

Calmmoon Marine



Excellent Noise &
Vibration Reduction
Technology



SEKISUI Chemical Co., Ltd.

For over 60 years Sekisui Chemical Group has been one of the world's leading manufacturers of plastic products. Sekisui Chemical is represented worldwide with more than 200 subsidiaries and around 20,000 employees; the company generates a combined annual turnover of approximately 8.6 billion Euros (as of 2012). Sekisui has extensive experience in polymer technology and is constantly developing innovative products.

Sekisui Chemical considers its mission to provide pioneering technologies whilst meeting the highest demands on corporate social responsibility.

Sekisui Chemical is composed of three main business companies.

The "Housing Company" produces well over 10,000 prefabricated houses every year for the Japanese market, each of which are equipped with the superior functions and quality. Every house is built to the customer's specific needs and meets the up-to-date standards in energy efficiency.

The "High-Performance Plastics Company" employs its own original technologies in the areas of fine-particle technologies or adhesive technologies. Utilizing these core technologies, the company provides a wide range of diverse functional materials and intermediate materials around the world. The business fields include automotive technology (AT) materials, information technology (IT) materials and medical devices (MD). A number of high value added products, such as high performance

interlayer film or LCD spacers and electroconductive fine particles, keep the top market shares in the world.

The main focus of "Urban Infrastructure & Environmental Products Company" is to provide social infrastructure which support safe and comfortable human life through an extensive range of products. These products include pipes and related products for water supply, sewage, electricity, gas and telecommunications; home building materials such as rain gutter and modular bath and foam; and functional materials like vehicle seat, FFU synthetic sleeper and noise & sound reduction system 'Calmmoon'. With these product lines, the company contributes to supply the product value chain for the customers.



Calmoon Rail



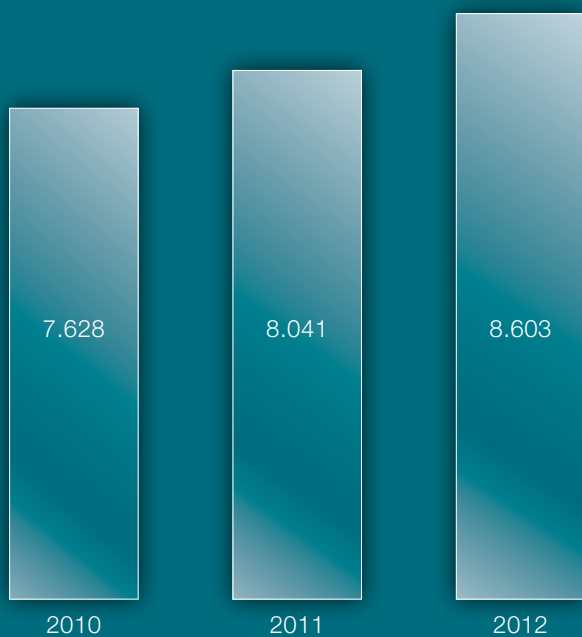
Sekisui Heim



S-Lec Interlayer Films

Annual Turnover SEKISUI Chemical Co. Ltd.

[billions €]



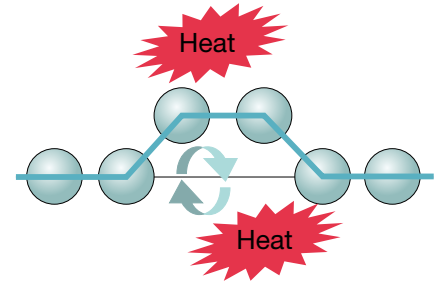
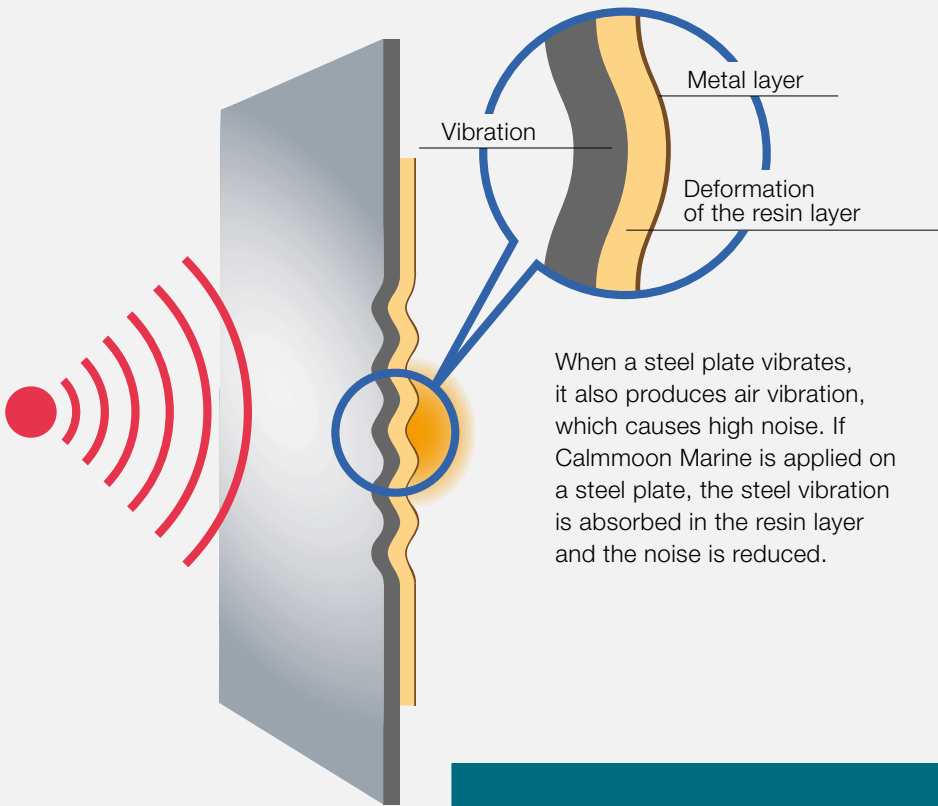
Exchange rate: 1€ = 120 YEN



SPR Technologies



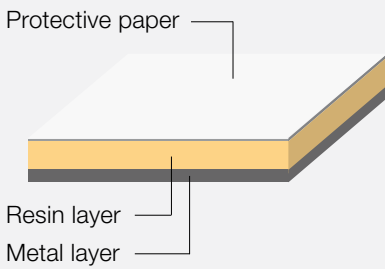
Mechanism of Noise Reduction



Vibration (Noise) Reducing Mechanism

Conversion of the vibration energy of Calmmoon resin layer into friction heat, which causes reduction of vibration (noise)

Calmmoon Marine




Introduction

Calmmoon was developed in 2002 by SEKISUI Chemical Co. Ltd. Since then it has been used in various industries such as marine, railway, automotive and aerospace.

The excellent feature of Calmmoon Marine is that it is a self-adhesive sheet composed of a resin layer with high performance in noise & vibration reduction developed over many years.

The resin layer has the property to convert vibration energy into heat making use of the principle of molecular friction.

Form 900



NIPPON KAIJI KYOKAI

NKK (Netherlands) B.V.

EC TYPE EXAMINATION CERTIFICATE

Certificate No: 2008-04-MED-R2

THIS IS TO CERTIFY that NKK (Netherlands) B.V., designated by the Government of The Netherlands as Notified Body according to Council Directive 96/98/EC on Marine Equipment as amended, did carry out the EC type examination procedures for the equipment and according to the specified standards as identified below:

Applicant : Sekisui Chemical Co., Ltd.
 Address : 2-3-17 Toranomon, Minato-ku, Tokyo, Japan
 Item No. : A.1/3.18
 Product : Surface materials and floor coverings with low flame-spread characteristics (a) decorative veneers
 Product Type : CALMMOON SHEET


Specified Standards : According to EC Directive 2009/26/EC dated April 6, 2009
 SOLAS, Reg. II-2/3, 2/5, 2/6, 2/9 and X/3
 IMO Res. MSC.97(73)-(2000 HSC Code), 7
 IMO Res. MSC.61(67) Annex 1, part 2 & 5 and Annex 2
 IMO MSC/Circ 1120 and ISO 1716(2002)


Attached pages regarding product particulars, approval Documentation, test reports and conditions of validity are part of this EC-Type Examination Certificate.

The equipment mentioned above was found to meet the specified standards in compliance with the requirements of ANNEX B, Module B of the Council Directive 96/98/EC on Marine Equipment.

This certificate is issued at Rotterdam on June 27, 2011 under the authority of the Government of The Netherlands by NKK (Netherlands) B.V., Notified Body No. 0849.

Expiry date of the Certificate: March 30, 2013.






M.P.M. Boeren
Director
NKK (Netherlands) B.V.

0849

Fire Resistance Approval

Calmmoon Marine is approved as the primary deck as per MED Certificate No. 2010-024-MED-R1 and as surface materials and floor coverings with low flame-spread characteristics decorative veneers as per MED Certificate No. 2008-04-MED-R2.

Form 900



NIPPON KAIJI KYOKAI

NKK (Netherlands) B.V.

EC TYPE EXAMINATION CERTIFICATE

Certificate No: 2010-024-MED-R1

THIS IS TO CERTIFY that NKK (Netherlands) B.V., designated by the Government of The Netherlands as Notified Body according to Council Directive 96/98/EC on Marine Equipment as amended, did carry out the EC type examination procedures for the equipment and according to the specified standards as identified below:

Manufacturer : Sekisui Chemical Co., Ltd. Shiga-Rimo Plant
 Address : 75, Nojiri, Rimo-City, Shiga 520-3081, Japan
 Item No. : A.1/3.1
 Product : Primary decks covering
 Product Type : CALMMOON SHEET (Floor Type)


Specified Standards : According to EC Directive 2009/26/EC dated 6 April 2009,
 SOLAS, Reg. II-2/4, II-2/6, X/3
 SOLAS, Reg. II-2/4, II-2/6, IMO Res. MSC.97(73) (2000 HSC Code) 7,
 IMO Res. MSC.61(67) (FTP Code), Annex 1 Part 2 and 6 and Annex 2,
 IMO MSC/Circ.1120


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Expiry date of the Certificate: May 6, 2015.





M.P.M. Boeren
Director
NKK (Netherlands) B.V.

0849

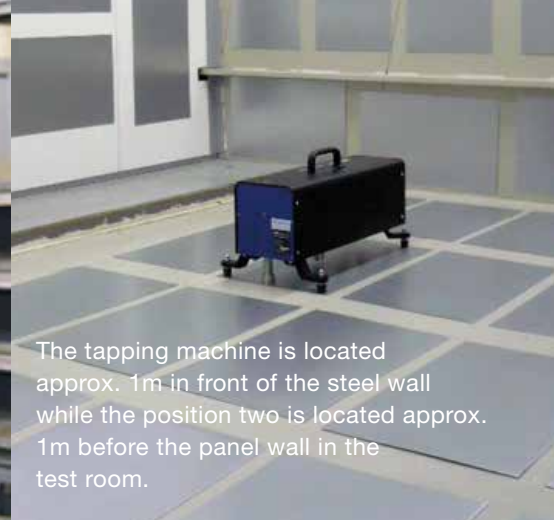
Specifications

The name of the product		Calmmoon Marine
Width (mm)×length (mm)		300 x 500
Thickness (mm)	Resin layer	0.5
	Metal layer	0.8
Weight per one piece (kg)		1
The number of sheets per one carton box		15

Calmmoon Marine consists of two layers: 0.5 mm resin layer and 0.8 mm metal layer in thickness. So it

has thickness of 1.3 mm in total and the weight is 6.9 kg/m². This makes the product easy to be handled.

Decks-Haus-Mockup (DHM)



The tapping machine is located approx. 1m in front of the steel wall while the position two is located approx. 1m before the panel wall in the test room.

Acoustical Investigations

■ Implementing Agency:

Future Ship

- A Germanischer Lloyd Company
- One of the largest maritime consultancies worldwide

Facility: Decks-Haus-Mockup (DHM)
at Kiel, Germany

Period: November 26-28, 2012

■ Operation of the DHM

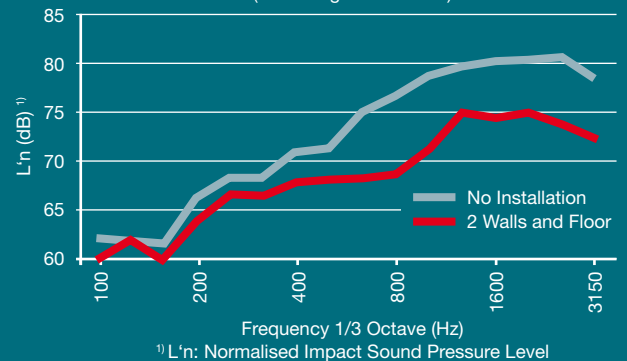
The "Interessen Gemeinschaft Schiffsakustik (IGS)" operates a testing facility – the DHM. The IGS consists of German insulation manufacturers, ship yards and acoustic consultants representing a major part of German maritime industry in this field.

■ Application of Calmmoon Marine

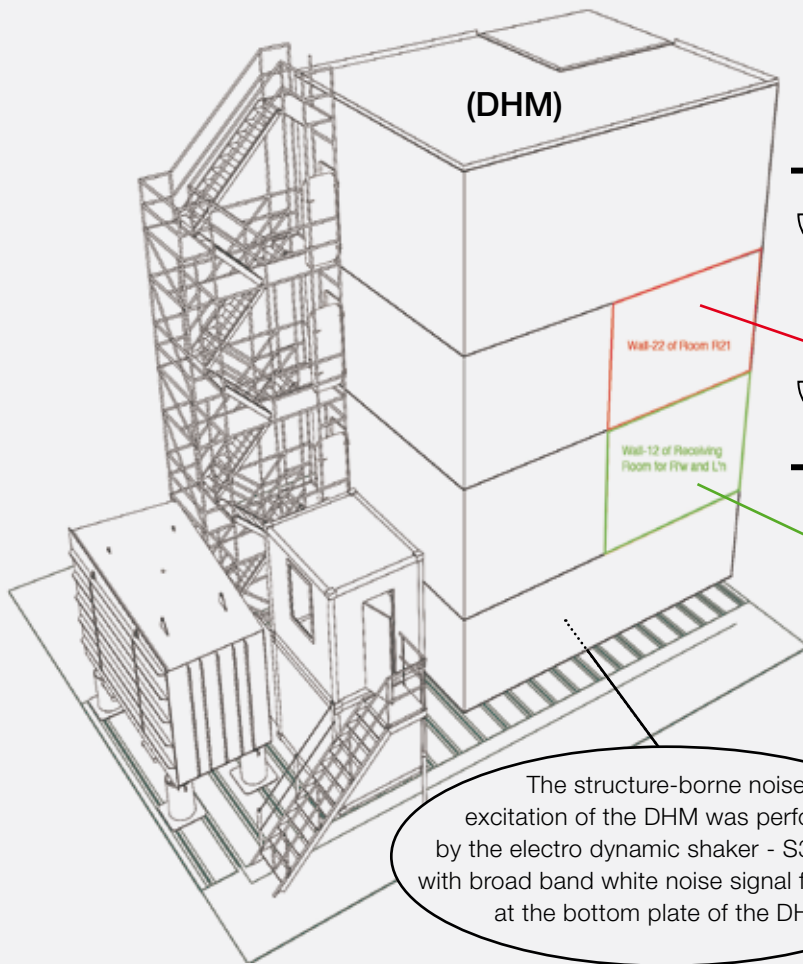
Calmmoon Marine was applied on the two steel wall sides and on the steel floor. The covering ratio of Calmmoon Marine was approx. 62%.

Measurement Results – L'n

(according to ISO140-7)

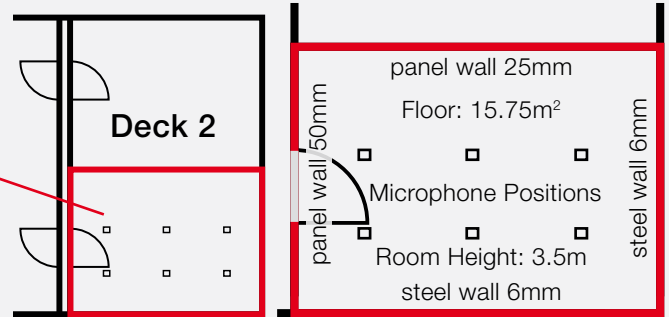


The noise reduction level after the installation of Calmmoon Marine in average (all path) was -7dB in the use of microphones in Deck 1.



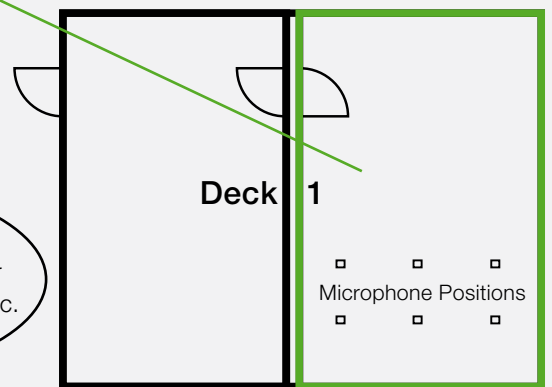
The structure-borne noise excitation of the DHM was performed by the electro dynamic shaker - S3-Shaker with broad band white noise signal for 30 sec. at the bottom plate of the DHM.

Test Room



Microphone Height (Deck 1 & Deck 2): 1.5m

Receiving Room

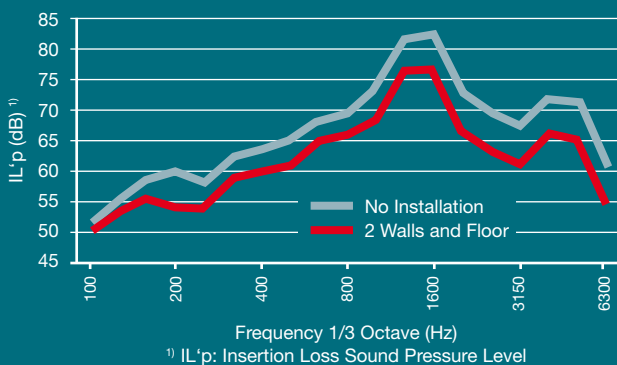


Measurement Results

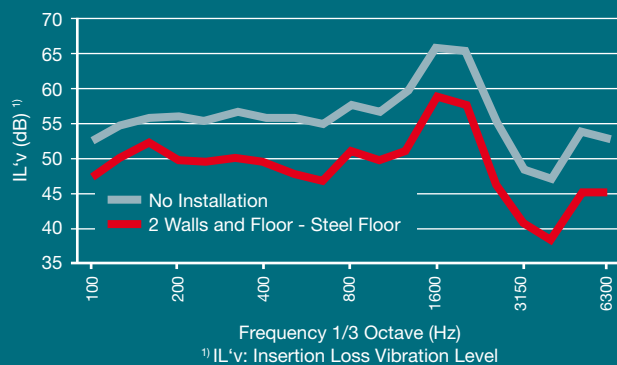
The noise reduction level after the installation of Calmmoon Marine in average (all path) was -5.1dB in the use of microphones in Deck 2.

The vibration reduction level after the installation of Calmmoon Marine in average (all path) was -6.4dB in the use of Permanent SBN-Sensor Setup on the steel floor.

Measurement Results – IL'p



Measurement Results – IL'v

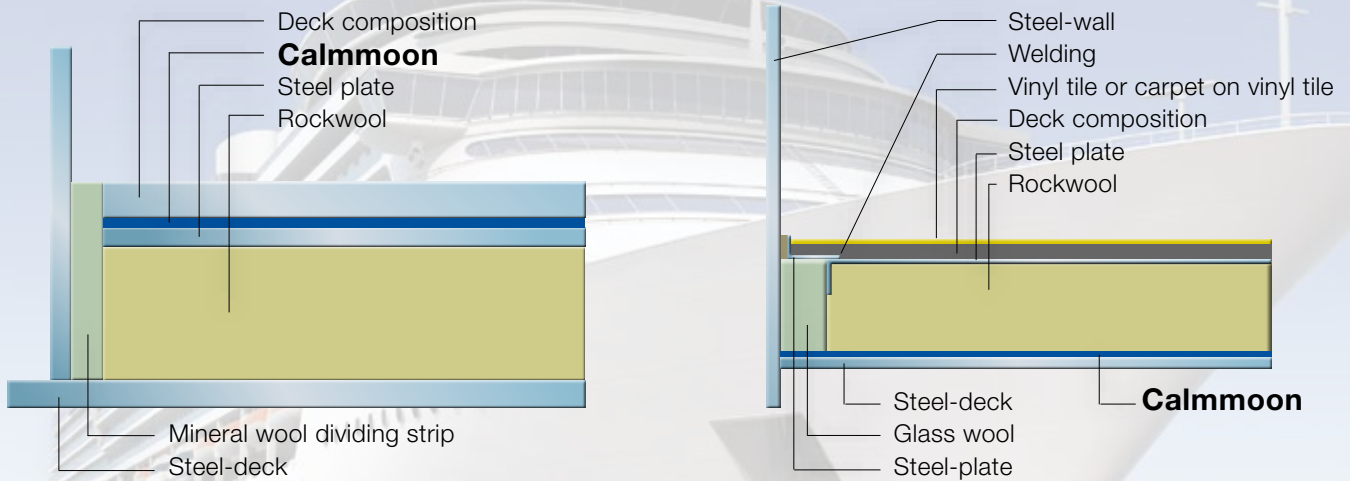


■ **Conclusion:** As a result of tests, Future Ship has concluded that the impact of Calmmoon Marine is clearly demonstrated and it shows excellent reduction in structure-borne noise levels.

Calmmoon Marine Application on Panel Wall



Example of Floor Construction

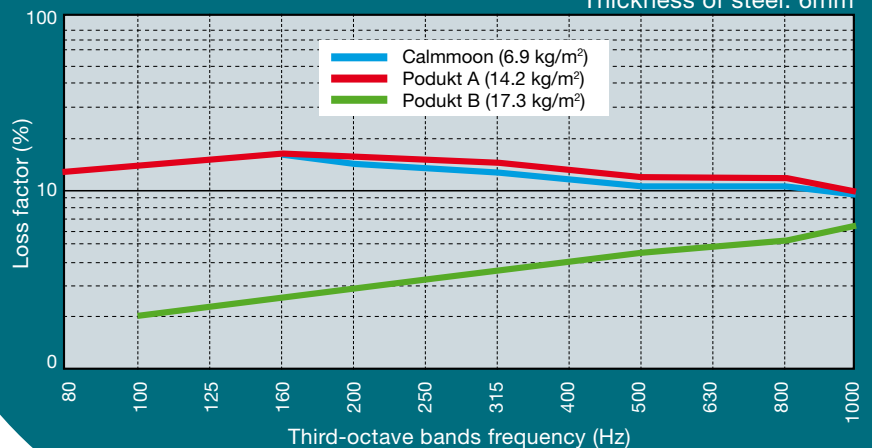


Damping Performance

Excellent noise & vibration reduction can be expected with Calmmoon Marine in spite of the thin thickness of 1.3mm.

Loss factor Measured by Lloyds Register Denmark ODS

Thickness of steel: 6mm



Calmmoon Marine Application before Deck Composition



Application of Calmmoon Marine with Spot Welding

Installation

Calmmoon Marine can be installed as follows:

1. Before the application of Calmmoon Marine, all the dusts and grease shall be removed from the surface.
2. Protective paper must be peeled from the resin layer.
3. Calmmoon Marine with 300 x 500 mm is applied to the surface with hands of one person, as its weight is around 1 kg.
4. It shall be manually pressed onto the surface and its edge shall be pressed down by edge roller.
5. For the wall application each corner of Calmmoon Marine shall be fixed by spot welding.
6. In order to get an optimum noise reduction level, it is sufficient to install Calmmoon Marine only on the area of around 60-70% of the whole surface (It depends on the application).



Advantages in Installation

Shortening Interior Construction Time

- No curing time is required for the installation on the steel construction.

Easy Installation

- Special tools, skills and adjustment works in thickness are not required.

Space Saving

- The flexibility of designing is high because its thickness is only 1.3mm.



References

Since 2002 Calmmoon Marine have been applied on the bulkheads, composite rock walls and floors of more than 200 ships.

Calmmoon Marine has been applied in the construction of cruise ships, ferry boats, tankers offshore ships, tugboats, battleships and submarines.



**Calmmoon Marine
already applied by:**

- Mitsubishi Heavy Industries
- Japan Coast Guard
- Kawasaki Heavy Industries
- Mitsui Engineering & Ship building
- Universal Shipbuilding
- Oshima Shipbuilding
- Hyundai Heavy Industries
- Colombo Dockyard



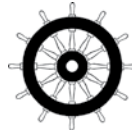
Many prestigious shipbuilders have already decided to use Calmmoon marine for the following reasons: immediate effectiveness in noise reduction, quick and easy installation and, above all, the possibility to shorten the construction period and create more time for other works on the walls or floors.



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Calmmoon Marine



Calmmoon Marine is used inside the ceiling of the dining room, which is located on the deck under the swimming pool of this ship.