
The False Mortar Bed: Understanding the Failure Mechanisms of the “Miami Sandwich” Tile Installation Method

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Abstract

Across the tile and stone installation industry, a shortcut technique variously called the “false mortar bed,” “false mud bed,” or the “Miami Sandwich” continues to appear on commercial and residential projects—often with serious, costly consequences. This white paper examines the defining characteristics of this non-standard method, the material and procedural deviations it produces, and the predictable failure modes that result: hollow-sounding tiles, debonding, cracking, and wholesale loss of structural integrity. Drawing on field observations and forensic laboratory analysis from a high-profile exterior travertine installation, as well as the requirements set forth in ANSI A108.1A, TCNA F103, and Natural Stone Institute guidelines, this paper argues that the Miami Sandwich is not a recognized installation method under any applicable industry standard and that its use represents a material departure from the standard of care expected of professional tile and stone installers.

Introduction

The mortar bed—or “thick-set”—method has been a foundation of quality tile and natural stone floor installations for decades. When executed correctly, a compacted, properly proportioned Portland cement-based mortar bed provides the stable, void-free substrate that large-format tiles and natural stone require to perform over the long term. The method is well-codified: the Tile Council of North America (TCNA) Handbook method F103 governs exterior deck

applications, and ANSI A108.1A establishes the specific installation requirements for the wet-set mortar bed technique.

Unfortunately, a modified version of this method has been prominent in certain regional markets, particularly in the southeastern United States. The “Miami Sandwich”—named for its geographic origin and the layered appearance of its assembly—mimics the look of a proper mortar bed installation but omits or violates nearly every critical step that gives the method its structural integrity. The result is an assembly that appears to conform to specifications but lacks the compressive strength, bond continuity, and long-term durability that the design of record requires.

As a forensic tile and stone consultant, I have investigated numerous installations where the Miami Sandwich technique was employed. In every case, the pattern of failure was predictable and consistent: hollow tiles, debonded sections, cracked stone, and mortar beds that crumble under the lightest investigation. This paper is intended to educate project owners, architects, general contractors, and specifiers about what this method is, why it fails, and what the applicable industry standards actually require.

What Is the Miami Sandwich?

The National Tile Contractors Association (NTCA) publication *TileLetter* has published detailed descriptions of the Miami Sandwich technique¹. According to those descriptions, the process begins when an installer spreads thinset mortar on the slab using a small, notched trowel—but without properly keying the mortar into the slab with the flat side of the trowel. Keying is the critical step that creates a mechanical bond between the adhesive mortar and the substrate; omitting it leaves the assembly resting on a surface rather than bonded to it.

A wet, loose stucco-style mix—typically a masonry cement product intended for wall applications rather than floor use—is then mixed with sand and loosely spread onto the slab and roughly flattened with a pointing trowel to approximate a level plane. This material is not compacted. It is not finished to the dense, smooth surface required by ANSI A108.1A. Thinset is then applied onto the back of the tile, often in a random pattern, and the tile is beaten into place with a rubber mallet until it is flush with adjacent tiles.

The NTCA Education and Curriculum Director, Becky Serbin, has been explicit on the industry’s position: *“Nowhere in ANSI, the TCNA Handbook, or the NTCA Reference Manual is the Miami sandwich stated as an industry accepted practice.”*²

In essence, the Miami Sandwich produces an assembly that has the visual thickness of a mortar bed installation without any of the structural properties. It satisfies neither the material requirements (Portland cement-lime mortar, properly proportioned) nor the procedural requirements (compaction, finishing, bond coat application, keying) of the standards to which it is typically compared.

Applicable Industry Standards

ANSI A108.1A – Installation of Ceramic Tile in the Wet-Set Method

ANSI A108.1A is the governing standard for the wet-set thick-bed mortar method. It specifies precise mortar mix proportions for floor applications: one part Portland cement, five parts damp sand, and optionally up to 1/10 part hydrated lime by volume. Critically, the standard requires that the mortar be a dry-pack consistency and that it be fully compacted and finished to provide a stable base for the tile.

Mortar mix proportions: Section 2.2.1 specifies the floor mortar bed mix. Section 2.2.2 states that “dry-pack mortar shall be compacted and the surface finished to provide a stable base for the tile, such as can be obtained with a wood or magnesium float.”³ Compaction eliminates voids and air pockets, increases density and compressive strength, and prevents the cracking and crumbling that characterize the Miami Sandwich.

Bond coat application and keying: Section 6.2.4 requires applying a 1/32- to 1/16-inch thick bond coat over the mortar bed while it is still workable. Section 6.2.5 requires that the bond coat be *keyed* into the substrate—pressed in with the flat side of the trowel—before combing with a notched trowel. This mechanical keying is essential to establishing a continuous bond.³

Mortar coverage: Where 95% coverage is specified (as required for exterior and wet areas), Section 6.2.5 directs the installer to back-butter each tile and embed it by beating perpendicular to the combed mortar ridges. “The method used should produce maximum coverage with the corners and edges fully supported.”³ Unsupported corners and edges are the most common sites of tile cracking—a pattern consistently observed in Miami Sandwich failures.

Prohibited materials for floor mortar beds: Section 2.1.1 limits Type S masonry cement to wall and ceiling mortar applications only. Type S masonry cement contains air-entraining agents and plasticizers that improve workability but reduce the compressive strength required for floor installations. Its use in a floor mortar bed is expressly prohibited under ANSI A108.1A.³

TCNA Handbook Method F103 – Exterior Deck / Roof Deck Installation

The “Miami Sandwich” method on an exterior pool deck is of even greater concern. TCNA method F103 governs tile and stone installation on exterior roof decks over occupied space—precisely the application at issue in many high-profile Miami Sandwich failures.⁴ F103 incorporates ANSI A108.1A as its installation specification, meaning that the compaction, bond coat, keying, and mortar mix requirements described above are all mandatory for exterior deck applications. F103 also requires proper slope to drain (1/4 inch per foot minimum), a waterproofing membrane beneath the mortar assembly, and wire reinforcement within the mortar bed (if the mortar exceeds 2”).

The TCNA further notes that exterior tile systems are subject to substantially greater stresses than comparable interior work—thermal cycling, moisture infiltration, wind loading, and live

loads. A mortar assembly lacking compressive strength and bond integrity is particularly vulnerable to these forces.

Natural Stone Institute – Dimension Stone Design Manual

For natural stone tile installations, the Natural Stone Institute publishes the Dimension Stone Design Manual (DSDM), the industry’s authoritative reference for dimension stone design and construction.⁵ The DSDM’s guidance on horizontal surfaces reinforces TCNA and ANSI requirements and adds stone-specific considerations. For natural stone tiles, the DSDM requires a minimum mortar coverage of 95% (for tiles 5/8 inch thick or thinner) with no voids within 2 inches of tile corners, back-buttering of each tile, and substrate conditions that meet a deflection rating of L/720. Movement joints must be designed into the system in accordance with TCNA EJ171, and the substrate must be fully cured, clean, and free of bond-breaking contaminants.⁵

The emphasis on corner and edge support underscores why a non-compacted, over-sanded mortar bed is so damaging to natural stone installations. Stone, unlike ceramic tile, has minimal tensile strength; without full, continuous support at corners and edges, it cracks under even modest point loads.

How and Why the Miami Sandwich Fails

Failure Mode 1: Non-Compacted Mortar Creates Structural Voids

The Miami Sandwich’s most fundamental flaw is the absence of compaction. TileLetter describes how beating the tile into the wet, uncompacted stucco mix “*drives the aggregate to the bottom and water to the top.*”¹ This water migration positions itself between the stucco mix and the thinset on the back of the tile, acting as a bond breaker. The result is predictable: hollow-sounding tile across large areas of the installation.

Forensic laboratory analysis of mortar samples extracted from a failed exterior travertine installation at a luxury hotel in Tampa, Florida illustrates this mechanism precisely. Construction Materials Consultants, Inc. (CMC) conducted petrographic examinations, acid-insoluble residue analysis, scanning electron microscopy, and X-ray diffraction on two mortar samples. Both samples arrived at the laboratory in a completely fragmented, powdery condition. CMC determined that both mortars showed sand contents of 70–75%—far in excess of the maximum permitted under ANSI A108.1A—and that the interstitial space between sand particles was dominated by large voids rather than hydrated cement paste. The plane of debonding was within the mortar itself, not at the tile-mortar interface: a direct consequence of an under-bound, over-sanded, non-compacted assembly.

Failure Mode 2: Wrong Material – Type S Masonry Cement on Floors

A consistent finding in Miami Sandwich installations is the use of Type S masonry cement for the mortar bed. Masonry cement products are designed for wall applications; they contain air-

entraining agents and plasticizers that make the material more workable and flexible—properties desirable in a wall mortar but directly counterproductive in a floor mortar bed, where compressive strength is paramount. Under ANSI A108.1A, Section 2.1.1, Type S masonry cement is permitted only for wall and ceiling mortar bed applications. It is not permitted for floors.

Failure Mode 3: Absence of Bond Coat Keying Produces Debonding

ANSI A108.1A requires that the bond coat be keyed into the mortar bed surface—worked in with the flat side of the trowel to create a mechanical bond—before the notched trowel comb is applied. In Miami Sandwich installations, this step is routinely omitted. Thinset is applied directly to the unfinished, non-compacted mortar surface in a random or multidirectional trowel pattern rather than in parallel ridges that can be properly embedded.

Failure Mode 4: Tile Cracking From Point Loads

TileLetter summarizes the structural consequence directly: *“Since the stucco mix is not properly compacted to yield a strong base to support the tile, it can be subject to point load failures.”*¹ This is especially consequential for natural stone, which has very low tensile strength. When a tile lacks mortar support at its corners or edges—voids that the Miami Sandwich virtually guarantees—ordinary foot traffic creates concentrated bending stress at the unsupported point. Travertine and similar stones crack cleanly and often catastrophically under these conditions.

What the Proper Method Requires

A compliant wet-set mortar bed installation under ANSI A108.1A and TCNA F103 is straightforward but requires discipline at every step:

1. **Slurry bond coat to substrate.** A 1/16-inch slurry bond coat is applied to the concrete substrate and keyed in with the flat side of the trowel while wet.
2. **Correct mortar mix.** One part Portland cement (ASTM C150, Type I), five parts damp sand (ASTM C144), and optionally up to 1/10 part hydrated lime. Type S masonry cement is not permitted for floor applications.
3. **Wire or mesh reinforcement.** If the installation is greater than 2” thick, wire fabric is embedded mid-depth within the mortar bed, lapped a minimum of 3 inches at joints.
4. **Compaction and finishing.** The mortar bed is compacted with a steel trowel and finished with a wood or magnesium float to a dense, smooth surface. This is not optional.
5. **Bond coat to mortar bed surface.** A 1/32- to 1/16-inch bond coat is applied to the surface of the mortar bed while it is still workable, and keyed in with the flat of the trowel.
6. **Back-buttering and embedding.** Each tile is back-buttered with bond coat and embedded by beating perpendicular to the combed mortar ridges. Corners and edges must be fully supported. A minimum 95% coverage is required for exterior and wet areas.

Conclusion

The “Miami Sandwich” of False Mortar Bed is not a variant of a proper mortar bed installation. It is a distinct, non-standard method that shares only the visual appearance—and the thickness—of the assembly it purports to replicate. It violates ANSI A108.1A in its material selection, its mortar proportioning, its compaction requirements, its bond coat application, and its tile-embedding procedure. It violates TCNA F103 by extension. It does not meet the back-buttering and coverage requirements of the Natural Stone Institute’s Dimension Stone Design Manual for natural stone tiles. And it has been explicitly confirmed as non-compliant by the NTCA.

The failures this method produces are not random or unpredictable. They are the direct, mechanical consequence of a non-compacted, over-sanded, improperly bonded assembly placed under service loads it was never capable of resisting. Hollow tiles, debonded sections, cracked stone, and structural collapse of the mortar bed are not warranty issues to be negotiated—they are the inevitable result of an installation method that should not have been used in the first place.

For project owners, architects, and general contractors, the practical lesson is this: verify during construction that the installer is following a bonded mortar bed method in strict compliance with ANSI A108.1A. Require pre-installation meetings. Engage a qualified third-party inspector during the mortar bed installation phase. Review installer submittals carefully—the presence of masonry cement bags on the jobsite for a floor application is a red flag. The cost of a proper installation, performed once and correctly, is a fraction of the cost of investigation, litigation, and remediation after the Miami Sandwich fails.

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