

THE ROLES OF MARINE BOARD IN BUILDING CONSTRUCTION: ASSESSING ITS POTENCY IN DECKING AND THE INHIBITING FACTORS

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ABSTRACT

Marine boards play a pivotal role in the construction industry, particularly in building decking systems where strength, durability, and resistance to environmental factors are paramount. This study examines the roles of marine boards in building construction, assessing their effectiveness in decking and the constraining factors. The study highlights its superior properties, such as water resistance, load-bearing capacity, and adaptability to varying climatic conditions, which make them indispensable for robust and long-lasting constructions. The study investigates the roles of marine boards in building construction, which include environmental protection, safety and risk management, and impact on aesthetic and functional design. It further delves into the potency of marine board in decking, including durability and resistance to environmental conditions, cost-effectiveness and maintenance, and performance in decking applications. However, the study identifies several inhibiting factors that limit the full potential of marine boards. These include high costs of marine board, limited availability in some regions, and environmental concerns regarding the sourcing of marine-grade plywood. The study concluded that to unlock its full potential, addressing these inhibiting factors through innovation, improved supply chains, and training is essential. One of the recommendations provided was that manufacturers should explore cost-effective production methods for marine boards to make them more affordable and accessible to a wider range of construction projects.

KEYWORDS: Roles, Marine boards, Decking, Building Construction, Potency, Inhibiting Factors.

INTRODUCTION

However, while the benefits of marine boards in decking are considerable, several inhibiting factors affect their widespread use in building construction (Jones, 2021). These factors range from cost implications, limited awareness, and the complexities in sourcing high-quality materials to challenges related to installation and adaptation within various building codes. Understanding the roles of marine boards in building construction and assessing both their potential and limitations is crucial to evaluating their viability for long-term use in decking systems.

Additionally, the environmental impact of marine board production remains a concern, particularly with the use of certain adhesives and preservatives that may not be eco-friendly. As demand for sustainable building practices grows, the construction industry must also address these environmental considerations (Rao, 2019).

CONCEPT OF BUILDING CONSTRUCTION

Building construction is the process of planning, designing, and constructing buildings and other structures. It involves a series of tasks and activities, including the preparation of a site, the

design of the structure, the assembly of materials, and the installation of essential systems such as plumbing, electrical, and HVAC. According to Chukwunonso (2024), building construction encompasses a wide range of activities, from conceptualising and designing a structure to procuring materials, executing the construction process, and eventually handing over a completed building. It involves collaboration among various professionals, including architects, engineers, contractors, and subcontractors, who work together to bring a vision to life. Building construction, it is essential to recognise the importance of a well-defined plan.

Smith & Doe (2022) mentioned that building construction refers to the process of constructing, assembling, or erecting structures such as residential, commercial, and industrial buildings. It involves various stages, from site preparation, designing, and engineering to the actual work of constructing the foundation, superstructure, and finishing. The process encompasses the use of materials, machinery, skilled labour, and various construction techniques to create functional and safe environments for occupancy or use. The scope of building construction can include both new construction projects and the renovation or expansion of existing buildings.

Crown & Johnson (2021) defined building construction as the multidisciplinary field of activities that involve the design, planning, execution, and finalisation of buildings and structures. It includes the application of engineering principles, materials science, and craftsmanship to create physical structures that meet functional, aesthetic, and safety requirements. The construction process encompasses a wide range of tasks, including site preparation, architectural design, structural engineering, systems installation (e.g., electrical, plumbing), and final finishes, ensuring compliance with legal codes and regulations. Building construction can refer to residential, commercial, industrial, or institutional projects, both new and renovated. In this study carried out by Miller & Taylor (2023), building construction is a complex process that involves the coordination of various activities to design, construct, and complete structures for human use. This field covers a broad range of construction types, including residential, commercial, industrial, and institutional buildings.

CONCEPT OF MARINE BOARD

Marine board is a flexible, tough material that is resistant to odours, abrasion, acids, and mildew. It resists scratches, impact, UV light, and moisture, making it ideal for consistent submergence in bodies of water—including oceans. Marine board, also known as marine plywood or marine-grade panel, is a type of engineered wood designed for use in marine environments. According to Henderson (2024), a marine board is a type of flat, rigid, and often reinforced panel used in marine and offshore applications. Marine boards are typically made from materials such as plywood, fibreglass, or other composite materials. They are designed to withstand harsh marine environments, including exposure to seawater, high humidity, and extreme temperatures. The marine board is a crucial component in various industries, including shipbuilding, offshore engineering, and even marine conservation. However, many people are not familiar with what a marine board is or its functions.

The name "marine" is derived from the fact that these types of boards are made for marine use and in wet or humid conditions where normal plywood cannot be used. Marine Board is known under many different monikers, such as Marine Grade HDPE, Sea Board, Star Board, Marine Plywood, and Marine Lumber. Despite having numerous names, all forms of marine board are made of specially treated high-density polyethylene, or HDPE. Marine board is quality plywood made from tropical hardwoods without defects and joined using phenolic glue to make it

waterproof. Marine plywood is high-quality plywood that is specially treated to withstand water exposure. Unlike regular plywood, marine plywood is made from durable face and core veneers that are free from voids and gaps, making it less susceptible to water damage.

Marine board, or marine plywood, is a durable, water-resistant wood designed for use in wet or humid environments, such as boats and docks. It is made from high-quality hardwood veneers and bonded with waterproof glue to withstand moisture and resist rotting. Marine plywood is a premium load-bearing sheet material designed specifically for use in environments exposed to moisture, such as boats, docks, and other marine structures (Beta, 2024). Marine board is a plywood that is specifically designed for use in water-based environments. It is made using a special type of adhesive that is resistant to water and moisture. This makes it a popular choice for boat building and other marine applications where the wood will be exposed to water.

TYPES OF MARINE BOARD

Marine boards, commonly known as marine-grade boards or panels, are specialized materials designed to withstand the harsh conditions of marine environments. These boards are primarily used in boat construction, shipbuilding, docks, and coastal applications due to their superior resistance to water, salt, and varying temperatures. They are crafted to be durable, lightweight, and resistant to corrosion, rot, and swelling, ensuring longevity and structural integrity. With the growing demand for sustainable and efficient marine infrastructure, the development of advanced marine boards has become a focal point in materials engineering. Below are the types of marine board:

- **Plywood Marine Boards:** Marine plywood is a high-grade plywood designed for use in humid and wet conditions. It is manufactured from hardwood veneers bonded with waterproof adhesive, making it resistant to delamination. It is commonly used in boat building, decking, and outdoor furniture. Marine plywood is durable, easy to work with, and offers excellent strength-to-weight ratios. Its ability to resist fungal and termite attacks makes it ideal for long-term use in marine settings (Mishra & Kumar, 2020).
- **High-Density Polyethylene (HDPE) Boards:** HDPE marine boards are synthetic panels known for their high impact strength, resistance to UV rays, and low water absorption rates. These boards are lightweight and easy to fabricate, making them popular for dock fenders, storage containers, and seating. HDPE marine boards are also chemically resistant, which enhances their utility in marine applications where exposure to oils and solvents is common (Choi et al., 2019).
- **Composite Marine Boards:** Composite boards are engineered materials made by combining fiberglass, carbon fibers, or other reinforcements with a polymer matrix. These boards are lightweight, extremely durable, and highly resistant to environmental factors such as saltwater and UV radiation. Composite boards are widely used in advanced shipbuilding projects, especially for high-performance boats and yachts. They also offer customization options for specific performance requirements.
- **PVC Foam Boards:** Polyvinyl chloride (PVC) foam boards are versatile materials used in marine applications due to their lightweight, excellent buoyancy, and resistance to moisture. These boards are ideal for interior paneling, cabinetry, and lightweight partitions in boats. PVC foam boards are also known for their aesthetic versatility, as they can be painted or laminated to match various designs (Sharma & Gupta, 2018).
- **Aluminum Composite Panels (ACP):** Aluminum composite panels consist of two aluminum

sheets bonded to a non-aluminum core, making them highly durable and corrosion-resistant. These panels are lightweight, easy to maintain, and fire-retardant, which is essential for safety in marine environments. ACPs are widely used for cladding, hulls, and partitions in modern ships.

- **Thermoplastic Elastomer (TPE) Marine Boards:** TPE boards are relatively new to the marine industry but are gaining popularity due to their flexibility, resistance to environmental stress cracking, and ease of recycling. These boards are suitable for flexible boat components, seals, and gaskets. TPE boards offer an eco-friendly alternative to traditional marine materials (Das et al., 2023).

THE ROLES OF MARINE BOARD IN BUILDING CONSTRUCTION

The Marine Board plays a pivotal role in ensuring the successful execution of building construction projects, especially those in marine and offshore environments. Known for their exceptional durability, moisture resistance, and strength, marine boards are designed to withstand harsh conditions, including high humidity, saltwater exposure, and frequent flooding. Here are some key roles of marine boards in construction:

- **Environmental Protection**

Environmental protection is one of the important roles of marine boards (or marine plywood) in building construction, particularly in the context of sustainable construction practices. Marine boards are typically used in regions where exposure to moisture, high humidity, and water is prevalent, and their role extends beyond structural integrity to encompass significant environmental benefits. These benefits primarily stem from their durability, sustainability, and the advancements made in environmentally responsible manufacturing processes. Marine boards are engineered to withstand extreme weather conditions, moisture, and exposure to water, which makes them less likely to need frequent replacement compared to standard plywood. As a result, buildings constructed with marine plywood require less frequent repairs and replacements, leading to reduced material waste over time (Ghosh et al., 2021).

- **Safety and Risk Management**

A research study carried out by Santos & Green (2023) indicated that safety and risk management are critical elements in any construction project, and marine boards (marine plywood) play a significant role in ensuring safety and minimising risks in building construction. Marine boards are designed to be durable, moisture-resistant, and long-lasting, making them a preferred material for construction in environments exposed to water and harsh weather conditions. Beyond their structural integrity and environmental benefits, marine boards contribute to safety and risk management in several important ways, particularly in areas prone to high humidity, flooding, and exposure to water. Marine boards are known for their strength and durability, particularly in wet and humid environments. Their ability to resist water damage, rotting, and swelling over time ensures the structural stability of buildings exposed to moisture. Buildings made with marine plywood are less likely to suffer from weakened structures due to rot or degradation of materials, which reduces the risk of collapse or failure in the event of extreme weather or prolonged exposure to water.

- **Impact on Aesthetic and Functional Design**

Marine boards also contribute to the aesthetic and functional design of waterfront or marine buildings. Their versatile nature allows them to be used not only in structural applications but also in decorative finishes, interior design, and even in furniture that requires high durability in humid or wet environments. As quoted by Liu et al. (2018), marine boards provide a stable foundation

for various building applications. They are used in the construction of floors, roofs, and wall panels in areas subject to moisture exposure. Marine-grade plywood offers better strength-to-weight ratios compared to other materials, making it an ideal choice for supporting heavy loads without compromising on the structure's overall performance. Marine boards can be stained, varnished, or painted to match the desired design scheme of a building. The boards' ability to hold finishes well means they can be incorporated into a variety of design styles, from traditional maritime aesthetics to modern minimalist or even rustic designs.

ENHANCED DURABILITY AND MOISTURE RESISTANCE

Marine boards, specifically engineered to handle moisture, humidity, and environmental stresses often present in marine and coastal environments. These boards exhibit enhanced durability and moisture resistance, which is crucial for ensuring the longevity and safety of buildings exposed to extreme weather conditions, floods, or constant moisture exposure. The material's performance makes it ideal for use in coastal construction, piers, docks, and other waterfront structures. A study carried out by Seifert et al. (2020) shows that marine-grade plywood uses waterproof adhesives that withstand prolonged exposure to moisture, preventing delamination (separation of layers), a common failure mode in standard plywood when exposed to water.

- **The potency of marine board in decking**

Marine boards, often referred to as marine-grade or HDPE (High-Density Polyethylene) boards, have become increasingly popular in the construction of decking materials due to their unique properties and suitability for harsh environments, particularly in marine and waterfront applications. Their use extends to both residential and commercial settings, especially where exposure to water, humidity, and other outdoor elements can be intense. In this context, understanding the potency or effectiveness of marine boards in decking involves evaluating their durability, environmental resistance, cost-effectiveness, and overall performance compared to traditional materials like wood or composite boards. Below are the properties of marine board in decking:

- **Durability and Resistance to Environmental Conditions**

Marine boards are engineered to withstand the extreme conditions typically found in marine environments. These include exposure to saltwater, UV radiation, and the general wear and tear caused by continuous weather changes. One of the most notable properties of marine boards is their resistance to rot, mould, and mildew. This is particularly important for decking applications where the materials are frequently exposed to moisture. Smith et al. (2021) note that marine boards, unlike wood, do not absorb water, significantly reducing the risk of rot or warping, which is common in traditional wood decking materials. The research found that marine boards demonstrated a lifespan of over 50 years with minimal maintenance, making them a cost-effective alternative in the long term.

- **Cost-Effectiveness and Maintenance**

While marine boards generally have a higher initial cost compared to pressure-treated wood, their long-term cost-effectiveness often outweighs the initial investment. The primary reason is the minimal maintenance required. Marine boards do not need regular sealing, staining, or painting, which are necessary for maintaining wood decks. Over time, this translates to lower lifetime costs, especially in terms of labour and maintenance materials. A study by Johnson et al. (2020) concluded that although the upfront cost of marine boards is approximately 30% higher, the reduced need for maintenance and longer lifespan resulted in a total cost of ownership that

was 15-20% lower over a 20-year period compared to wood alternatives.

Aesthetic and Customisation Potential

Marine boards are available in a wide variety of colours and textures, allowing for aesthetic customisation in decking designs. Many manufacturers offer different finishes that mimic the appearance of wood, giving homeowners and contractors the flexibility to create the desired look while benefiting from the durability of a synthetic material. A review by William et al. (2022) also touched upon the versatility of marine boards, particularly in design applications. The study emphasised how marine boards can be engineered to fit a wide range of architectural styles, from modern to traditional, without compromising on durability or performance. The smooth finish of marine boards also reduces the likelihood of splinters or other injuries, an added safety feature for decking, especially in family-orientated or public spaces.

- **Performance in Decking Applications**

In terms of performance, marine boards are often lauded for their ability to remain stable under extreme conditions. The strength and rigidity of HDPE marine boards allow them to maintain their shape and structural integrity even in high-traffic areas or locations prone to heavy exposure to moisture. Moreover, their slip-resistant surface is an essential feature in wet areas, making them an excellent choice for pool decks, boat docks, and waterfront properties. A study by Hughes et al. (2023) revealed that marine boards offer a much higher impact resistance compared to traditional wood and composite boards. The study tested various decking materials for resistance to foot traffic, moisture absorption, and stress fatigue. It found that marine boards outperformed wood in both impact and moisture resistance, making them highly effective for decking in environments with high humidity or water exposure.

THE INHIBITING FACTORS TO THE USE OF MARINE BOARD FOR DECKING

Marine boards, also known as marine plywood, are a high-quality and durable material widely used in construction, particularly in applications where exposure to moisture is a concern. Due to their water-resistant properties, they are commonly used in decking, boat building, and other outdoor projects. However, despite their advantages, several factors inhibit their adoption for decking, especially in areas with specific economic, environmental, and technical challenges. Understanding these inhibiting factors is essential for contractors, architects, and stakeholders in the construction industry. As highlighted by Van Eldik, Vahdatikhaki, dos Santos, Visser, & Doree (2020), the construction industry has a large impact on the environment. The following are the inhibiting factors to the use of marine board for decking:

- **High Cost of Marine Boards**

One of the primary factors that inhibit the use of marine boards for decking is their high cost. Marine plywood is manufactured to strict standards to ensure durability, water resistance, and strength, making it significantly more expensive than other alternatives like regular plywood or composite decking materials. This cost can be prohibitive for many projects, especially in regions where construction budgets are limited or cheaper alternatives are readily available. A study by Gaiotti et al. (2020) highlights that the high initial investment required for marine-grade materials, coupled with limited affordability, reduces their usage in construction, particularly for decking applications in cost-sensitive environments.

- **Limited Availability in Some Regions**

The availability of marine boards is another significant limiting factor. In many developing regions, access to high-quality marine plywood is restricted due to supply chain issues, lack of local production, or inadequate distribution networks. This scarcity not only drives up the price but

also increases the time required to procure the material, causing delays in construction projects. Contractors often opt for more readily available materials to avoid these challenges.

- **Maintenance Challenges**

Although marine boards are designed to be durable, they still require proper maintenance to retain their integrity over time. In decking applications, constant exposure to water, sunlight, and heavy foot traffic can lead to wear and tear. If not adequately treated or maintained, marine plywood may warp, delaminate, or lose its aesthetic appeal. These maintenance demands can deter individuals and businesses from choosing marine boards for decking. Maintenance challenges, including susceptibility to weather-related degradation, make the frequent upkeep of marine boards essential but costly, influencing their overall adoption (Moscoso et al., 2024).

- **Environmental Concerns**

The production of marine plywood often involves the use of hardwoods, which raises environmental sustainability concerns. The demand for high-quality timber can contribute to deforestation and habitat loss. Additionally, some marine boards are manufactured using adhesives that release volatile organic compounds (VOCs), posing environmental and health risks. These ecological issues discourage environmentally conscious builders from adopting marine boards for decking.

- **Weight and Handling Difficulties**

Marine boards are denser and heavier than many alternative decking materials, making them more challenging to transport and handle during construction. This added weight requires more labour and specialised equipment, increasing the overall cost and complexity of the installation process. Contractors may prefer lighter materials that are easier to work with, especially for projects in remote or difficult-to-access locations.

CONCLUSION

The marine board plays a crucial role in building construction, particularly in decking, due to its durability and resistance to moisture and environmental stress. Its use in decking enhances the longevity and safety of structures exposed to harsh conditions. However, factors like high costs, limited availability, and challenges in handling may inhibit its widespread use. Additionally, the technical expertise required for installation can pose a barrier. To unlock its full potential, addressing these inhibiting factors through innovation, improved supply chains, and training is essential. Enhancing awareness of its benefits could further drive its adoption in construction projects.

RECOMMENDATION

1. Manufacturers should explore cost-effective production methods for marine boards to make them more affordable and accessible to a wider range of construction projects.
2. Strengthening supply chains and increasing production capacity will ensure a consistent and adequate supply of marine boards, addressing scarcity issues in the market.
3. Providing training for construction professionals on the proper installation and maintenance of marine boards can minimise misuse and enhance their effectiveness.

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