A CRITICAL ANALYSIS OF FOUNDATION BLINDING: STUDYING ITS RELEVANCE IN BUILDING CONSTRUCTION

By

Arc Peter Sunday USANGA
Department of Architecture
University of Uyo

And

Prince Uko EBENEZER,
Department of Civil Engineering,
Akwa Ibom State University, Akwa Ibom State.

ABSTRACT

This study sought to examine the relevance of foundation blinding in building construction and its contribution to the quality, durability, and performance of structural foundations. The study critically analyzed the concept of foundation blinding, its various types, roles, and effects on structural foundations in modern construction projects. Foundation blinding was identified as a vital construction practice that provides a clean, level, and stable surface for foundation works; prevents contamination of structural concrete by soil particles and groundwater; and enhances moisture control during construction. The study also examined different forms of foundation blinding, including sand blinding, granular blinding, lean mix concrete blinding, and cement-stabilized soil blinding, highlighting their suitability under varying site conditions. Findings revealed that foundation blinding improves concrete quality, facilitates accurate reinforcement placement, preserves the integrity of the foundation base, and minimizes the risk of differential settlement and structural defects. The study further established that although foundation blinding is non-structural, it indirectly contributes to the long-term stability, safety, and durability of buildings. The study concluded that foundation blinding remains an indispensable component of modern building construction and recommended its adoption as a standard practice in all foundation projects to ensure sustainable and durable structures. One of the recommendations made was that foundation blinding should be made a standard requirement in all building construction projects to improve foundation quality and structural durability.

KEYWORDS: Foundation Blinding, Relevance, Building, Construction.

INTRODUCTION

Because it safely distributes structural loads to the ground and guarantees the stability of the entire building, the foundation is one of the most important parts of any building construction. Architectural specifications play a crucial role in the construction process by furnishing comprehensive details on the items, materials, and techniques that will be employed in the building of a project (Usanga & Edem, 2024). The quality of building techniques used during foundation preparation has a significant impact on a foundation's efficacy and longevity. Among these techniques, foundation blinding has come to be recognized as a crucial procedure that improves the performance and integrity of structural foundations. Before structural concrete is cast, foundation blinding entails applying a thin coating of lean concrete, sand-cement mixture, or other appropriate materials on the prepared ground. Although often considered a non-structural element, foundation blinding plays a significant role in improving construction quality and protecting the foundation from adverse environmental conditions (Neville, 2021).

Foundation blinding is well known for its capacity to improve moisture control during foundation building, prevent soil particles from contaminating concrete, and give a clean and level working surface in contemporary construction projects. The robustness, longevity, and long-term performance of foundations are directly impacted by these functions. Furthermore, foundation blinding supports accurate placement of reinforcement bars and formwork, thereby reducing construction errors and ensuring compliance with engineering specifications (Althoey et al., 2021). The use of eco-friendly materials in foundation blinding has drawn more attention as the construction industry continues to adopt sustainable building standards.

In small-scale construction projects, foundation blinding is sometimes disregarded despite its significance because of financial concerns or a lack of technical expertise. Poor concrete quality, unequal load distribution, and early structural damage can result from such neglect. In order to emphasize foundation blinding's importance in building construction and its contribution to structural stability, safety, and sustainability, a critical analysis of the practice is required. In order to highlight the importance of foundation blinding in contemporary building construction, this study assesses the idea, kinds, functions, and impacts of foundation blinding on structural foundations.

Concept of Foundation Blinding

Before building structural foundations, a thin layer of low-strength concrete, lean concrete, sand-cement mix, or another appropriate material is applied directly to the prepared ground surface. This process is known as foundation blinding. Between the earth and the foundation's structural concrete, it acts as a leveling and protecting layer. Because it offers a clear, stable, and consistent working surface that enables precise placement of reinforcement bars, formwork, and foundation concrete, foundation blinding is a crucial part of contemporary construction. It serves a vital function in enhancing construction quality, durability, and foundation performance even though it has little effect on the building's structural load-bearing capability.

Preventing soil, groundwater, or other external contaminants from contaminating structural concrete is the main goal of foundation blinding. The quality and strength of foundation concrete may be diminished when it is placed directly upon excavated soil due to the mixing of organic matter, moisture, and tiny particles. The blinding layer acts as a barrier that preserves the integrity of the structural concrete and ensures compliance with design specifications (Zhang, 2022). Additionally, blinding provides a level and smooth surface that enables contractors to accurately position reinforcement cages and maintain the specified concrete cover, which is essential for preventing steel corrosion and enhancing structural durability (Althoey, 2021).

Moisture control is another crucial role of foundation blinding. The blinding layer minimizes changes in the water-to-cement ratio and enhances the curing process by reducing the migration of water from the soil into freshly laid concrete. This contributes to the development of the desired strength and durability characteristics of the foundation concrete (Neville, 2021). Additionally, foundation blinding lessens disturbance to the underlying soil, particularly in soft or unstable ground conditions, and helps distribute building loads during foundation preparation procedures.

In contemporary construction projects, sustainable approaches to foundation blinding are gaining attention. Researchers have explored the use of recycled aggregates, industrial by-products, and low-carbon concrete materials in blinding applications to reduce environmental impacts while maintaining adequate performance (Siddika, 2021). These developments support international initiatives to encourage environmentally friendly building techniques and lessen the carbon footprint of construction projects.

Concept of Building Construction

Building construction is the systematic process of planning, designing, and assembling physical structures such as residential, commercial, and industrial buildings. A building is an enclosed space, such as a house or factory that has walls and a roof and is typically stationary. Buildings may be found in a wide range of sizes, forms, and purposes" (Usanga & Usanga, 2024). It involves the transformation of architectural ideas and engineering designs into a tangible structure through coordinated activities that include site preparation, foundation laying, structural framing, roofing, finishing, and installation of building services. Building construction is not only a physical activity but also an integrated process that combines technical knowledge, project management, sustainability principles, and modern technologies to achieve efficient and durable infrastructure development. This is noted by Sheikh and Sharma (2020), who emphasize that modern construction is increasingly driven by innovation and improved building techniques.

The pre-construction phase, which includes feasibility studies, architectural design, structural analysis, budgeting, and getting regulatory clearances, is where the idea of building construction starts. Professionals, including architects, civil engineers, quantity surveyors, and contractors, work together at this point to make sure the planned construction satisfies functional, financial, and environmental standards. As noted by Lu (2020), the design phase has become more advanced with the integration of digital tools such as Building Information Modeling (BIM), which improves accuracy, coordination, and decision-making among project stakeholders.

The actual physical work starts during the construction phase, which is the second step. This covers clearing the site, excavating, building the foundation, framing the structure, and installing the mechanical, electrical, and plumbing systems. Prefabrication, modular construction, and automation are examples of contemporary building techniques that are being utilized more frequently to increase productivity, shorten construction times, and improve quality. As noted by Schönbeck (2020), the emergence of Construction 4.0 technologies has significantly transformed traditional construction practices by improving productivity, safety, and project delivery outcomes.

The usage of materials and technology is another crucial component in building construction. While conventional materials like steel, cement, sand, and gravel are still necessary, eco-friendly and sustainable materials are becoming more and more popular. The design and construction of buildings are being revolutionized by advancements in construction technology, such as automated machinery, smart sensors, and 3D printing. As noted by O'Neill (2020), prefabrication and automated assembly methods improve quality control, reduce waste, and enhance construction speed compared to conventional site-based methods.

Post-construction and maintenance is the last phase, which includes building inspection, commissioning, occupancy, and long-term upkeep. Over time, structural performance, safety, and durability are guaranteed by proper maintenance. Modern construction practices also place a strong emphasis on sustainability, designing buildings to have as little of an impact on the environment as possible through water conservation, energy efficiency, and lower carbon emissions. Sustainable construction practices are essential for achieving long-term environmental and economic benefits in the built environment (Olaniyi, 2020).

Types of Foundation Blinding

- **Sand Blinding**

Sand blinding involves the placement of a layer of well-graded and compacted sand beneath a foundation. The sand layer helps to create a uniform formation level, improve drainage, and reduce minor irregularities in the excavation surface. It is particularly suitable where the underlying soil is stable and groundwater conditions are favorable. The use of sand blinding also helps distribute loads more evenly across the foundation base. According to Oyeyemi et al. (2020), sand blinding contributes significantly to foundation stability by improving the interface between the soil and the structural foundation.

- **Granular or Crushed Stone Blinding**

Granular blinding is made from crushed stone, gravel, or hardcore materials compacted to form a stable foundation base. This type of blinding is widely used in areas with poor drainage conditions because it allows water to move freely through the layer, thereby reducing hydrostatic pressure beneath the foundation. The material also increases bearing capacity and minimizes differential settlement. Uge and Guo (2020) observed that granular blinding enhances load transfer mechanisms and improves the performance of foundation systems constructed on weak soils.

- **Lean Mix Concrete Blinding**

Lean mix concrete blinding is produced using concrete with a lower cement content than that used for structural purposes. It provides a firm, economical, and durable platform for foundation construction while reducing overall construction costs. The layer is particularly useful in large raft foundations and industrial buildings where extensive foundation areas require preparation. The effectiveness of lean mix concrete blinding in providing a stable working surface was highlighted by Zhang and Li (2023), who noted that it improves foundation quality control and construction efficiency.

- **Cement-Stabilized Soil Blinding**

Cement-stabilized soil blinding is formed by mixing in-situ soil with a specified quantity of cement to improve its engineering properties. The process increases soil strength, stiffness, and durability while reducing permeability and settlement potential. This method is considered environmentally sustainable because it reduces the need for imported materials. Varaksin (2020) stated that cement stabilization techniques have become increasingly important in modern geotechnical engineering due to their ability to enhance foundation performance on weak or problematic soils.

Types of Building Construction

- **Residential Building Construction**

Okoye (2020) stated that residential building construction refers to the design and erection of structures intended for human habitation and accommodation. Single-family homes, duplexes, apartments, bungalows, and high-rise residential complexes are among these structures. Creating safe, cozy, and useful living spaces that satisfy residents' social and financial needs is the main goal of residential construction.

- **Commercial Building Construction**

Mohan (2020) noted that commercial building construction involves the development of structures used for business and commercial activities. Office buildings, shopping centers, hotels, eateries, banks, and retail establishments are a few examples. These structures are made to be as useful, accessible to customers, and profitable as possible while adhering to safety and building codes.

- **Institutional Building Construction**

As highlighted by Eberhardt (2020), institutional building construction involves the development of structures that provide public and social services. Schools, colleges, hospitals, libraries, museums, government institutions, and places of worship are among them. Usanga & Usanga (2025) noted that school buildings are physical structures that are designed to educate students… designed to be safe, accessible, and conducive to learning with functional floor plans. Institutional buildings must meet certain functional, safety, and accessibility requirements in order to accommodate large numbers of people.

- **Industrial Building Construction**

As noted by Ghumare (2021), industrial building construction involves the erection of factories, manufacturing plants, warehouses, and processing facilities. These structures are made to support large-scale production activities, industrial processes, heavy machinery, and storage while maintaining worker safety and operational effectiveness. It encompasses a wide range of activities, from site preparation and foundation laying to erecting walls, installing utilities, and finishing interiors.(Akpan & Bernard,2025)

- **Smart Building Construction**

As emphasized by Zhou (2021), smart building construction incorporates advanced digital technologies, automation systems, sensors, and data-driven management tools into building design and operation. Through intelligent monitoring systems, smart buildings enhance maintenance, security, energy efficiency, and overall building performance.

- **Sustainable (Green) Building Construction**

According to Amusan (2021), sustainable building construction emphasizes environmentally responsible design, resource efficiency, waste reduction, and the integration of innovative technologies throughout the building life cycle. The objective is to improve building performance and occupant well-being while reducing environmental effects.

- **Modular Building Construction**

Lim (2022) said that modular building construction is a construction method in which building units or modules are manufactured in a factory-controlled environment and later transported to the project site for assembly. Compared to traditional approaches, this strategy shortens building times, increases quality control, and strengthens project collaboration.

The Roles of Foundation Building in Building construction

The primary functions and structural contributions of a foundation can be categorized into four key technical roles:

- **Load Distribution and Mechanical Transfer**

A building's superstructure exerts massive dead loads (weight of permanent materials) and live loads (occupants, furniture, and environmental forces). The foundation acts as the essential interface that accepts these collective loads and uniformly distributes them over a larger surface area of soil or bedrock (Nnaji Eze2023). In structural framing, this mechanical path relies heavily on columns and building pillars to channel superstructure weight downward so the foundation can spread it safely across the underlying earth (Isaac & Edem, 2024). This spreading mechanism ensures that the

pressure exerted does not exceed the ultimate bearing capacity of the underlying strata, safeguarding the structure from foundational rupture.

- **Prevention of Differential Settlement**

While uniform settlement is common and manageable, differential settlement—where one portion of a building sinks faster or deeper than another—induces severe internal stresses. This leads to structural failure, wall cracks, warping, or total collapse. Foundations are explicitly engineered to equalize localized soil stresses, bridging gaps in uneven subsurface soil profiles and maintaining a uniform leveling plane across the entire building envelope. Achieving this level of structural durability requires efficient design and construction parameters that preserve structural integrity over time (David & Isaac, 2024).

- **Lateral Stability and Resistance to Environmental Forces**

Beyond vertical gravitational forces, buildings are continuously subjected to lateral (horizontal) dynamics caused by seismic activity, high-velocity wind loads, and hydrostatic soil pressure. A properly constructed deep or shallow foundation anchors the building deep into the earth, providing the necessary lateral resistance to prevent overturning, sliding, or uplifting during extreme geological or meteorological events (Al-Anbari2025). Foundational stability anchors the entire stationary shelter, securing the building envelope against external dynamic loads (Usanga & Usanga, 2025).

- **Overcoming Ground Environmental Changes**

Subsurface environments are highly dynamic. Soil moisture fluctuates, groundwater tables rise or fall and certain formations (like expansive clays) expand and shrink intensely (Eze2023). Foundations isolate the primary framing of the building from these variable soil movements, providing a stabilized buffer that resists moisture intrusion and minimizes shifting. A resilient foundation design works in tandem with the upper envelope to exclude adverse weather, noise, and excess heat, creating a safe internal environment (David & Isaac, 2024).

The Effect of Foundation Blinding on the Structural Foundation

Additionally, foundation blinding helps structural foundations last longer and be more durable. Blinding reduces the possibility of chemical assault, moisture penetration, and deterioration processes by minimizing direct contact between the structural concrete and potentially hazardous soil contaminants. Research indicates that proper construction practices, including the use of protective layers such as blinding concrete, enhance the longevity and durability of concrete structures (Zhang, 2022).

Additionally, foundation blinding improves the precision of reinforcement placement. The blinding layer's flat, level surface makes it possible to properly arrange formwork and reinforcement bars in accordance with engineering drawings. Proper reinforcement placement ensures adequate concrete cover, which protects steel reinforcement from corrosion and contributes to the structural integrity of the foundation (Li, 2022). This is especially crucial in harsh settings where foundations are subjected to chemicals, groundwater, or varying moisture levels.

The increase of concrete quality in structural foundations is one of the most significant outcomes of foundation blinding. The strength and durability of structural concrete can be negatively impacted by moisture, organic matter, and small soil particles contaminating the concrete mix when it is put directly into the ground. A blinding layer acts as a protective barrier that prevents such contamination and helps maintain the intended water-cement ratio of the structural concrete

(Althoey, 2021). As a result, the foundation achieves better compressive strength and long-term performance.

The performance, durability, and quality of structural foundations are significantly impacted by foundation blinding. Although blinding concrete is typically a non-structural layer placed beneath foundations, it indirectly contributes to the overall stability and service life of a structure. Usually made of lean concrete or a sand-cement mixture, foundation blinding creates a clean, level, and stable surface upon which structural foundation elements are constructed. Its presence helps ensure that the foundation is built in accordance with design specifications and minimizes risks associated with soil contamination and construction errors.

The protection of the foundation base and bearing soil is another significant outcome. The prepared foundation surface may be disturbed by personnel, tools, and materials during construction. By avoiding erosion, softening, or mechanical disturbance prior to the placement of structural concrete, the blinding layer aids in maintaining the state of the underlying soil. This preservation of the foundation base contributes to uniform load transfer from the structure to the ground and reduces the likelihood of differential settlement (Siddika, 2021).

CONCLUSION

Foundation blinding is a vital construction practice that significantly enhances the quality, durability, and effectiveness of structural foundations. Although it does not directly contribute to the load-bearing capacity of a building, its role in providing a stable, clean, and level platform for foundation construction cannot be overemphasized. The study established that foundation blinding protects structural concrete from contamination, improves moisture regulation, facilitates accurate reinforcement placement, and preserves the integrity of the foundation base.

The study further revealed that various types of foundation blinding, including sand blinding, granular blinding, lean mix concrete blinding, and cement-stabilized soil blinding, offer unique advantages depending on site conditions and project requirements. By reducing the risks of settlement, concrete deterioration, and construction defects, foundation blinding contributes substantially to the long-term performance and safety of buildings. Therefore, its adoption remains essential for achieving durable, stable, and sustainable construction projects.

RECOMMENDATIONS

1. Foundation blinding should be made a standard requirement in all building construction projects to improve foundation quality and structural durability.
2. Construction professionals should ensure the selection of appropriate blinding materials based on soil conditions, environmental factors, and project specifications.
3. Regulatory agencies and building control authorities should enforce compliance with foundation preparation standards, including the use of foundation blinding where necessary.
4. Contractors and site engineers should receive continuous training on modern foundation construction techniques and the importance of foundation blinding in preventing structural failures.
5. Researchers and construction stakeholders should promote the use of sustainable and environmentally friendly materials in foundation blinding to support green building practices and reduce environmental impacts.

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