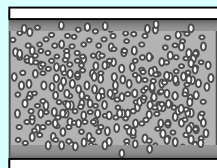
- Same easy handling as virgin plastic boards.
- Almost **zero water absorption**; no weight change due to rain, etc..
- Dirt can be wiped off easily.
- Excellent performance as **embedded forms**.

4. Excellent performance

- High **water/chemical resistance**; virtually corrosion free.
- High **soundproof/heat insulation performance**; suitable for walls.
- **Resists bacterial propagation**; dirt/bacteria are easy to remove.

5. Secondary recycling possible

- Collected used boards can be recycled again (Collection is limited to club association members).



Board cross section
(3-layer foam structure)

← Lightweight foam core layer (waste plastic + N₂ gas)

← High stiffness skin layer (PP)

NF Board®

ISO 14024 standard (Type I Environmental Labelling) “Eco Mark” certification
ISO 14021 standard (Type II Environmental Labelling) Environment-friendly product conforming to “self-declared environmental claims”

◆ Type I ISO14024 Standard “Eco Mark”

Certification method: Certified by 3rd party based on standards established by 3rd party.
Certifying organization: Japan Environment Association

◆ Type II ISO14021 Standard “NF Eco Label”

Certification method: Certification of products satisfying company’s own standards at all times.
Certifying organization: Self-certification



プラスチック中に
再生材料 70% 使用



Eco

■ Product Line

No.	NF (3 Layer)	Thickness (mm)	Size	Width (mm)	Length (mm)	Weight (kg)	Applications	Certified labels
①	NF12	12	2 x 6	600	1,800	9.5	(1) Material for inside walls and ceiling of pigpens, chicken houses and stables (2) Concrete forms, embedded forms (3) For home centers, etc.	
②	NF4	4	2 x 6	600	1,800	4	(1) Material for inside walls and ceiling of pigpens, chicken houses and stables (2) Interior materials for various types of processing plants, interior materials for trucks (3) For home centers, etc.	
No.	SL (Single Layer)	Thickness (mm)	Size	Width (mm)	Length (mm)	Weight (kg)	Applications	Certified labels
③	SL	3	14	1,420	1,420	5.5	(1) Protective sheets for steel coils (2) Materials for anti-inundation measures (rainwater storage tank roofs), etc.	






* Due to the properties of the product, color may change (white to cream) in some cases.

* When ordering, please confirm dimensional difference and inventory status.

* In some regions, products are sold under the name of AD Board White.

Basic Performance and Comparison of Properties of NF Board® ①

Basic Performance

Item		Performance	Test method	
Workability	Cutting, drilling, nailing		Same as plastic board.	
	Nail holding force (N/mm)	Round nail	6 - 13	
		Screw nail	9 - 22	
Internal test method (cutting with saw, drilling with drill, nailing with round and screw nails)			JIS Z2101 "Nail pulling resistance test method"	
Durability	Scratch resistance (abrasion resistance)		Good	
	Impact resistance	Drop weight impact resistance (3kg·5mh)	No cracks	
				DIN 30678 "Drop weight impact test"
	Dropping impact (4mh)	Corner damage (crushing) is slight.		Internal test method (Drop test from height of 4m)
				
	Fire resistance	Welding fireball drop	Burns, but fire does not spread.	
				
Water resistance	Water repellency		Good	
			Internal test method (Repellency test during water dripping)	
	Swelling caused by water			None
Alkaline resistance		No change	Internal test method (Dimensional change after immersion in water for 1 week)	
		Japan Agricultural Standards "Standard for concrete form use (2/27/2003)"		

Comparison of Properties

Mechanical properties		NF Board® (thickness: 12mm)	Plastic board A (other company)	Plastic board B (other company)	Plastic board C (other company)
Name of material		Waste plastic + PP	PP	ABS	PP + glass fiber
Outer dimensions	Width (mm)	600	600	300, 600, 900	600
	Length (mm)	1,800	1,800 to 2,400	800	600 to 2,100
	Thickness (mm)	12	60, 72	10, 12, 15	60, 72
Coefficient of linear expansion (/ °C)		1.1 x 10 ⁻⁴	7 x 10 ⁻⁵	7 to 9 x 10 ⁻⁵	2.2 x 10 ⁻⁶
Bending Young's modulus (kN/mm ²)		1.8 or more	2.6 or more	1.47	3
Allowable bending stress (N/mm ²)		27.0 or more	35.0 or more	37	50
Coefficient of water absorption		0.05% max.	-	-	-
Moisture content		0.02 to 0.05%	-	-	-

Soundproof/heat insulation properties	NF Board® (thickness: 12mm)	Gypsum board (thickness: 12.5mm)	Remarks
Sound transmission loss Frequency 125Hz	21 dB	17 dB	Same soundproof performance as gypsum board.
Thermal conductivity Room temperature 20°C	0.27 W (m·k)	0.22 W (m·k)	Same heat insulation performance as gypsum board.

Comparison of Properties ② (Antibacterial Properties)

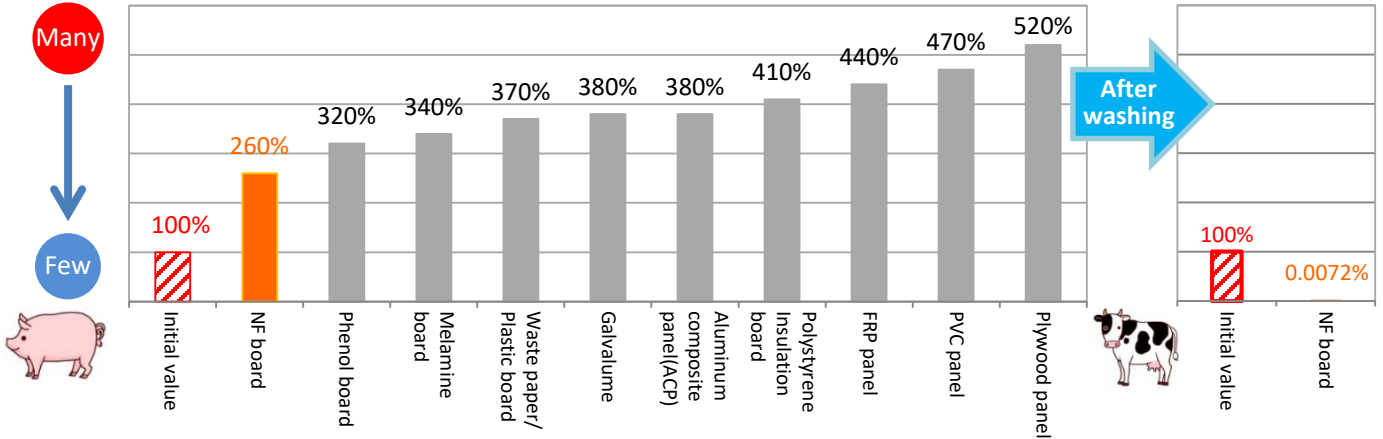
NF board

Antibacterial action allows cleanliness to be easily be restored by washing.

< Bacteria propagation/washing test: e. coli >

Bacteria propagation test parameters: static cultivation on surface wetted with pig manure/water mixture and allowed to sit for 24h at 30°C.

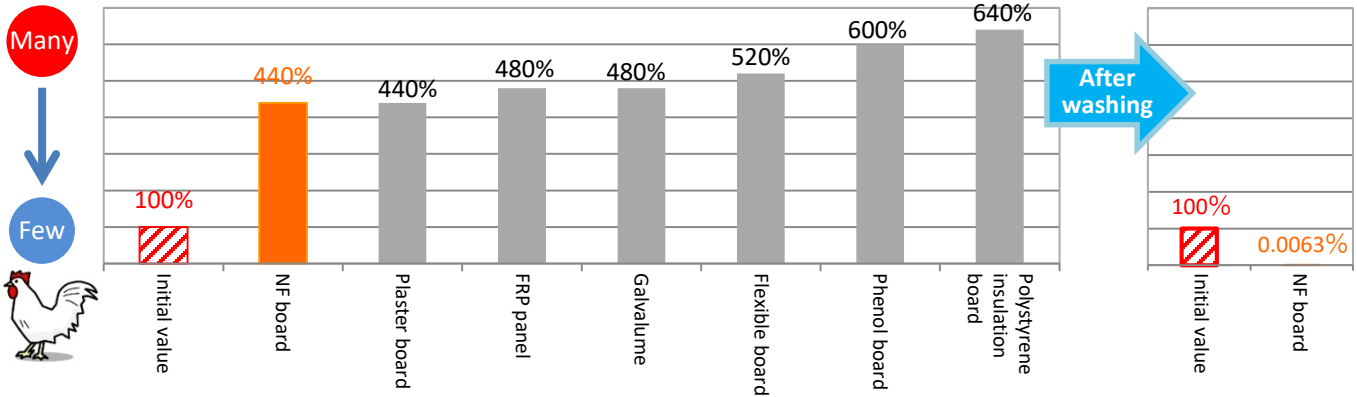
Washing test parameters: high-pressure water washing (10s) and setting (10min) of surface wetted with pig manure/water mixture and allowed to naturally dry for 12h.



< Bacterial propagation/washing test: salmonella bacteria >

Bacteria propagation test parameters: static cultivation on surface wetted with chicken manure/water mixture and allowed to sit for 24h at 30°C.

Washing test parameters: high-pressure water washing (10s) and setting (10min) of surface wetted with chicken manure/water mixture and allowed to naturally dry for 12h.

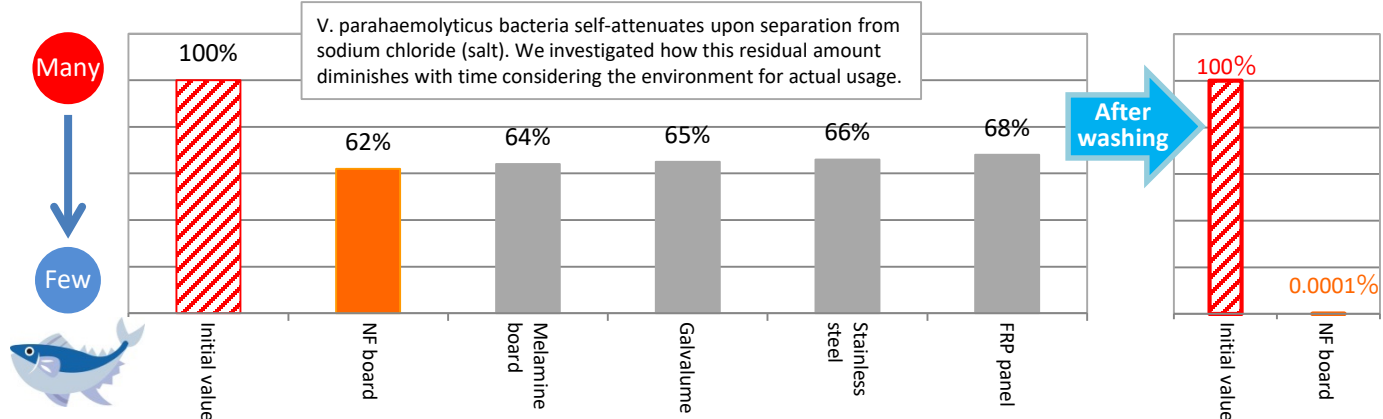


NF board can maintain the same degree of surface cleanliness as stainless steel or melamine (kitchen paneling).

< Test: residual V. parahaemolyticus >

Residual test parameters: static cultivation within sealed humid atmosphere of a surface wetted with V. parahaemolyticus /saltwater mixture and allowed to sit for 24h at 35°C.

Washing test parameters: high-pressure water washing (10s) and setting (10min) of surface immersed in test mixture for 12h at 25°C.



Comparison of Properties ③ (Visible Light Reflectance)

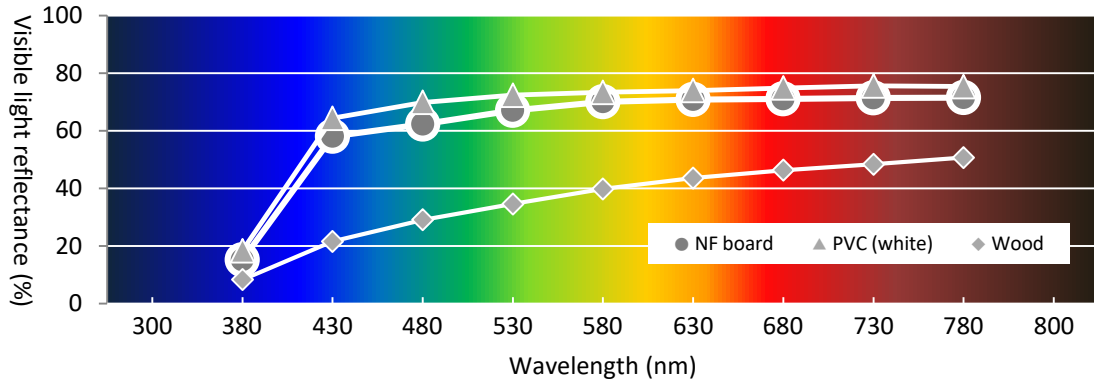
NF board

Strongly reflecting the visible light plants need to grow

Visible light refers to the portion of the electromagnetic spectrum that is perceivable by the human eye (wavelength: approx. 380nm to 780nm). Light of shorter wavelengths is referred to as ultraviolet; and, of longer wavelengths, as infrared. The visible light of particular significance for photosynthesis has a wavelength of about 660nm. Also, for germination, wavelengths of around 450nm and around 660nm are favorable. Likewise, for blossoming, a wavelength of about 550 to 700nm is best.

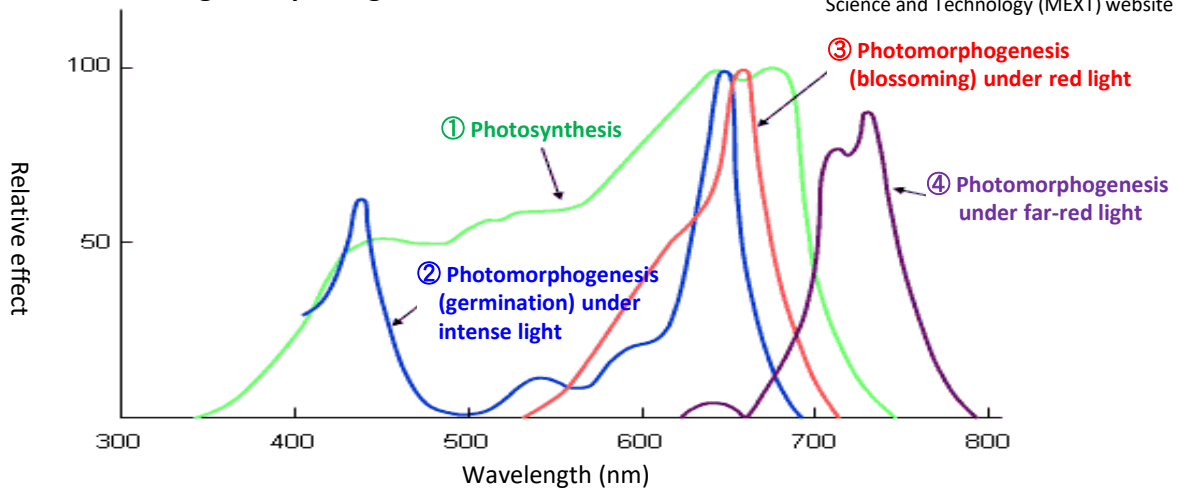
< Test: visible light reflectance >

Test parameters: halogen lamp, diffuse reflection; incident angle of 8° ; UV-visible spectrophotometer



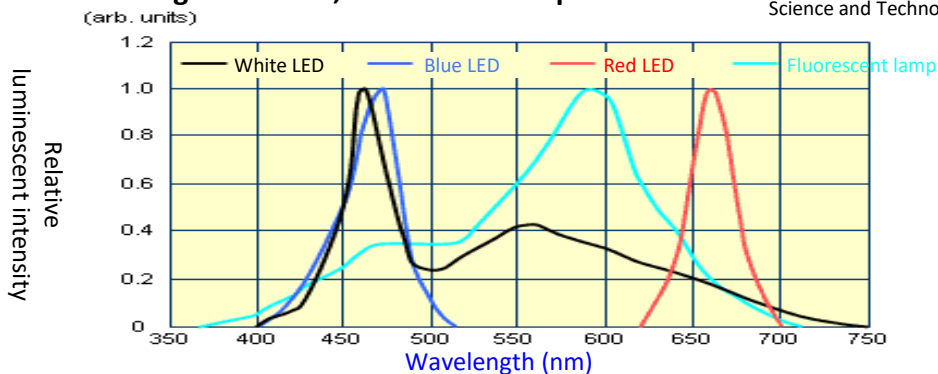
< Effect of wavelength on plant growth >

Source: Ministry of Education, Culture, Sports, Science and Technology (MEXT) website



< Reference: wavelengths of LEDs, fluorescent lamp >

Source: Ministry of Education, Culture, Sports, Science and Technology (MEXT) website



Comparison of Properties ④ (Visible Light Reflectance; Shock Resistance)

NF board

NF Board reflects 60-70% of incoming LED and fluorescent light. This makes pre-existing structures much brighter.

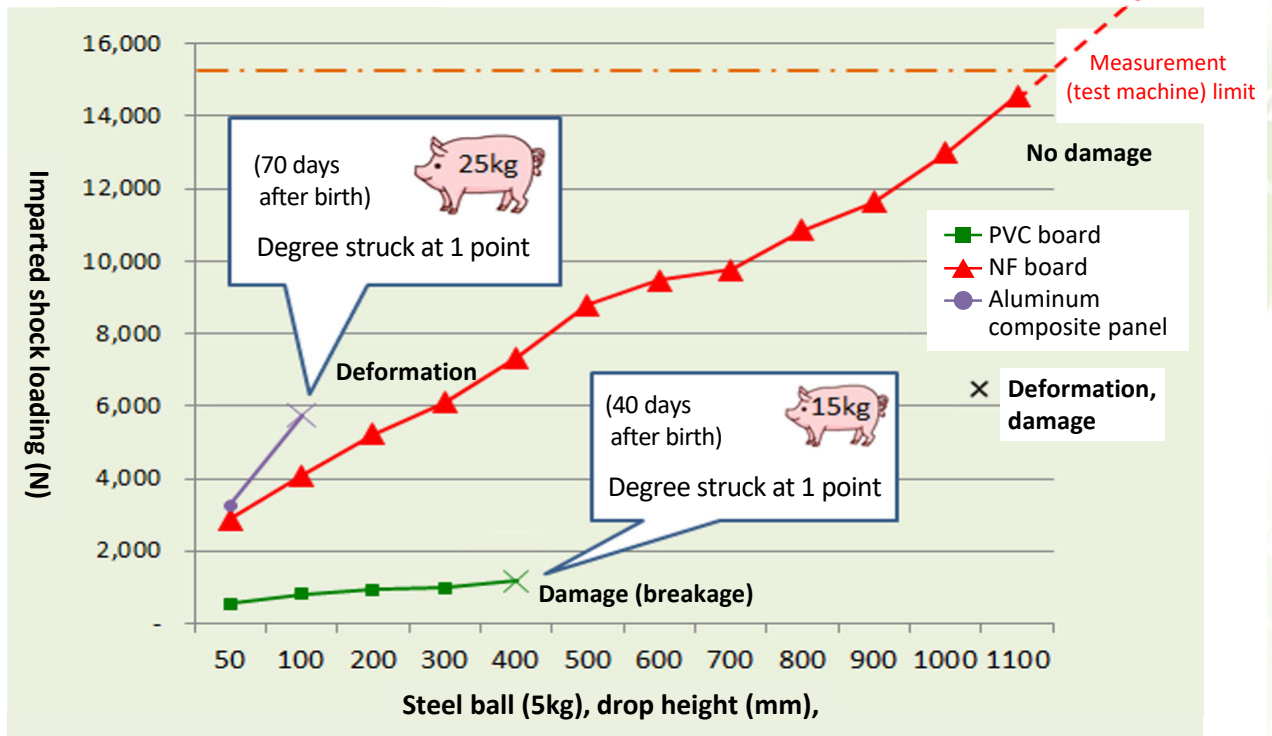
< NF Board suspended over the ceiling >

*Illumination: fluorescent lamps



Absorbs shocks without damage and offers long service life.

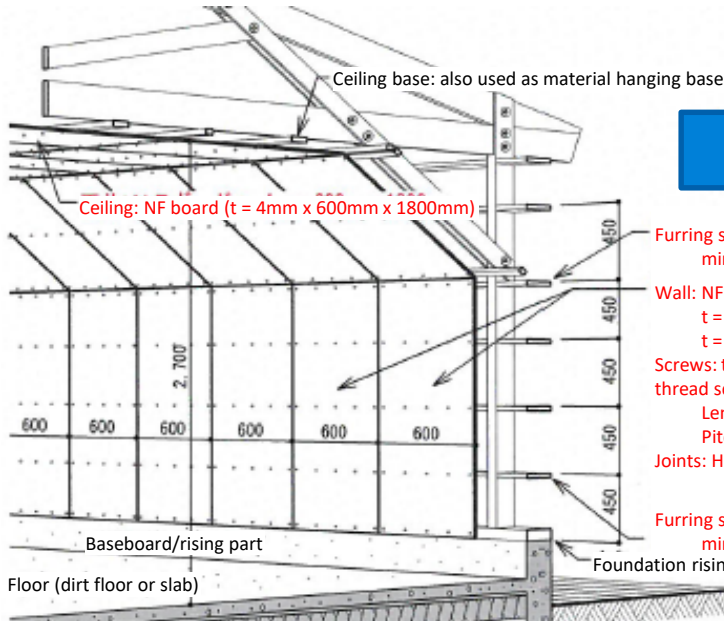
< Test: Vertical drop impact loading >



NF Board® Application Examples (chicken house, pigpen)

NF board

Application of NF4 Board to chicken house wall/ceiling facilitates cleaning and increases brightness while holding down total costs.



Chicken house

- Furring strip:
min. 105mm x approx. 45mm (at joint)
- Wall: NF Board
t = 12mm x 600mm x 1800mm
t = 4mm x 600mm x 1800mm
- Screws: truss head (machine) screws, coarse thread screws, etc.
Length: 38 to 40mm
Pitch: 150-200mm
Joints: H joints or caulking

- Furring strip:
min. 105mm x approx. 30mm (at center)

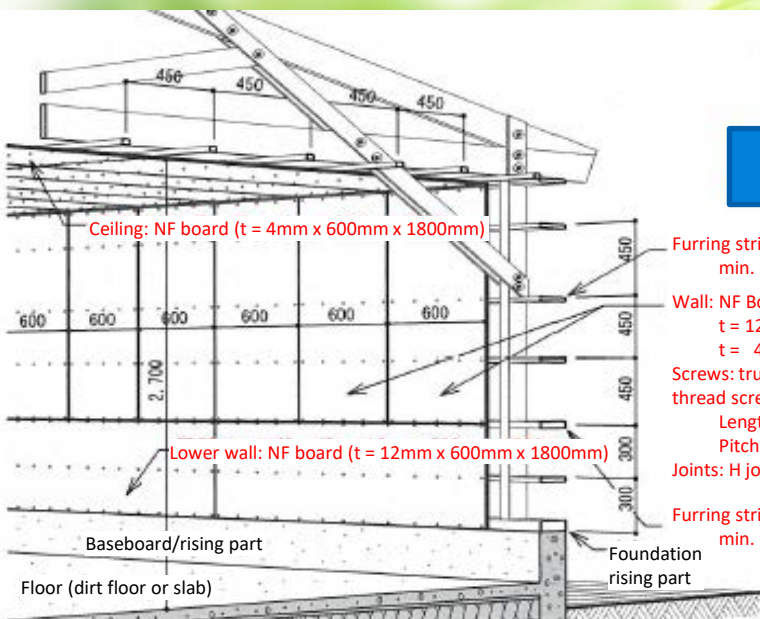


NF4 on ceiling, walls
(chicken house)



Stainless steel
flathead screw

Application of NF4 Board and NF12 Board (lower wall) to pigpen reduces material costs.



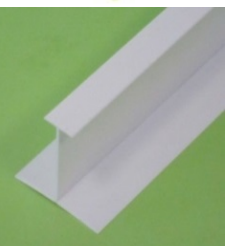
Pigpen

- Furring strip:
min. 105mm x approx. 30mm (at center)
- Wall: NF Board
t = 12mm x 600mm x 1800mm
t = 4mm x 600mm x 1800mm
- Screws: truss head (machine) screws, coarse thread screws, etc.
Length: 38 to 40mm
Pitch: 150-200mm
Joints: H joints or caulking

- Furring strip:
min. 105mm x approx. 45mm (at joint)



Hybrid construction
(pigpen)



H joint

NF Board® Awards and Certifications

Awards

- ① Chairperson's Award, Eco-Products Awards Steering Committee, November 2004

Certifications

- ① Ministry of Environment, Green Purchasing Law, designated procurement product: Certification for concrete forms, 2008, certification for notice boards, 2014
- ② 2009 Kawasaki City Low CO₂ Pilot Brand: Approved February 2010, selected February 2014
- ③ Ministry of Land, Infrastructure, Transport and Tourism, NETIS (New Technology Information System): Registered April 2010
- ④ Eco Mark: Approved April 2010
- ⑤ NF Eco Label (Type II Environmental Labeling): Approved September 2015
- ⑥ Building Center of Japan
Approval of new construction technology: September 2003
Review and certification of construction technology: September 2013
- ⑦ Aichi Prefecture Recycling Evaluation System "Aicle": Approved December 2003, renewed December 2015
- ⑧ 2013 Kawasaki Mechanism: Certified January 2014
- ⑨ Kanagawa Recycled Product Certification: Approved November 2016



Kanagawa Recycle Product Certification



Kawasaki City CO₂ Reduction Pilot Plant (2009)

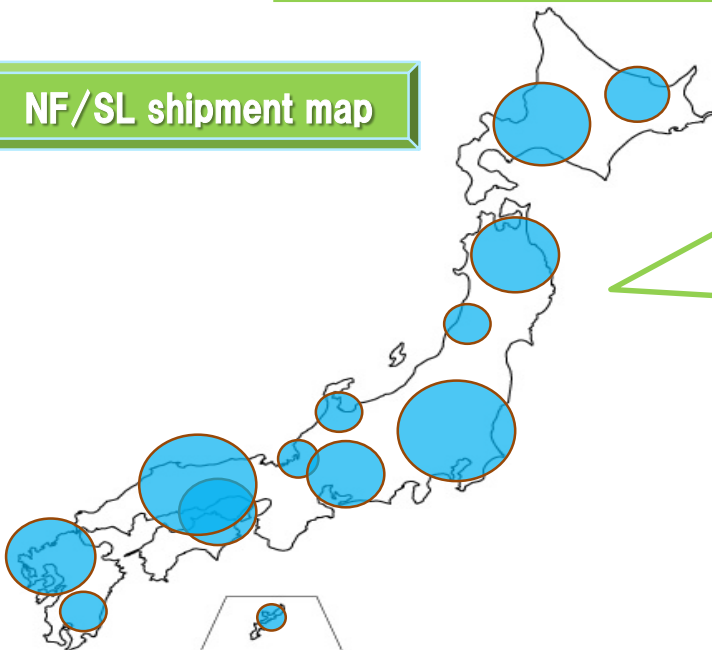


Certification of construction technology by Building Center of Japan

NF Board® Sales Record

Record of sales throughout Japan

NF/SL shipment map



Used in throughout Japan.
Sept. 2002

to end December 2017:

3.70 million sold!

★For overseas, sold under the name of
"JFEN-PLABOARD™"

Wide Range Applications of NF Board®

NF board

Interior Walls of Livestock Barns

<NF12mm・4mm、SL3mm>

White, bright, and easy to clean, NF Board® has excellent resistance to water and chemicals, and suppresses the growth of bacteria.

Chicken house



Pigpen



Cow shed



Stable



Compost shed



Tochigi Prefectural Livestock & Dairy Experimental

Tochigi Prefectural Livestock & Dairy Experimental Center

Pigpen, Azabu University

New Applications <NF12mm・4mm>

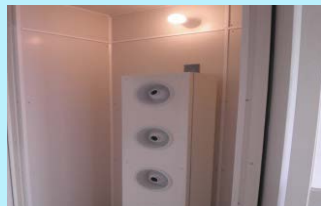
Application of NF Board® is expanding, and gaining track records in the new applications through constant efforts for product developments.



Interior wall of meat processing plant



Interior wall of meat processing plant



Interior wall of cleanroom



Interior wall of fish processing plant



Platform for aquaculture facility



Fish cleaning station



Ship deck wave shields



Ship-bottom wear plates

Other Applications <NF12mm・4mm、SL3mm>

NF Board® with excellent water resistance, durability, and workability, is used in various applications such as protection boards, base materials, information boards.



Protective material for steel



Skateboard ramp material



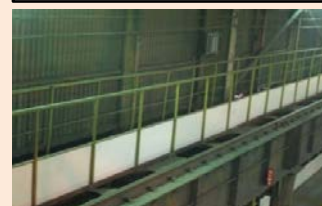
Base material for wall



Election poster board



Visitor information sign in



Passageway fences



Waterproof substrate



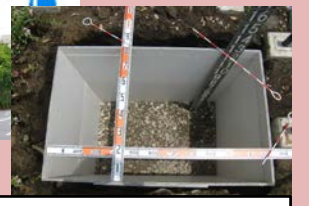
Temporary fence for

For Concrete Forms <NF12mm>

NF Board® has the same strength and workability as plywood forms, but doesn't rot like wood. It's the perfect material for foundation forms for highway signs and for concrete forms used at construction sites.



Foundation form for highway sign



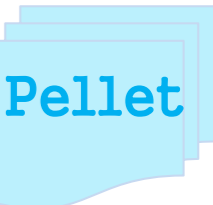
Concrete forms at construction site



Features of Pellets

100% made from recycled plastic materials

1. 2 production sites: Keihin and Fukuyama (Total production capacity: 3 t/h)
2. Sales of hot cut pellets and strand pellets
3. Stable pellet quality, also available for use as board molding material



Equipment

Products

Hot cut



Hot cut pelletizer

Item	Content
Extruder	Twin screw, single screw
Shaft diameter	150φ, 105φ
Capacity	2 t/h x 1 unit 0.5 t/h x 1 unit 0.6 t/h x 1 unit
Mesh size	#20 to #40



Hot cut pellets

Item	Content
Main component	Polyolefin group
MFR	3 to 4
Geometry	Cylindrical (approx. 5φ x 5 mm)
Bulk density	>0.50
Water content	<0.5%
Chloride concentration	<0.3%
Ratio of foreign substances	~0.5%

Strand



Strand pelletizer

Item	Content
Extruder	Single screw x 2 stages
Shaft diameter	140φ, 140φ
Capacity	0.3 t/h x 3 units
Mesh size	#60

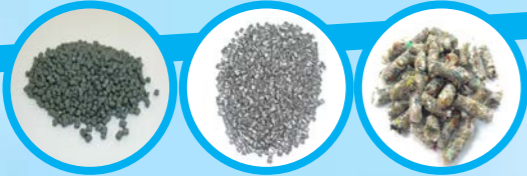


Strand pellets

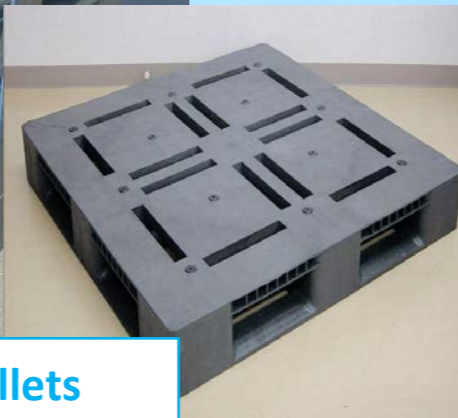
Item	Content
Main component	Polyolefin group
MFR	3 to 4
Geometry	Elliptical cylinder (approx. 3φ x 3 mm)
Bulk density	>0.55
Water content	<0.5%
Chloride concentration	<0.3%
Ratio of foreign substances	<0.2%

Various applications for pellets made from recycled plastic materials

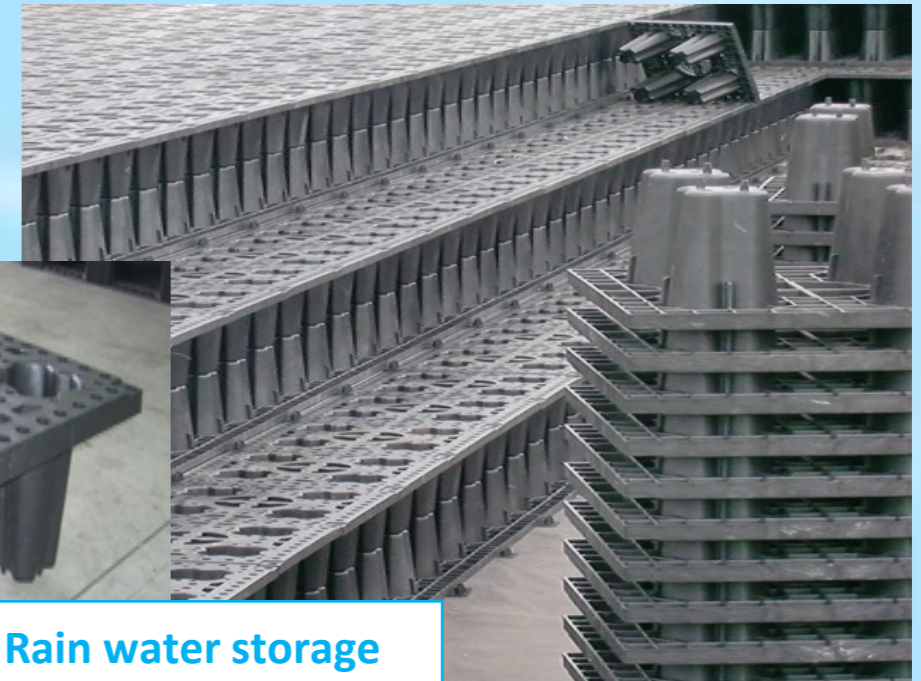
Pellet



Pallets



Rain water storage



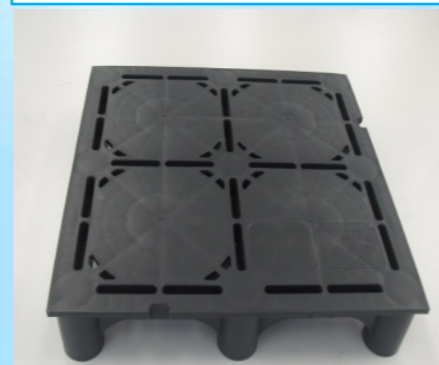
Board for carrying bag



Container for medical wastes



Wall materials for barns



Floor materials



Step for vehicle



eco & eco WIN planters



Composting pot



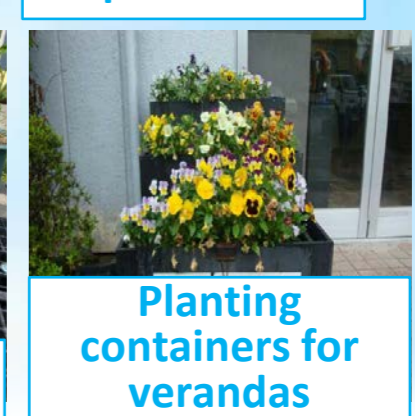
Plant turntable (for Bonsai)



Lawn edging board



Planting pots



Planting containers for verandas

Important: read before use of NF Board®

Using NF Board®



⚠ Warnings, Cautions

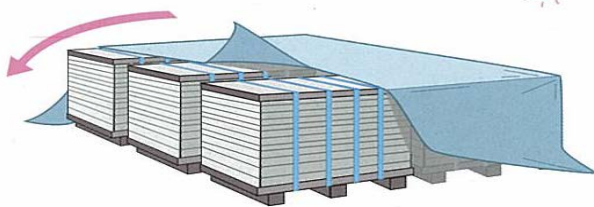
- NF Board is considered a "designated flammable good" under the Fire Service Act and should be stored away from fire or open flame.
- The material can be ignited by sparks/flame from pressure bonding or welding. Make sure to give sufficient curing to the board when using open flame.
- Prolonged exposure to sunlight can lead to surface degradation and precipitate powders (coloring agent). Store under curing sheet or other protective covering.
- Do not walk on the products. It can be slippery.

⚠ Considerations

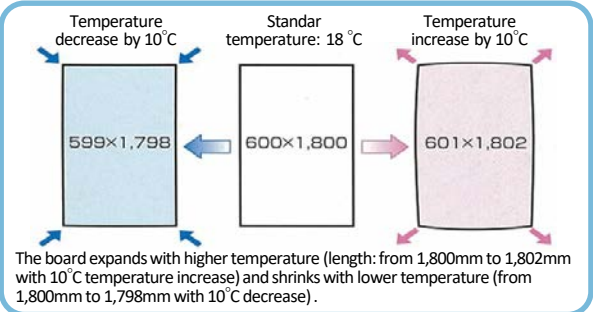
- NF Board is made out of plastic and is thus sensitive to temperature expansion/contraction. It swells in the summer and shrinks in the winter. Thus, it should be fastened in place with finely placed screws and numerous joints.
- NB Board can be brittle at low temperatures. So, when sinking a screw or the like, take care to avoid chipping, especially near edges.
- NB Board can bend, break, chip or otherwise deform if dropped or subject to excessive impact. Handle with care.
- When cutting NB Board, be careful to avoid injury.
- Edges can be sharp. Enough care should be taken for use.
- Dispose of NB Board in a proper manner. If necessary, contact our company for instructions. Be sure to observe all stipulations of the Waste Management and Public Cleansing Act.

Storage and Construction

Storing outdoors for an extended period



Allow to cure. Avoid direct sunlight with a covering sheet, etc.



Cutting



Circular saw is ideal.

Drilling

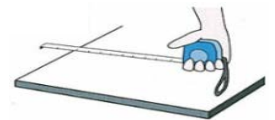


Dedicated drill is ideal.

Nailing



Measurement



Dimensions can vary slightly with temperature. Remeasure before construction.

< Contact us about NF Board® and Pellet >

Keihin Division Sales Sec.
5-1 Mizue-cho, Kawasaki-ku, Kawasaki,
Kanagawa Pref. 210-0866, Japan
TEL: +81-44-299-5193 FAX: +81-44-299-5328
E-Mail: keiji-kaburagi@jfe-plr.co.jp

Fukuyama Division Administrative Sec.
113 Minooki-cho, Fukuyama, Hiroshima Pref.
721-0956, Japan
TEL: +81-84-981-3160 FAX: +81-84-981-3170
E-Mail: hiroki-mishima@jfe-plr.co.jp

