

INTRODUCTION

This Arriscraft.NOTE discusses materials and methods used for installing quarried limestone units, specifically Arriscraft Adair® Limestone, in paver applications.

Adair® Limestone is a dense, dolomitic limestone that exceeds the requirements of ASTM C568, Standard Specification for Limestone Dimension Stone; Class III - High Density. It is well suited to withstand the typically adverse conditions associated with at-grade and paver installations, such as moisture saturation, spalling and deterioration caused by continuous exposure to moisture-laden soil and de-icing compounds. With a compressive strength of 29,000 psi and abrasion resistance of 18.0, its physical properties are also suitable for heavy traffic loads that could potentially be imposed on its surface.

The proposed installation methods within this technical note are guidelines put forth by the MIA (Marble Institution of America). Additional guidelines for the installation of interior flooring applications can be found in the “Handbook for Ceramic Tile Installation” by the Tile Council of North America. Some installation methods may not be suitable in all geographic areas due to local practices, building codes and regulations, and environmental conditions. Prior to construction, consult with a licensed technical professional and the Authority Having Jurisdiction to design and approve the final construction method.

GENERAL GUIDELINES

Traffic classification should be determined to be able to select the appropriate abrasion resistance required. The traffic classifications are for the stone’s abrasion resistance only. The stone’s finish (polished, honed, thermal, etc.) will wear with traffic.

Joint Width should allow proper installation of grout being used and allow for proper compression of the joint when tooled. Exterior applications should have a minimum joint width of 1/4", preferably 3/8". Interior applications should have a minimum joint width of 1/16", preferably 1/8". In both exterior and interior applications, larger joint sizes should be considered for larger unit installations.

Paver thickness requirements are dependent on where the units will be installed, and the type of traffic they will endure. Exterior stone pavers exposed to pedestrian traffic should have a minimum thickness of 1 1/4". Pavers exposed to vehicular traffic should have a thickness of 3" or greater, but this thickness should be determined by an engineer. Pavers used for interior residential and commercial flooring should have a minimum thickness of 3/8". It is recommended to seek the consultation of an engineer to determine the final thickness and its application regardless of exposure type.

INSTALLATION METHODS (EXTERIOR APPLICATIONS)

Exterior stone flooring is installed by one of the following methods:

Mortar Bed Bonded to Concrete Subsurface Method

Mortar Bed Bonded Method has the limestone paver set in a full bed of mortar consisting of one-part Portland cement and from four to five parts sand, that is to be at least 1 1/4" deep. The paver is then set into the bed. A bond coat of Portland cement paste or other approved material (slurry) is recommended. Joints between pavers may be pointed with mortar or grout, raked out to receive sealant, or left open to receive a resilient filler strip and sealant (Fig. 1). Reinforcing in mortar bed depths of 2" or greater may be required.

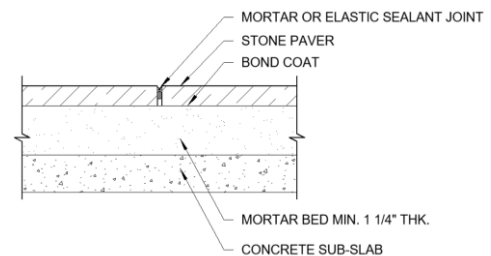


Fig. 1 – Mortar Bed Bonded Method

Mortar Bed Separated from Concrete Subsurface Method

In situations where there is larger anticipated movement between the concrete slab and the stone paver, a modified version of the Mortar Bed Bonded Method should be considered. This installation method is similar to the Mortar Bed Bonded Method, with the difference being the inclusion of a crack isolation membrane between the mortar bed and the concrete slab. This crack isolation membrane serves to isolate the mortar bed from the concrete sub slab and minimize movement between the two layers (Fig. 2).

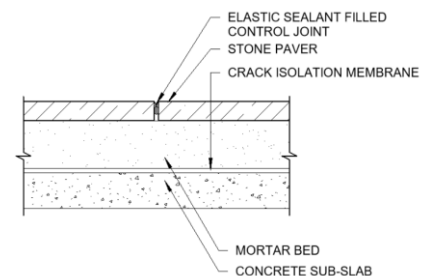


Fig. 2 – Mortar Bed Separated from Concrete Subsurface Method

Pedestal Supported System Method

The Pedestal Supported System Method has the limestone paver set on bricks, plastic pods or mortar spots (pedestals), leaving the joints between units open to allow for drainage. The open joints allow moisture to flow below the units and be collected by a drainage system. This method is most appropriate for larger slabs, rather than pavers (Fig. 3).

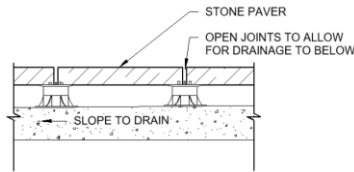


Fig. 3 – Pedestal Supported System Method

Sand Bed Method

Area of installation should be excavated and clear of any unsuitable, unstable or unconsolidated subgrade material. The area should be filled and leveled with densely crushed stone aggregate suitable for subbase material, or as otherwise directed by Specifying Authority. Place bedding course on top of sharp, normal weight limestone screening or concrete sand to a depth of approximately 1 1/2" leveled to grade. Pavers should be laid true and even and brought to grade using a wood mallet or similar tool. After pavers are laid, the surface should be swept and inspected (Fig. 4).

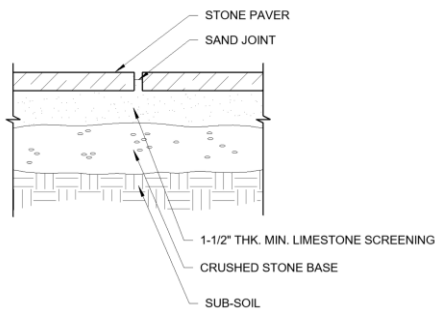


Fig. 4 – Sand Bed Method

INSTALLATION METHODS (INTERIOR APPLICATIONS)

Due to the application location, the paver units are referred to as Stone Tile in the illustrations below.

Interior stone flooring is installed using one of the following methods:

Mortar Bed Bonded to Concrete Subfloor Method

A mortar bed consisting of one-part Portland cement to five parts sand is laid over the concrete subfloor to a nominal thickness of 1-1/4".

Stone pavers must be buttered uniformly with a cement paste bond coat that is then laid over the mortar bed and tamped into a true and level plane. Joints are grouted with a Portland cement-based grout or other approved material (Fig. 5).

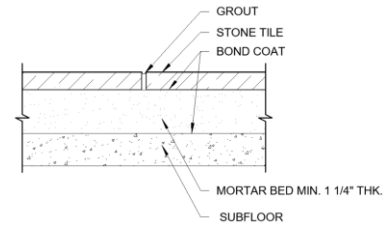


Fig. 5

Mortar Bed Separated from Concrete/Wood Subfloor Method

In situations where there is larger anticipated movement between the concrete slab/wood subfloor and the stone paver, a modified version of the Mortar Bed Bonded Method should be considered. This installation method is similar to the Mortar Bed Bonded Method, with the difference being the inclusion of a crack isolation membrane between the mortar bed and the concrete slab/wood subfloor. This crack isolation membrane serves to isolate the mortar bed from the concrete slab/wood subfloor and minimize movement between the two layers (Fig. 6).

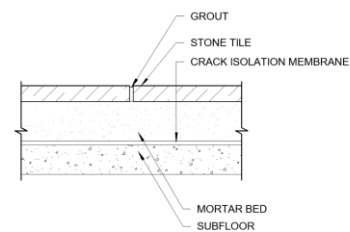


Fig. 6 – Mortar Bed Separated from Concrete/Wood Subfloor Method

Thin Bed Method

The Thin Bed Method should only be used in residential construction. Design the subfloor to carry anticipated loads while limiting deflection to a maximum of $L/720$. The Thin Bed Method has the limestone tile set in a thin layer of dry-set mortar or a latex-modified Portland cement mortar, applied using a notched trowel (Fig. 7).

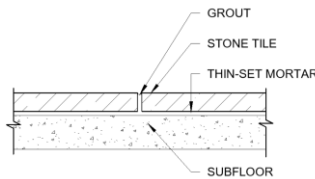


Fig. 7 – Thin Bed Method

SUMMARY

This Arriscraft.NOTE discusses the various methods and installations for Adair® Limestone pavers.

Refer to ARRISCRAFT•CARE and ARRISCRAFT•NOTE (Vol. 2, No. 3), Cleaning Quarried Limestone Units, which together describe the important criteria to be considered when storing, protecting, and cleaning the material.

The information and suggestions contained herein are based upon the available data and information published by the listed references and the experience of Arriscraft architectural and engineering staff. More detailed information may be found by referring to any of the related references listed below.

The information contained herein must be used in conjunction with good technical judgement and a competent understanding of masonry construction. Final decisions on the use of the information contained in this ARRISCRAFT•NOTE are not within the purview of Arriscraft and must rest with the project designer or owner, or both. It remains the sole responsibility of the designer to properly design the project, ensure all architectural and engineering principles are properly applied throughout, and ensure that any suggestions made by Arriscraft are appropriate in the instance and are properly incorporated through the project.

RELATED REFERENCES

1. MIA Stone Design Manual Version VIII (2016)
2. Brick Industry Association, Technical Notes on Brick Construction 20 (Revised), Cleaning Brick Masonry, November 1990 (Reissued March 2000).
3. "Handbook for Ceramic Tile Installation" by the Tile Council of North America (2020)
4. Arriscraft, Arriscraft.CARE (June 2018)
5. 5. Arriscraft, ARRISCRAFT•NOTE (Vol. 2, No. 3), Cleaning Quarried Limestone Units (February 2020)

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