



Crossville® Porcelain Tile Panels- Vertical Exterior Surfaces Field Applied

Direct Bond Method for 3+ or 5.6 mm

FLO is not recommended in exterior applications

The vertical exterior direct bond guidelines in the Crossville Technical Manual/Guidelines are excerpted below, additionally this section opens with the following statement: “The use of full size tile panels (1Mx3M) for ground floor installations is acceptable. For installations higher than ground floor, Crossville recommends the tile size is limited to a 1.5 square meters or, at most, 39-3/8” x 59-1/16” half panels, due to logistics, open air environments, mortar/installation limitations, as well as potential building code limitations.”

Crossville makes this recommendation of reduced piece size at higher elevations to address the limitations of current installation practices and installation materials, **not** limitations of the tile. The installation requires thin-set mortar to be spread on both the tile panel and the substrate. Once keyed in and troweled to form ridges the mortar can have a limited open time before it begins to skin-over and thus begins to decrease the optimum bond and flow characteristics needed for ideal coverage and long-term strength. In exterior environments, conditions such as wind and sun diminish this time frame. The necessary logistics/equipment required such as scaffolding or scissor lifts for installation above ground floor create additional challenges to this scenario. In addition, exterior installations require temporary enclosures or tarpaulins prior to, during, and immediately after installations to shield the installation from rain, direct sunlight and other potential adverse weather conditions that may affect the bond and cure. This protection applies to the substrate, the installation mortars, accessories, and grout. Tent/ shade and heat areas that will be subjected to the elements and / or freezing temperatures during the installation and cure period. Reducing the piece size to 1.5 square meters or, at most, 39-3/8” x 59-1/16” half panels above ground floor is the most logical way to ensure that the optimum characteristics of the bonding material are employed. Exteriors are applications where long term performance is even more critical and directly related to the optimization of the installation materials and practices. Tools and installation materials continue to evolve and while it may be possible to utilize larger pieces without mechanical fastening, if the proper setting materials and practices are utilized, this should only occur if close coordination with the installer and installation materials manufacturer can be guaranteed and the proper details and considerations as described above can be properly specified and managed. Always consult with the setting material manufacturer for the proper recommendations specific to your individual project. This information seeks to keep all parties involved, as well as the gauged porcelain tile category, safe from potential failures.

This recommendation of piece size is a Crossville recommendation, separate from, and made with the assumption that considerations such as the code requirements detailed below have already been addressed.



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Project Requirements/Specifications

Step 1: Code compliance and approval of local building authorities

Secure documentation/approval from building authority that the project complies with the provisions of the IBC (International Building Code), local code or authorities having jurisdiction.

A: Crossville® 3+ porcelain tile panels are 3 millimeters thick, with an added layer of fiberglass mesh for increased strength and flexibility. 5.6 porcelain tile panels are 5.6 mm thick with no additional fiberglass layer. 3+ and 5.6 are suitable for exterior direct bond applications if the project is in compliance with the International Building Code.

B: International Building Code Current Language

2009 IBC states a size limitation for exterior adhered veneers of 5 square feet with no side over 36 inches.

2012/2015 IBC (Chapter 14- Section 1405.10.2) requires that exterior adhered porcelain tile be a maximum of 24 inches in any face dimension and not more than 3 square feet in total facial area, and weighing not more than 9lbs per sqft. In addition, Table 1405.2 states a minimum thickness of weather coverings (in this case porcelain tile) of ¼ inch or 6.35 mm.

2018 IBC same as 2015

C: If the project design does not meet these requirements, then the project owner, architect or engineer should seek local code approval for the use of a **thinner** and/or **larger** format porcelain tile finish material for the exterior veneer.

Section [A] 104.11 of 2012/2015 IBC contains the generic language for obtaining this type of approval by the local building official for alternative materials. The provisions of the code are not intended to prevent the installation of any material or prohibit any design or method of construction not specifically prescribed by this code. An alternative material, design or method of construction shall be approved where the building official finds that the proposed design is satisfactory and complies with the intent of the provisions of this code, and that the material, method or work offered is, for the purpose intended, at least the equivalent of that prescribed in this code in quality, strength, effectiveness, fire resistance, durability and safety.

We recommend that this conversation with the building code official is addressed by noting that the requirement of size limitation is logically designed to exclude extremely heavy tiles from being direct bonded without mechanical fastening (code states max 9 lbs. per sqft and 3 sqft max for a total of 27 lbs. for a 3sqft tile), and the minimum



thickness, we think, was just encompassing currently available technology at the time of the code approval. 3+ is only 1.7 lbs./sqft and 5.6 is 2.9 lbs./sqft. The technology to produce porcelain tile (with all the same physical properties of its thicker counterpart) in these reduced thicknesses/weights was not prevalent in the market when the code adopted this language. If the code allows a 3 sqft tile to weigh 9lbs./sqft, then we think logically a larger piece of a reduced weight/thickness tile should be within the scope of what the alternative materials language above was designed to address.

Step 2: Installation methods

Movement Joints: Installation of 3+ and 5.6 on exteriors will be in accordance with the applicable Tile Council of North America (TCNA) Handbook exterior wall details. Movement joints shall be in compliance with EJ-171 of the current TCNA Handbook. While the size and interval of movement joints must be in accordance with the TCNA guidelines and specified by the architectural/engineering authority with strict attention to the environmental demands of the project, at a minimum Crossville recommends that all joints be at least 3/16 inch and all joints treated as soft joints (no hard-grouting materials in any joint) *. It is crucial that each project is evaluated individually and the architectural/engineering authority as well as the setting material manufacturer is consulted for proper recommendations specific to the project. Porcelain tile panels have similar expansion and contraction characteristics when compared to traditional thickness porcelain tile, their reduced thickness means that they will reach maximum thermal gain and cycle through expansion/contraction **more rapidly** than a traditional thickness tile. For this reason, proper movement accommodation is extremely critical for success of the installation.

**Note: Joint width calculations were done using a coefficient of thermal expansion of 6.5×10^{-6} in/in/ °C for the tiles panels and installation of a class 25 sealant material at 70 °F, using a high temperature of 190 °F and a low temperature of -30 °F. This is assuming a maximum side length of 59-1/16" is used. If larger pieces are utilized a wider joint such as ¼ inch should be considered.*

Cap Flashing: The elimination of water intrusion into the bond coat is extremely critical for success of any exterior applied veneer. Proper detailing of capping and/or flashing at the roof line, at the top of the exposed tile layer, and other appropriate openings requiring flashing is necessary. If not properly detailed, specified, and installed, efflorescence, latex leaching, and freeze thaw damage can occur.

Ensure the architect/engineer is aware of these statements and that movement joint/grout joint detail and cap flashing language is provided in the specification.

Step 3: Selection of Setting Material Company

Only setting material companies with specific installation guidelines for exterior direct bond applications using porcelain tile panels should be considered. Ensure that the setting material company specified can provide products and installation specifications for exterior application of 3+mm and 5.6 mm porcelain tile panels. A list of setting



material companies with experience in this application are identified in the back of the by Crossville® Technical Guide.

Ensure the project architect/engineer has knowledge of the setting materials being used, and that those setting materials are specifically recommended for exterior applications of porcelain tile panels. A pre-construction meeting and mock-up of appropriate scale is strongly recommended to be in the projectspecification.

Step 4: Technical guide

Provide the Technical Guide to the project architect/engineer and recommend the specification of the installation instructions for 3+ or 5.6 mm that are contained in the Crossville® Porcelain Tile Panel Technical Guide and where applicable A108.19.

Language should be in the specification that references the Technical Guide and its installation practices.

Step 5: Qualified Labor

1. Crossville® porcelain tile panels have great potential in exterior applications: its lightweight nature and aesthetic qualities make a great material for cladding. However, the potential for failure in outdoor environments is greatly increased when qualified labor is not utilized. Crossville recommends the use of qualified labor for the installation of 3+ and 5.6 mm for all installations, this becomes even more critical on a exterior field (direct bond) applied installation.

ANSI A108.19 contains qualified labor language. While the standard is for interior installation, Crossville recommends that the qualified labor language from A108.19 be included in the project specification when exterior installation is being specified. This language as follows is excerpted from the standard:

Due to the unique material characteristics and unconventional installation techniques required of gauged porcelain tiles and gauged porcelain tile panels/slabs, this work requires installers who are equipped with the proper tools and have acquired sufficient product knowledge and installation experience through the completion of an Installer Qualification Program as listed in 10.2.

Installer Qualification Programs

- Installer certified by Advanced Certification for Tile Installers (ACT) program for Gauged Porcelain Tiles and Gauged Porcelain Tile Panels/Slabs.
- Installer completion of a comprehensive installation program (See details in informative appendix C) provided by the manufacturer of gauged porcelain tiles or gauged porcelain tile panels/slabs or setting materials for gauged porcelain tiles and gauged porcelain tile panels/slabs.



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- Installer completion of a comprehensive installation program provided by the International Masonry Institute (IMI) tile layer programs or the National Tile Contractors Association (NTCA)

Informative Note: Requirements for installer qualifications shall be listed in the Tiling specification section, PART 1, QUALITY ASSURANCE. Documentation of compliance with required installer qualification criteria shall be required in the Tiling specification section, PART 1, INFORMATION SUBMITTALS.

Crossville maintains a list of installers that have completed training. A list by zip code is available on our website at: <https://crossvilleinc.com/locate>

In addition, this information is available in section 1.5 of the Crossville Porcelain Tile Panel Guide Specification: <https://www.crossvilleinc.com/Resources/Library?keyword=Panel>

Language to be in the specification that references the labor qualifications in ANSI A108.19.

The foregoing suggested project requirements and/or specifications are offered as guidelines only. Each project has its own unique characteristics and requirements, and the project's architect/engineer and design professionals must determine the appropriate requirements and specifications in each instance. Crossville makes no warranties or representations regarding the applicability of the foregoing guidelines to any given project, and assumes no liability for and shall not be responsible for the use or failure to use these guidelines.