



# PROFILE OF TTMAC

The Terrazzo, Tile and Marble Association of Canada was founded in 1944. Its mandate was to develop a method of standardizing terrazzo, tile and marble installation techniques, as well as being a technical resource and liaison for architects, specifiers, designers and engineers. TTMAC honours this commitment today as well as many other services and support of the hardsurface industry and its members.

## ASSOCIATION ACTIVITIES & BENEFITS

- Produces and distributes specification guidelines.
- Sets standards for installation methods used in the industry.
- Promotes technical research, new materials and techniques.
- Maintains an up-to-date library resource centre.
- Encourages development of new technology and products.
- Is a door to the industry in Canada with a global outlook.
- Publishes newsletters, maintains and circulates an annual Membership Directory and Buyers Guide.
- Provides a liaison with other associations, government departments, trade magazines, trade commissions, and those interested in sharing information for the good of the industry.
- Offers independent arbitration of complaints and site inspections.
- Promotes an annual convention, seminars and workshops. Provides general information to architects, specifiers, engineers, contractors, designers and the building industry in general.
- Encourages and promotes the installation of terrazzo, tile marble, granite, slate and other dimensional stone products and related materials.
- Has full-time technical representative on staff.
- Assists in setting training standards and distributes information to further develop training in the hardsurface industry.

## SPECIFICATION STUDY ON TILE

The Terrazzo, Tile and Marble Association of Canada provides this 2012-2014 Specification Guide 09 30 00 to assist in clarifying and standardizing installation specifications for hard surface material and related products.

It is the responsibility of the architect/specifier or qualified consultant to clearly specify in detail requirements for the complete installation of the hard surface materials, products, systems, related sections, warranty and guarantees.

This guide refers to the usual circumstances relating to tile installations. In the case of circumstances out of the ordinary, we suggest that you consult the TTMAC. The scope of work and methods of installation may vary by site conditions and from region to region.

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The Terrazzo, Tile and Marble Association of Canada do not accept liability for the information presented by this document. Readers are expected to make judicious use of data in this guide as part of the quest to further their knowledge.



## TTMAC SPECIFICATIONS AND GUIDES (Disponible en français)

Life Cycle Guideline  
Specification Guide 09 30 00 Tile Installation Manual  
Terrazzo Specification Guide 09 66 00

Terrazzo Colour Plates  
Maintenance Guide  
Dimensional Stone Guide

As the members of TTMAC are continually striving to maintain and improve the standards of the industry, specifications are subject to revision at any time.

Photo on cover: Eaton's Center Toronto downtown. Installation company: Maple Terrazzo.

## ACKNOWLEDGEMENTS

Terrazzo, Tile and Marble Association of Canada appreciates the assistance of the following in the preparation of this guide:

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Desktop Publishing – Violeta Ivanescu – TTMAC

This 2012-2014 Specification Guide 09 30 00 Tile Installation Manual has been completely overhauled to provide the user with a more orderly and concise document.

This manual has been created with reference to MasterFormat™ 1995 & 2004 numbering and titling systems in conformance with Construction Specifications Canada recommended practice.

Changes are noted with a  in the margin.

### ORGANIZATIONS

American National Standards Institute (ANSI)  
American Society for Testing and Materials (ASTM)  
Canadian General Standards Board (CGSB)  
Canadian Standards Association (CSA)  
Construction Specifications Canada (CSC)  
Ceramic Tile Institute of America (CTIOA)  
International Standards Organization (ISO)

Marble Institute of America (MIA)  
Materials and Methods Standards Association (MMSA)  
The National Terrazzo & Mosaic Association (NTMA)  
Tile Council of North America (TCNA)  
Terrazzo, Tile and Marble Guild of Ontario (TTMGO)  
Terrazzo, Tile & Marble Trade School Inc. (Ontario) (TTMTS)  
Trowel Trades Training Association (TTTA)

**This 2012-2014 Guide supersedes 09 30 00 2009/2010**

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# LEADERSHIP IN ENERGY AND ENVIRONMENT DESIGN

LEED® (Leadership in Energy and Environmental Design) Green Building Rating System is the accepted standard in the US (US Green Building Council, [www.usgbc.org](http://www.usgbc.org)) and in Canada (Canada Green Building Council, [www.cagbc.org](http://www.cagbc.org)) for what constitutes a “green building”.

The LEED® Green Building Rating System is an assessment tool quantifying the positive contribution of different sections to the environment and well-being of the occupants. Check with Green Building Council (CaGBC or USGBC) rating system being used for the building which version is being used; such as New Construction, Schools, Core and Shell or Commercial Interiors, and what the latest version is; such as CaGBC NC v1.0 with March 2007 Addendum, or USGBC CI v3.0 3009.

LEED® accreditation identifies leaders in green building design.

LEED® recognizes achievements and promotes expertise in “green” building practices through a comprehensive point-based rating system. Using the system, building owners and architects can measure their success in environmental stewardship. Achieving a LEED® certification on your project requires a clear, well defined strategy which is written up-front, checked for compliance, monitored through bid review and finally audited for success. Taking into account all areas where LEED® credits can be reached is paramount in obtaining each valuable point.

Categories listed below are based on CaGBC Requirements for New Construction, USGBC requirements may vary and will need to be checked before preparing a specification. Manufacturers’ products can contribute towards the required credits for a project, but typically cannot contribute the entire requirement to attain specified credit. The contractor should request submittal information from manufacturers at the same time as they order their materials so that the consultant has the required submissions for credits before making application to the Green Building Association for certification.

CAGBC LEED® Canada for New Construction and Major Renovations, and LEED® Canada for Core and Shell, 2009.

## Materials and Resources

**Recycled Content MR Credit 4 – Potential Points 2:** Specification should indicate a requirement for materials having a recycle content such that the sum of post-consumer recycled content +1/2 of the pre-consumer content constitutes a minimum of 10% (for 1 point) or 20% (for 2 points) based on cost of the total value of materials in the project. Value of materials is determined by excluding mechanical and electrical materials in this calculation and includes only materials that are permanently installed in the project. Before the installation begins, the tile contractor is responsible for submitting documentation indicating compliance with specified recycled content.

**Regional Materials MR Credit 5 – Potential Points 2:** Specification should indicate a requirement for regional materials in the amount of 20% (for 1 point) or 30% (for 2 points) (depending on the number of points being sought). Building materials or products that have been harvested, extracted, recovered and processed within an 800 km radius (by truck transport) or 2400 km radius (by rail or ship) of the final manufacturing site. And then that the final manufacturing site is within an 800 km radius (by truck transport) or 2400 km radius (by rail or ship) of the project where the products are installed. Value of materials can be determined by the fractions of each component where contributing materials may extend outside of the stated radius. The percentage is based by weight for each material or product, of the total value of the materials in the project. If only a fraction of the building product or material is extracted, harvested, recovered, processed and manufactures locally, then only that percentage (by weight) must contribute to the regional value. This Credit specifically excludes mechanical and electrical materials in this calculation and includes only materials that are permanently installed in the project. Before the installation begins, the tile contractor is responsible for submitting documentation indicating compliance with specified materials content.

## Indoor Environmental Quality

### Low-Emitting Materials: Adhesive & Sealants (EQ 4.1 – Potential Points 1)

All adhesives and sealants used on the interior of the building must comply with the following requirement as applicable to the project scope. Adhesives, Sealants and Sealant Primers: South Coast Air Quality Management District (SCAQMD) Rule #1168. . Before the installation begins, the tile contractor is responsible for submitting documentation provided by the manufacturer indicating compliance with specified VOC limit.

# NOTES FOR THE PROFESSIONAL

## Surface Preparation:

- Slab Surface must be clean, dimensionally stable, cured and free of contaminants such as oil, sealers and curing compounds. Concrete must be cured for a minimum of 28 days (preferably 90 days or longer to minimize shrinkage) and should have a steel trowel and fine broom finish for thin-set applications, and should be screed finished for mortar bed applications. If a cleavage membrane is being used, concrete should be steel trowel finished; if a cleavage membrane is to be applied over a rough surface, a 6 mm sand-bed must be applied under the cleavage membrane.
- Variances in substrate not to exceed 6 mm in 3000 mm for mortar bed or thinset applications.
- Thin-set applications also require a maximum tolerance of 2 mm in 300 mm. For tile larger than 380 mm x 380 mm substrate variation of 3 mm in 3000 mm should be considered.
- Substrate repair variations of 5 mm or less can be levelled with a latex Portland cement mortar or an epoxy mortar levelling and allowed to set before application of other materials. A levelling coat in excess of 5 mm should be installed with a medium set mortar or a mortar bed. If required, the method must be specified by the consultant.
- For tile larger than 300 mm x 300 mm and/or grout joints of 5 mm or less, a more stringent tolerance of 3 mm in 3049 is required. Refer to specification section.

## Environmental Conditions:

- Tile should not be installed at temperatures below 12°C when using Portland cement mortars, dry-set mortars, latex-Portland cement mortars or bond coat and temperature should be maintained at a minimum of 12°C or a maximum of 38°C until cured. Follow manufacturers recommendations.
- Certain rapid-set, dry-set or latex mortars may be suitable for use at temperatures as low as 5°C. Manufacturer's recommendations must be followed.
- Epoxy mortars and grouts should not be applied at temperatures below 16°C or above 32°C or follow manufacturer's recommendations.

## Site Conditions:

Protecting new tile work – General contractor to provide appropriate protection to completed tile work. Protect work of other trades. Prohibit traffic during installation and for 48 hours after completion or longer if required by tile contractor for unique installation requirements. Protect floor from impact and vibration for a minimum of 48 hours after installation. On completion of tile floor it is the responsibility of the owner/agent or general contractor to protect the floor from damage.

## Materials:

- Materials used, must, at a minimum, meet the requirements of relevant standards listed under "References".
- Metal lath – refer to Detail 307W-2012-2014. Attachment of metal lath should be with fasteners on maximum 600 mm o.c. having a pull out resistance of minimum of 400 N. Use galvanized or stainless steel lath in wet areas and exterior applications.
- Do not use paper-back, mesh-back or dot mounted tile for exterior use or in locations of extreme moisture unless the manufacturer guarantees that the material is suitable for this type of installation.
- For colour consistency, tile should be from the same production run, dye lot, calibre and batch number. If shading variation is evident, the consultant, owner, designer and architect must be notified prior to installation. Slight shading variations in the manufacturing of the tile may occur even with the highest modern technologies. On large quantity projects, it may not be possible to obtain all tile from the same production run, dye lot, calibre or batch number, therefore, consult with the supplier or manufacturer to ensure tile consistency.
- Natural stone is a product of nature and is not subject to the rules of consistency that apply to manufactured materials. The selection of natural stone tile (marble, granite, limestone and slate) should never be made on the basis of viewing one single sample, as these products are subject to variation in their tonal qualities, veining and shading variations. However, the aforementioned characteristics make these products highly desirable and therefore selection should always be made by viewing sufficient tile in order to observe an adequate range of the tile characteristics prior to installation.
- Material must be inspected prior to installation.
- Use or installation constitutes acceptance of materials.
- Installer to work from multiple boxes or multiple pallets to ensure even shading distribution.

## Mock-ups:

Mock-ups to be installed as per the specification when being used to evaluate the entire assembly. Specify whether the mock-up will remain on site as it may form an integral part of the installation. Material mock-ups are intended to show the range and appearance of the tile. Mock-ups may be specified to pre-determine and/or negotiate the range of a stone. Mock-ups should be used for approval by all parties.

## Execution:

- Movement Joints are mandatory – see Detail 301MJ-2012-2014.
- Grout joint width for floors and walls are normally 2 mm to 6 mm depending on the type of material. Required grout joint width (joint width is the space between vertical edges of tile) should be specified (butt joints are not acceptable). Tile with bevelled or cushioned edges will appear to have wider grout joints than specified. For ease of maintenance, grout joints must be level. Grout depth maximum tolerance must not exceed the depth of the bevelled or cushion edge of the tile. For straight edge tile, grout must be close to flush with the surface of the tile for joint widths up to 6 mm; maximum allowable grout concave depression not to exceed 1 mm for joints in excess of 6 mm up to 10 mm. Concave depression in the middle of the joints in excess of 10 mm width not to exceed 2 mm. For epoxy grouts, joints must be filled close to flush with tile edges to a maximum concave depression in the middle of the joint not exceeding 1 mm for joints up to 6 mm and 2 mm for wider joints up to 10 mm. Manufacturer's recommendations must be followed. A minimum of 2/3 of joint depth should be kept open for grouting and grout must penetrate the joint to the bond coat.
- Latex-Portland cement mortar will improve adhesion of porcelain tile and backbuttering will assist in achieving higher bond strengths.
- When tile are set by the thin-set method on exterior surfaces, heavy loads, in wet areas or for tile larger than 300 mm x 300 mm that are going to be subjected to heavy load impact, a minimum of 95% coverage must be achieved. The bonding material must be notched in horizontal straight lines. Set tile on the freshly notched thin-set mortar, slide tile back and forth at 90° to the notches. This method can produce maximum coverage, with the corners and edges fully supported.
- Specify backbuttering when required. Backbuttering improves adhesion to tiles with bond breakers such as dust, kiln release agents and dirt, as well as tile with a raised or textured back. Backbuttering involves application of a thin trowelled coat to the back side of the tile using the flat side of the trowel immediately before setting to achieve a minimum 95% adhesion for exterior, large tile or wet areas.
- Wipe the backs of all stone tiles with a damp cloth to remove the dusty film that can prevent the adhesive from bonding to the tile.
- Immediately prior to setting ungauged slate, marble, stone or large sized ceramic, tile must be backbuttered through a push box or box screed to achieve a uniform thickness of tile and mortar combined.
- Tile must always be set while bond coat is wet and tacky and has not skinned over.
- For rough textured or irregular surface tile it is advisable to preseal or prewax tile prior to grouting.
- For broken –joint pattern with a tile that is rectangular, the off-set should not be more than 33%.

Guidelines cannot address every installation. The type and size of tile, use or service requirements, environmental conditions, tile spacing and individual manufacturer's recommendations are all factors that should be considered and specified.



### **NEW for the 2012-2014 Manual**

The TTMAC Specifications and Technical Research Committee has decided to identify those installation methods in the following pages that require unique installation knowledge and experience. The tile contractor selected for these installations should be a member in good standing with the TTMAC and must have a minimum of 5 years experience and references for the installation method specified.

## Recycling & Environmental Responsibilities

Many manufacturers are moving towards environmentally friendly production. For many years there have been tiles made from recycled glass. The movement from tunnel (slow fire) kilns to fast fire (porcelain) kilns has helped reduce energy consumption. In 1992 the European Community developed a product certification policy called Eco-Label. Under the HFC (Hard Floor Coverings) category, manufacturers must meet strict criteria to ensure that their products have a reduced impact on the environment. The Eco-Label criteria examines the entire process from raw materials, through production, distribution (including packaging) and finally to disposal of the product to determine its impact on the environment. Factories are inspected for water recycling, pollution emissions, use of hazardous substances (including lead and cadmium) and waste management. Only 30% of the tile currently on the market has achieved the Eco-Label status.

Ask manufacturers for a copy of the label or look for it on their product brochures. More information can be found at [Europa.eu.int/ecolabel.it](http://Europa.eu.int/ecolabel.it). Specifying products from factories that have achieved Eco-Label status is a powerful way to encourage ecological manufacturing.

## Cleaning

The more slip resistance a tile has, the more difficult it is to keep clean. Textured tiles grab the bottom of shoes and therefore the floor will get dirtier, faster. Textured surfaces do not release dirt as easily as smooth tiles.



# Technical Bulletin Tolerances for Tiles



The Concrete Floor Contractors Association was founded in 1971 to represent the interests of the concrete floor industry in Canada.

Technical Bulletins are designed to provide state of the art information to owners, specifiers and contractors to both improve quality and reduce problems.

We hope that this information will assist you in this goal.

If you have any questions, or comments, please feel free to contact us at 905-582-9825 or by e-mail at [info@concretefloors.ca](mailto:info@concretefloors.ca)

***The Best Floors Start  
With Our Finish !***



July 30, 2012

## **Background:**

The installation of applied finishes on concrete floor surfaces requires different levels of flatness and levelness for success. This can be problematic when concrete floors are constructed to an incorrect tolerance or when unrestrained drying shrinkage curling is permitted to change the constructed “as-built” concrete floor tolerances to unacceptable levels.

Applied finish manufacturers often employ straightedge tolerances which have proven to not be practical for concrete floor construction. The concrete floor trade utilizes a special tolerance system called F-Numbers which relate the flatness (FF) and levelness (FL) of a concrete floor surface. Floor flatness and levelness tolerances are produced by the construction methodology employed and are therefore extremely practical. Using more advanced methods of construction, concrete floor flatness and levelness can be improved to meet any need (costs generally increasing with higher tolerance demands).

## **Discussion:**

CSA A23.1-2009 defines two classifications for conventional surfaces: Class A (FF20) and Class B (FF25). Class A surface tolerances are suitable for most concrete floors subject to foot traffic and thick finishes. Class B tolerances may be employed when enhanced surface flatness is desired or required. Class B tolerances are the upper limit of practical tolerances for most residential, commercial and institutional floors. Note that Class B tolerances require the use of more specialized methodology which may or may not be available or accessible in all areas.

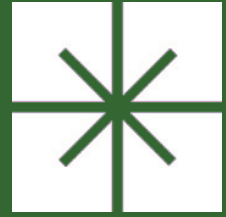
Concrete floor contractors generally take the view of trying to exceed specified tolerances as a best practice. The actual results of using Class B methodology, including suitable concrete materials in adequate ambient conditions, ranges between FF25 to FF35. These Class B flatness tolerances have been shown to be suitable for most thin applied finishes. Concrete floor tolerance requirements in excess of FF35 are generally not possible to achieve unless deferred bonded concrete toppings are employed.

... Page 2

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# Technical Bulletin Tolerances for Tiles



## Problem

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July 30, 2012

All jointed, non-continuously reinforced concrete floors on grade will change in surface profile as they dry. This process is called drying shrinkage curling. The influence of drying shrinkage curling of the concrete cannot be understated—this is a significant problem. Without sufficient restraining steel in the concrete, concrete floors will curl upwards at all joints. Without any steel reinforcing, concrete surfaces have been observed to curled more than 25mm at joint intersections.

The US National Tile Association has published floor flatness tolerance recommendations of FF50 and FF60 for tiles larger than 16” or with narrow 1/8” joint sizes (link: <https://www.tile-assn.com/CMS/Images/85/86.pdf> ). This document also include tolerances of FF25 and FF32 which fall within the normal range of results for Class B methodology. Tolerances in excess of FF35 can only be achieved using deferred toppings and the most advanced methods of construction. This is not practical in most residential, commercial and institutional applications.

## Recommendations

Specifiers must exercise great care when determining concrete floor tolerances.


Specifiers must design concrete floors to retain the as-built concrete floor tolerances with sufficient restraining reinforcing steel.

Concrete floor tolerances for applied finishes must be discussed and reviewed carefully at pre-construction meetings. Concrete materials for slabs on grade must be designed to reduce drying shrinkage while remaining workable and finishable.

Tolerance losses due to the drying shrinkage curling are a design matter and are not the responsibility of either the concrete floor or tile trade contractor.

Concrete floor tolerances of FF50 and FF60 are not a practical solution. Tile contractors who wish to obtain surface tolerances in excess of Class B (FF25-35) will need to include allowances to level the floor with a mortar bed or self-levelling screed to suit their needs.

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 **Note to Specifier:**

According to the above technical bulletin of the CFCA (Concrete Floor Contractors Association - Canada) : “ Applied finish manufacturers often employ straightedge tolerances which have proven not to be practical for concrete floor construction” **AND** “Tile contractors who wish to obtain surface tolerances in excess of Class B (FF25-35) will need to include allowances to level the floor with a mortar bed or self-leveling screed to suit their needs”.

This essentially indicates that floor flatness requirements for most floor finishes cannot be achieved with conventional concrete floor finishing methods. Please insure your specification includes; As the level of work and material required to meet the flatness and straightedge requirements cannot be predetermined, it is essential the specification allocate an allowance, permitting the Tile contractor (Division 9) to provide pricing for such preparative work after inspection of the cured concrete.

 **TABLE 1**

Grout Joint Size Relative to Subfloor Flatness Minimum Requirements  
Minimum Subfloor Flatness using ASTM E1155-06 FF (SOFF) or a 3000mm (10') Straightedge

Tile Size*		Grout Joint Size		Grout Joint Size		Grout Joint Size	
Inch	mm	Inch	mm	Inch	mm	Inch	mm
+/- 1/2"	+/- 13	1/4" or larger	7 or larger	3/16"	5	1/8"	3
8" x 8"	200x200	F35 or 1/4" - 10'	F35 or 6 - 3000	F45 or 3/16" - 10'	F45 or 4 - 3000	F60 or 1/8" - 10'	F60 or 3 - 3000
12" x 12"	300x300	F35 or 1/4" - 10'	F35 or 6 - 3000	F45 or 3/16" - 10'	F45 or 4 - 3000	F60 or 1/8" - 10'	F60 or 3 - 3000
16" x 16"	400x400	F35 or 1/4" - 10'	F35 or 6 - 3000	F45 or 3/16" - 10'	F45 or 4 - 3000	F60 or 1/8" - 10'	F60 or 3 - 3000
18" x 18"	450x450	F45 or 3/16" - 10'	F45 or 4 - 3000	F60 or 1/8" - 10'	F60 or 3 - 3000	F60 or 1/8" - 10'	F60 or 3 - 3000
24" X 24"	600x600	F45 or 3/16" - 10'	F45 or 4 - 3000	F60 or 1/8" - 10'	F60 or 3 - 3000	F60 or 1/8" - 10'	F60 or 3 - 3000
36" X 36"	900x900	F50 or 1/8" - 10'	F50 or 3 - 3000	F60 or 1/8" - 10'	F60 or 3 - 3000	F60 or 1/8" - 10'	F60 or 3 - 3000

\* For non-square units, the tile size shall use the longest side dimension - TABLE 2

 **TABLE 2**

Longest Side Tile Dimension

Longest Side Dimension		Grout Joint Size		Grout Joint Size	
Inch	mm	Inch	mm	Inch	mm
1/4" or larger up to 16"	7 or larger up to 400	3/16"	4	1/8"	3
from 16" to 36"	from 400 to 900	F35 or 1/4" - 10'	F35 or 6 - 3000	F45 or 3/16" - 10'	F45 or 4 - 3000
36" and over	900 and over	F45 or 3/16" - 10'	F45 or 4 - 3000	F60 or 1/8" - 10'	F60 or 3 - 3000
		F60 or 1/8" - 10'	F60 or 3 - 3000	F60 or 1/8" - 10'	F60 or 3 - 3000

## TILE

### Types

Tile includes mosaic, quarry, glazed, glass, decorative, porcelain and stones that have a thickness of less than 19 mm. For stones 19 mm or greater refer to the latest TTMAC Dimensional Stone Guide.

In early 2012 the CAN/CGSB 75.1-M88 was withdrawn. The Terrazzo Tile and Marble Association has decided to adopt the ISO 10545 standards complimented by ASTM standards for missing topics. The ISO 10545 is written for ceramic tile only and does not include mosaics or stone tile. The TTMAC Manual covers all tile using ISO standards where available and ASTM standards for the balance.

 **Ceramic Tile**

ISO 13006 is the International Standards Organization's manual for ceramic tile excluding mosaics, specialty items and trim fittings. The standard categorizes a tile by its forming method, either pressed or extruded, plus it's water absorption. There is a further subcategory for extruded tiles as to whether they are natural or precision. The results are 12 categories, each assigned a chart which will define acceptable tolerances for the tile. In order for a tile to be ISO compliant, it must meet all of the criteria in the test summary chart. Unlike the ASTM, the ISO standards stipulate the performance criteria for each tile category. Complete listings may be found in ISO 13006. The tests themselves may be found in ISO 10545-1 through 10545-12.

The following information is required in order to determine to which standards a tile will be governed:

Forming Method	a) pressed	b) natural extruded	c) precision extruded
Absorption	a) <0.50%	b) 0.50- 3.00%	c) 6.00-10.00% d) > 10.00%

Other highlights of the ISO 13006

The ISO 13006 requires clear indication by the manufacturer, for example, on the following:

- 1) Country of origin must be stamped on each tile
- 2) Only first quality tiles will be compliant and the box must be so labelled
- 3) Manufacturers must disclose whether a tile is glazed or not or whether it has been treated after production.

ISO does not cover trim pieces.

ANSI 137.1, Table 6 provides technical performance levels for mosaic tile and mosaic trim.

## Porcelain Tile

### Definitions:

Porcelain tiles are made from fine quality clays that allow for a range of colours and patterns. Fired in a fast fire kiln, they have absorptions of less than .5% (MR1) and are normally frost Resistant. Shading and sizing is more easily controlled and larger sizes are increasingly popular.

Many tiles can be rectified to ensure minimal sizing tolerances of less than 1mm, allowing for tight grout joints.

### Types:

- Homogeneous tiles are Colour through body; where the colour and pattern are created with the clays and run throughout the entire body of the tile. They may be polished or honed, unglazed or enhanced.
- Through Body tiles have the colour running throughout the body but the pattern does not. The pattern is often created with silk screens or digital ink imprinting. This application may or may not include glazes.
- Double pressed tiles are when the clay is pressed twice, once to achieve the pattern and the second to create the back of the tile without the pattern.
- Glazed Porcelain: Where colour and pattern are achieved with glazes and the body of the tile may or may not have a similar colour. In order to achieve porcelain status, the tile must have absorption of less than .5% \*.

### Finishes:

- Porcelain tiles are hard and can be finished like stone; to a honed or polished. These finishes are mechanically ground after firing however tile may also be pre-honed prior to firing.
- Treated surfaces are usually created by applying a surface to the tile prior to firing. These treatments may improve cleanability, enhance colour or create a soft shine however they do not usually contribute to the colour or pattern.

## Thin Ceramic Tile Panels

- There are large format thin tiles which are 5.5 mm or less in thickness which both ANSI and ISO do not address. Currently, the ISO are developing new standards for these new tile formats which will be completed in another 2 to 3 years.
- Ceramic wall tile: While these have been on the market for many years, the latest technology has large format wall tiles (i.e. 300x1200mm) in thickness of less than or equal to 5.5 mm.
- Pressed Porcelain: These tiles are usually limited to tile sizes (up to 600 x 1200 mm) and less than or equal to 5.5 mm in thickness. Some adhesive companies offer specialty adhesives so that these products may be used on the floor as well as the wall in both new and tile over tile applications. The Robinson Floor Tester can verify a tile's suitability for a given application however full coverage of 95-100% is required to support thin tile in a flooring application.\*
- Extruded Porcelain Tiles are produced in large slabs currently up to 1200 x 3600 mm in thickness less than or equal to 5.5 mm. These slabs are somewhat flexible and can be held in place in a curve or installed flat. Currently these slabs are rated for wall applications although they have many additional uses such as furniture, countertops, exterior wall and ceiling applications. Usually the slabs are available with an optional mesh for easy handling, as they tend to be brittle. Many slab manufacturers offer mechanically fastened systems for use in exterior cladding.

\* The use of thin Ceramic tile panels on the floor is a relatively new application for these materials and there are some exceptional challenges with these types of tiles. Things that have to be considered are levelness of the floor minimum 3 mm in 3000 mm, coverage of mortar to the tile should be 95 to 100% which is extremely difficult to attain and is crucial for load bearing capability. Edge protection as well as movement joints are also challenging aspects of these materials on floors. In all specialized tools, equipment, thin-bed mortar and training are required for the proper installation of these products.

Lastly, the TTMAC does not recommend these tiles on a wood substrate until the industry has done enough R&D to determine that these products can survive on this substrate and other bending, deflecting substrates. TTMAC has not yet been able to assess the suitability of this tile for flooring use in this format, and as such has not developed any installation detail. Consult manufacturer for all substrate, performance and installation criteria as well as warranty coverage.



Please refer to page 8.

### Trims

Trim units of various shapes, consisting of such items as: covebase, caps, corners, mouldings, interior and exterior angles, bullnose, curb units and stair treads, are available to achieve an installation of the desired sanitary and/or architectural design. Special slip resistant inserts, as well as prefabricated transition strips for use in interior and exterior corners to achieve a more finished appearance, are available. Specifier must indicate if these special trim units are required as their use will have an impact on the price of the tile installation.

- Bullnose - rounded edge which returns tile back to the substrate.
- Cove Base - a slightly rounded 90° return which allows a wall tile to flow into a floor tile. Used where sanitary conditions are required as it allows for easy cleaning.
- Step treads have either a bullnose or full return and may or may not have raised or grooved treads to increase slip resistance.
- Angle beads are ¼ rounds used to cover an exterior corner.
- Internal angles are ¼ rounds used to cover an internal corner.
- V-caps are raised returns used to create a counter top nosing.
- Also refer to ANSI A137.1.

## CERAMIC TILE NOTES FOR THE SPECIFIER

### Selection

Selection should be based on the specific environment taking into consideration, traffic and other exposure, safety (slip resistance), desired longevity, suitability of a tile size given substrate tolerances and maintenance concerns. For exterior use, only frost resistant tile should be used. Water absorption is not indicative of freeze thaw stability and separate tests are required or verify with manufacturer to determine suitability in an exterior environment.

In areas where slip resistance is required, special slip resistant tile are available, however these tiles may be more difficult to clean or maintain.

Carborundum tiles are less common, however, it should be noted whether the carborundum filings run throughout the body of the tile or sit on top. Topically applied products are more vulnerable to wear.

Refer to the testing section for available tests.

Tiles will either have a manufactured edge which is slightly eased or a cut and rectified edge which is mostly square. Verify with the manufacturer for edge options.

### Caution

- Do not use paper-back, mesh-back or dot mounted tile for exterior use or in locations of extreme moisture unless the manufacturer guarantees that the material is suitable for this type of installation.
- For colour consistency, tile should be from the same production run, dye lot, calibre and batch number. If shading variation is evident, the consultant, owner, designer and architect must be notified prior to installation. Slight shading variations in the manufacturing of the tile may occur even with the highest modern technologies. On large quantity projects, it may not be possible to obtain all tile from the same production run, dye lot, calibre or batch number, therefore, consult with the supplier or manufacturer to ensure tile consistency. ANSI 137.1 section 5.4.2.1 provides a table for assessing shading characteristics of a tile.
- When specifying rectangular tiles with offset joints, the off-set should be no more than 33% to reduce lippage at the mid-point.
- Material must be inspected prior to installation.
- Use or installation constitutes acceptance of materials.
- Installer to work from multiple boxes or multiple pallets to ensure even shading distribution.

### Stone Tile

Natural Stone Tile – includes granite, marble, travertine, slate and limestone. Each material has its own unique physical and technical characteristics. ASTM standards have been developed to better assess the suitability of each type of stone for a particular application.

Granite – Typically granular in appearance, granite is an igneous rock primarily composed of feldspar, quartz and smaller ferromagnesium materials. Many types of granite are resistant to mild chemical attacks and rock salt. Due to its commonly dense physical make-up, many types of granite are suitable for exterior applications where freeze-thaw conditions exist. Refer to ASTM test methods for standards.

Marble – A metamorphic stone that contains calcite, dolomite and is capable of being polished. Marbles have a wide variety of densities and abrasion resistance and are susceptible to chemical attack and the possibility of staining. The MIA classifies marbles into four groupings – A,B,C, and D. This classification system is based on a particular materials working capabilities and not necessarily the quality of the stone. Some natural stones react adversely to moisture and therefore epoxy setting may be required. This relates to soundness with group “A” having uniform and favourable working qualities. Group “B” may have natural faults, some filling may be necessary. Group “C” and “D” may require additional reinforcement.

Travertine – A “sub-category” of limestone that originates from hot springs. A primary characteristic of many travertines is the voids which are present. These voids are often filled with epoxy, polyester resins and Portland cement based products. Many travertines can be polished and are commercially referred to as marble.

Slate – A metamorphic rock that is known for its naturally occurring cleavage lines. Typically earth-tone colour in nature. Due to the various countries of origin some slates are not suitable for exterior applications. Refer to ASTM test data.

## **Surface Finishes**

There are various different surface finishes that are available for natural stone. Listed below are some of the more common finishes available. Some surface finishes are more conducive to certain stones due to their densities and mineral content. Specify the desired finish for the tile face and all exposed edges.

Polished – A high gloss finish that is achieved by the grinding of the materials surface with fine grit abrasives. Polished finishes are highly reflective and depending on the material may accentuate surface inclusions and variations.

Honed – A mat finish that is achieved by the grinding of the surface with fine grit abrasives. This type of surface finish is achieved through lower grit abrasives than that of a polished finish. Honed finishes typically achieve higher slip resistance readings than a polished finish.

Flamed (Thermal) – A surface finish that is more commonly associated with granite pavers. This process involves the surface of the material being exposed to high thermal temperatures where the softer minerals are removed resulting in an undulated surface. The rougher surface texture often mutes the colouration of the stone and increases the slip resistance of the material. Due to varying densities of stone this type of finish may not be conducive to certain stones and thicknesses.

Water Jet – Similar to a flamed texture with a more honed appearance. Waterjet also refers to precision cutting, etching and engraving.

Tumbled – This finish is achieved through the use of large tumblers that may include the use of some acids within the drum to roughen and/or “distress” the appearance of the stone. This decorative type of finish is more commonly applied to softer stones (marble and limestone).

Brushed – Similar in appearance to honed, however the use of polyester brushes leave a slightly undulated surface.

Natural Cleft - This type of surface finish is mostly found with slate. The surface finish is a result of the natural occurring lines of separation of the stone and is achieved through splitting of the stone at its natural fault lines.

## **STONE TILE SELECTION**

Select stone on the basis of manufacturer’s recommendations or on the basis of proven performance under similar conditions of use. In evaluating suitability of stone, refer to following requirements:

ASTM C615 Granite  
ASTM C568 Limestone  
ASTM C503 Marble  
ASTM C629 Slate  
ASTM C616 Quartz-based  
ASTM C629, Slate  
ASTM C1526 Serpentine  
ASTM C1527 Travertine

## **STONE NOTES FOR THE SPECIFIER**

Specify the edge detail to be straight cut or eased. Natural stone is usually sold with a gauged thickness with the exception of some slates. Gauged stones have a minimum tolerance for thickness and may be installed using a thin-set method if installation. Stones that are un-gauged may require a medium-bed or full mortar bed installation system. Verify with the supplier as to whether the stone is gauged or not prior to installation.

For safety in exterior walking areas, polished stone should not be used.

For exterior applications, coarse textured, sandblasted or thermal (flamed) finished stone is recommended. Verify with the supplier as to the suitability of the selected stone for an exterior application the type of edge finish should be specified by the consultant.

When specifying stones with varying degrees of hardness for use in a pattern, note that the material will not wear at the same rate. The use of sealers and other chemical stone products may react differently to each type of stone, special precautions may be required during restoration.

Vertical applications can use any finish, however, polished finish on most marbles and limestones may not last on exterior applications.

On interior flooring applications, polished stone will show wear patterns in traffic areas. Honed finishes will show less wear patterns and should be recommended for interior flooring use.

For stone tile larger than 380 mm x 380 mm the surface variation should not exceed 3 mm in 3000 mm.

Prior to the grouting of the natural stone ensure that the colour of the grout selected does not stain the stone. Due to the natural absorbing characteristic of most natural stones it is advisable that site testing be carried out to determine if staining from pigmented grout and mortars is prominent. Lighter coloured stones may require the use of "white" mortars to avoid "bleeding" of pigments through the stone. When possible, natural stone should be grouted with similarly shaded pigmented grouts. Sealing of the stone prior to grouting may be required to effectively reduce the stones porosity.

Specify the exact facial dimensions and thickness. Note where stone sizes are to be modular and deduct the joint from the finished size.

Specify straight cut or eased/beveled edges for all stone tiles.

- Natural stone is a product of nature and is not subject to the rules of consistency that apply to manufactured materials. The selection of natural stone tile (marble, granite, limestone and slate) should never be made on the basis of viewing one single sample, as these products are subject to variation in their tonal qualities, veining and shading variations. However, the aforementioned characteristics make these products highly desirable and therefore selection should always be made by viewing sufficient tile in order to observe an adequate range of the tile characteristics prior to installation.
- Material must be inspected prior to installation.
- Use or installation constitutes acceptance of materials.
- Installer to work from multiple boxes or multiple pallets to ensure even shading distribution.

## OTHER CONSIDERATIONS FOR SPECIFYING TILE (all types)

- a) Tile selection should be based upon service requirements. Glazed floor tile is most commonly used in residential or light commercial applications. Stone, quarry and porcelain tile are normally used in commercial and heavy traffic areas.
- b) In areas where slip resistance is required, special slip resistant tile are available, however, these tiles may be more difficult to clean or maintain.
- c) Slip resistant tiles and some unglazed tile may be prone to staining by pigmented grouts. It is recommended that all unglazed tile be tested with the grout that will be used prior to installation to determine whether staining will be a problem. Staining can be minimized by selecting grout colours close to the colour of the tile or by use of appropriate sealers on the tile prior to grouting. For further information refer to the latest TTMAC Maintenance Guide.
- d) LIGHTING — Where the ceramic tile, marble or granite surfaces are exposed to natural or artificial light at a shallow angle almost parallel to the tile surface, normal inconsistencies in the surface may be highlighted by shadows. To avoid this shadowing effect, avoid the use of lights mounted on the wall and locate ceiling fixtures at least 600 mm away from the wall and preferable in the centre of the room. Installing permanent or temporary lighting that simulates the planned lighting schematics prior to the tile installation may identify potential problems and may allow for some adjustments during the installation to minimize or eliminate shadows.
- e) MAINTENANCE — Refer to TTMAC Maintenance Guide.
- f) CHEMICAL RESISTANCE — Where improved chemical resistance is required, tile can be set and grouted with furan or epoxy setting and grouting materials. These materials are shown as acceptable alternates throughout this manual where appropriate. Refer to the manufacturer's product data sheets for details concerning resistance to specific chemicals and/or chemical groups.
- g) ENVIRONMENTAL CONSIDERATIONS — Ceramic tile, marble, granite and terrazzo are environmentally safe materials that do not pose any hazards in use. The setting materials used with these products are generally low hazard materials that, when cured, do not cause any environmental concerns. Portland cement bases products are alkaline and workers should avoid skin contact with all setting materials, manufacturer's recommendations should be followed.

- h) CHANGES IN LEVEL — Specify thresholds to adjust between adjacent finish floor levels when substrate cannot be depressed. Changes in level up to 6 mm and 13 mm shall be bevelled with a slope no greater than 1:2. Changes in level greater than 13 mm shall be accomplished by means of a ramp. The least possible slope shall be used for any ramp. The maximum slope of a ramp in new construction shall be 1:12.
- i) Sealers or Protective Coatings (all type of tile) — Follow manufacturer’s recommendations for sealing. The word sealer is often misused. A sealer will coat the tile and become the wear layer. It might consist of urethane, varethane or wax. Sealers will require periodic re-application which should be covered in the maintenance data sheets.
- j) Breathable, penetrating sealers do not coat the surface completely. They may provide some improved cleanability and may also improve the slip resistance of the floor, however, check manufacturers’ data to determine the limitations of the product such as protection from staining or damage from rock salt or corrosive products.

## INSTALLATION NOTES FOR THE SPECIFIER

### Size Tolerances for Tile and Grout Joint Selection

Prior to specifying grout joint sizes, determine the facial dimension tolerance of the tile.  
 Minimum joint sizes for unsanded wall grout are 1.6 mm.  
 Minimum joint sizes for sanded floor grout are 3 mm.

Generally, most wall tiles will have less than 1 mm tolerance and so a 1.6 mm tile joint may be used. All other tiles and stones may vary according to manufacturer/producers standards for production and sorting.  
 To achieve a 3 mm grout joint, tile sizes should not vary by more than +/- .5 mm  
 To achieve a 6 mm grout joint, tile sizes should not vary by more than +/-1.5 mm

Rectified tiles generally have sizing tolerances of approximately +/- .8 mm and can therefore be installed with a tighter grout joint. When specifying floor joints of less than 3 mm, seek manufacturers recommendations for suitable grout. Butt joints are not recommended for the following reasons:

- Does not allow for expansion and contraction of the substrate (i.e. movements due to thermal conditions and curing, etc.)
- Does not effectively address size variations of tile
- May contribute to moisture penetration resulting in mould and mildew growth
- Does not allow for unevenness of substrate

### Size Tolerances for Tile and Grout Joint Selection

Lippage is a condition where edges of adjacent tiles are not installed at the same level. Lippage, or its perception, may be influenced by many factors including:

- A) Installation of tile by thin-set method on a surface which exceeds the permissible substrate surface variation.
- B) Failure to properly beat the tile into position on a fresh mortar bed.
- C) Allowable manufacturing variation in thickness and warpage of the installed tiles.
- D) Naturally occurring warpage in materials.
- E) Setting ungauged stone without backbuttering through a screed or push box.
- F) Size of joints between installed tiles.
- G) Angle of natural or artificial light which creates exaggerating shadows across the tiles surfaces.

ANSI A137.1 establishes limits for allowable warpage in manufactured tile and needs to be taken into account when considering lippage. The following chart is a guideline for identifying acceptable lippage in tile installations in addition to the inherent warpage of tile manufactured in accordance with ANSI A137.1.

TILE TYPE	TILE SIZE	JOINT WIDTH	ALLOWABLE LIPPAGE*
Glazed Wall/Mosaics	25 mm x 25 mm to 150 mm x 150 mm	1.5 mm to 3 mm	.78 mm
Quarry	150 mm x 150 mm to 200 mm x 200 mm	6 mm or greater	1.56 mm
Pressed Floor/Porcelain	All	1.5 mm to less than 6 mm	.78 mm
Pressed Floor/Porcelain	All	6 mm or greater	1.56 mm

\*Values to be added to the actual measured tile warpage.

Note: On floors where slope to drains are present, the amount of lippage which will occur will exceed these limits, especially when tile sizes are 150mm x 150mm or larger are used. Lippage will be greater when tile sizes are larger. The use of smaller module tile on floors which are sloped to drain units will help reduce lippage.

## **DEFLECTION**

All floor systems, including wood frame construction and sub-floor panels, over which the tile or stone is installed, shall be in conformance with the National Building Code and/or the Provincial Building and/or the local Building Codes.

\*Note: The owner (should/shall) communicate in writing to the project design professional and general contractor the intended use of the tile installation, in order to enable the project design professional and general contractor to make necessary allowances for the expected live load, concentrated loads, impact loads, and dead loads including weight of the tile and setting bed. The tile installer shall not be responsible for problems occurring from any flooring or subfloor installation not compliant with applicable building codes, unless the tile installer or tile contractor installs the floor framing or subfloor.

\*The preceding was re-written with the consent of the TCNA (Tile Council of North America).

## **Exterior Tile Cladding**

Tile cladding of buildings may be accomplished by the following methods:

- a) Direct bonding to a solid concrete or cementitious backer unit substrate.
- b) Shop fabrication of cladding panels usually consisting of cementitious backer units attached to metal studs with tile bonded to the cementitious backer units with a latex-Portland cement mortar.
- c) Large sized porcelain tile (currently up to 600 mm x 1200 mm) mechanically attached to a metal framework fastened to the wall. The method of attachment must be approved by the manufacturer of the tile and design should be approved by the consultant.
- d) Tile may be bonded directly to a solid substrate up to 3000 mm above the top of the foundation wall.
- e) For mechanically fastened stone cladding refer to the latest edition of the TTMAC Dimensional Stone Guide.

Regardless of the method of construction, the following criteria must be met:

1. Movement joints must be provided as per detail 301MJ-2012-2014.
2. Where tile is bonded to a substrate, every effort must be made to achieve 95% contact and preferably 100% contact between the setting material, the substrate and the tile. Full contact is achieved more readily when applying tile to shop fabricated cladding panels and/or when applying smaller sized tile.
3. Proper flashing must be used to prevent water ingress behind the tile.
4. The final installation must be able to withstand all design loadings in accordance with the national and local building codes. Direct bonding of tile to a solid substrate should be approached with caution when cladding height exceeds 3000 mm since bond failure could endanger pedestrians. Installation systems above 3000 mm must be consulted, designed and guaranteed by the manufacturer. Proper design, workmanship and proven materials are required for successful installations.

## **Exterior Tile Floors & Decks**

Tile installed on horizontal surfaces may be installed in accordance with Details 310F-2012-2014, 311F-2012-2014 or 325ED-2012-2014 with the following recommendations:

- a) Provide expansion and control joints as per Detail 301MJ-2012-2014.
- b) Slope slabs and finished tile surface to provide complete drainage.
- c) Use tile classification Type MR1 having good freeze-thaw durability, see page 7.
- d) Use suitable latex additives in mortar beds, bond coats and grout. When a latex additive is to be used, a minimum cure of 14 – 60 days is required before exposure to moisture. Verify with manufacturer the correct cure time required. Alternatively, to reduce curing time required, a rapid set mortar may be more suitable.
- e) Over occupied areas or non-occupied decks or balconies that are not flowthrough, use suitable roofing membranes with a drainage layer over the roofing membrane.
- f) For slabs on grade, concrete shall have air entrainment of 5% to 8% and provide suitable drainage below slabs.

## Installation of Agglomerate Marble, Terrazzo, Tile & Dimensional Stone (such as granite, marble, and slate)

These materials can be set by any of the methods used for installing tile. However, most agglomerate marble should not be used on exterior surfaces unless recommended by the manufacturer. Dimensional stone with a hardness (Ha) of 10 or more are suitable for use as flooring (ASTM C241). A minimum abrasive hardness of 12.0 is recommended for commercial and other heavy traffic areas. Light coloured marble tile should be installed with a white latex cementitious thin-set mortar to prevent shadowing or discolouration due to setting materials. Certain marbles such as Rosso Levanto, green marble, some green slate and agglomerate tile have a tendency to warp and curl when installed with bond coats that contain water. These materials generally have to be installed with a 100% solids epoxy mortar. When installing granite or agglomerate marble tile, the bond coat should be a latex cement slurry, a Portland cement mortar, 100% solids epoxy mortar or modified epoxy emulsion mortar.

When installing slate or marble tile on floors, attempt to achieve full contact with the bond coat to prevent cracking of tile under traffic loading. When installing ungauged materials, backbutter through a push box or box screed to compensate for variations in material thickness or wet set installation as ANSI A108.1A. Install granite, marble or agglomerate tile with 1 mm to 3 mm width joints and grout with a non-sanded latex-Portland cement grout. Terrazzo and slate tile may be installed with joints from 3 mm to 6+ mm and may be grouted with latex-Portland cement grout. Some terrazzo tile may require grinding after installation. Allow adequate cure of bonding material before grinding terrazzo tile (minimum 3 days at 20°C and 7 days at 10°C is recommended).

### INSTALLATION MATERIALS

#### Setting Materials - Adhesives and Mortars (Notes for the specifier)

The same materials may be used for installing ceramic tile, natural stone agglomerate and terrazzo with the following exceptions:

- White latex cementitious thin-set mortars are recommended for light coloured limestones and marbles to prevent staining and shadowing. Cement substrates should also be tested for moisture not to exceed 1.36 kg/9.3m<sup>2</sup> to avoid Portland staining or damage.
- Epoxy setting (100% solids) is recommended for use with certain stones such as Rosso Levanto, green marble, some green slates and some agglomerate tiles that may have a tendency to curl when set with mortars containing water.
- Latex-Portland cement mortar will improve adhesion of porcelain tile and back buttering will assist in achieving higher bond strengths.
- When tile are set by the thin-set method on exterior surfaces, heavy loads, in wet areas or for tile larger than 300 mm x 300 mm that are going to be subjected to heavy load impact, a minimum of 95% coverage must be achieved. The bonding material must be notched in horizontal straight lines. Set tile on the freshly notched thin-set mortar, slide tile back and forth at 90° to the notches. This method can produce maximum coverage, with the corners and edges fully supported.
- Specify backbuttering when required. Backbuttering improves adhesion to tiles with bond breakers such as dust, kiln release agents and dirt, as well as tile with a raised or textured back. Backbuttering involves application of a thin trowelled coat to the back side of the tile using the flat side of the trowel immediately before setting to achieve a minimum 95% adhesion for exterior, large tile or wet areas.
- Wipe the backs of all stone tiles with a damp cloth to remove the dusty film that can prevent the adhesive from bonding to the tile.
- Immediately prior to setting ungauged slate, marble, stone or large sized ceramic, tile must be backbuttered through a push box or box screed to achieve a uniform thickness of tile and mortar combined.
- Tile must always be set while bond coat is wet and tacky and has not skinned over.

**Mortar Bed** - A mixture of Portland cement, sand and water installed to a thickness as required to provide a flat substrate on which to apply tile. When a latex additive is to be used a minimum cure of 14 – 60 days is required before exposure to moisture. Verify with the manufacturer the correct cure time required. It may be accurately sloped where required and can be used to correct irregularities in sub-surface planes. On floors, mortar beds may be reinforced with 51 mm x 51 mm x 1.6 mm gauge galvanized or stainless square wire mesh and on walls with expanded metal lath weighing not less than 1.4 kg/m<sup>2</sup>. Where expanded metal lath is used, a scratch coat is normally applied before the mortar bed is applied.

#### Types of Installation Systems

12 mm - 26 kg/sq.m. Medium bed  
25 mm - 52 Kg/sq.m. Medium bed  
38 mm - 80 kg/sq.m. Mortar Bed Bonded system  
50 mm - 105kg/sq.m. Mortar Bed Bonded system  
63 mm - 132kg/sq.m. Mortar Bed Floating system

Approximate weights for underbed mortar installation (weight of mortar only). Weight may vary depending on sand, aggregate size and mix percentage of sand/cement/water.

**Dry-Set Mortar (ANSI A 118.1-1999)** - a mixture of Portland cement, sand and water retentive additives which is used as a bond coat for setting tile over cured mortar beds, masonry, concrete or on other suitable backings which are plumb and true.

**Latex-Portland Cement Mortar (ANSI A 118.4-1999)**

- A: A two component liquid latex mixed with factory blended dry-set mortar. Both components must be compatible or supplied by the same manufacturer. Used as a bond coat for setting tiles on all surfaces listed under dry-set mortar, cementitious backer units and coated glass mat backer boards. Certain products may be suitable for installation over plywood and existing ceramic tile. Recommended for heavy-duty and extra heavy duty installations, exterior installations and hard to bond tiles such as porcelain or slate in high traffic areas.
- B: A single component mix incorporating a redispersible dry latex in a bag, generally referred to as "Polymer Modified Mortar", generally recommended for moderate, light and residential use. Some high-latex content polymer modified mortars may be suitable for heavier use. Manufacturer's recommendations must be followed.

Latex-Portland cement mortars may require 14 – 60 days cure before exposure to water. Verify with the manufacturer the correct cure time required. Alternatively, to reduce the curing time required, a rapid set mortar may be more suitable. The formulation of latex additives varies substantially and the manufacturer's directions and recommendations should be followed explicitly. Always compare physical properties when writing multiple choice specifications or accepting equivalents.

**Exterior Grade Plywood (EGP) Latex-Portland Cement Mortar (ANSI A 118.11-2000)**

A modified Portland cement dry-set mortar to which a polymer has been incorporated in latex form or in a powder form for the bonding of tile to exterior grade plywood in interior dry or limited water exposure areas only. When added in latex form it is added as a replacement for part or all of the gauging water in accordance with the manufacturer's instructions.

**Lightweight Mortars (ANSI 118.4 AND 118.11)**

Lightweight mortars are polymer-modified, premium-grade, non-sag lightweight mortars, for thin or medium bed installations. The lightweight characteristics both in the powder and the resulting mortar provide advantages such as ease of handling and application, superior coverage and excellent sag resistance. Lightweight mortars are used in wall, floor and ceiling installation of marble, slate, granite, pre-cast terrazzo, agglomerate, porcelain tile, and most types of ceramic and stone tile on properly prepared substrates of concrete, masonry, cement terrazzo, concrete backer units, existing surfaces of ceramic or stone tiles, or, in dry areas only, on exterior grade plywood. They are also used in lieu of mastic adhesives for tile in shower, bathroom and backsplash installations.

**Medium bed dry-set mortar (ANSI A 118.1)**

A cementitious dry-set mortar specifically formulated for direct bonding of Ceramic Tile and Stone that exhibits reduced shrinkage and higher support compared to traditional dry-set mortars, which also allows for use in thicker bond coats from 5 mm to 20 mm thick after the tile is embedded. These mortars are not designed to be used for trueing or leveling underlying substrates such as unlevel concrete.

**Medium bed latex-Portland cement mortar (ANSI A 118.4)**

A cementitious latex-Portland Cement mortar specifically formulated for direct bonding of Ceramic Tile and Stone that exhibits reduced shrinkage and higher support compared to traditional dry-set mortars, which also allows for use in thicker bond coats from 5 mm to 20 mm thick after the tile is embedded. These mortars are not designed to be used for trueing or leveling underlying substrates such as unlevel concrete

**Self-levelling Mortars (There is no current standard for this material)**

Self-levelling mortars consist of special cements mixed with synthetic resins and additives. When mixed with water, a fluid, self-levelling mortar is produced which can be applied from a feather edge up to the required thickness in one operation. High-performance self-levelling cementitious flooring compounds permit a good working time, followed by rapid hardening, thereby allowing walk-on access and light traffic within two to three hours. They can incorporate rapid-drying characteristics, allowing ceramic tile, stone and various floor coverings to be applied within 24 hours. In residential, office or industrial construction, self-levelling flooring compounds are applied at a typical thickness of 1 mm - 10 mm. In most cases, a primer is recommended to improve adhesion, limit water absorption from the flooring compound into the base and prevent air leakage into the screed and surface bubbles. For small surface areas, the material is hand-applied but for larger floors (greater than 1000 m<sup>2</sup>) a pumpable material has many advantages. The unique reaction of special cements used enables formulations to be produced that are shrinkage-compensated. Thanks to the reduced tension and strain in the hardened floor, the surface is less susceptible to cracking and de-bonding. Flexural strength and toughness are not compromised by the speed of the process, and the resulting surface finish provides a high compressive strength underlayment, for use in heavy commercial applications, certainly suitable for tile and stone installations.

**Full Contact Mortars (ANSI 118.4 AND 118.11)**

Full contact mortars are single component, high performance, polymer modified mortars that are used in thin-bed and medium-bed applications specifically designed to achieve the required coverage of bonding mortar to large format or heavily lugged tiles. Superior wet-in characteristics provide outstanding backing transfer and eliminate the need for back-buttering. Although the resulting mortars are more fluid, they support large format tile horizontally, holding trowel ridges well. They are available in regular-setting or fast-setting mortar versions.

**Fast-Setting Mortars (ANSI 118.4 AND 118.11)**

Fast-setting mortars allow for tile to be grouted and light traffic within 3-4 hours of application, and for full service after 24 hours. They offer major advantages for tiling of surfaces that have to be ready for use quickly, such as shopping malls, existing industrial facilities, hospitals, airports, as well as for outlying area installations, where installers are required to complete installations within a limited time frame. Some mortars may need to have extended cure time before exposure to moisture, 7 – 14 days.

**Epoxy Mortars (ANSI A 118.3-1999)**

An epoxy resin normally filled with silica sand and combined with a hardener before application. Used as a bond coat where high bond strength and chemical resistance are required.

**Modified Epoxy Emulsion Mortars (ANSI A 118.8-1999)**

A three component mortar consisting of emulsified epoxy resins, a hardener and blend of Portland cement and sand. Modified epoxy emulsion mortars give high bond strengths and are used for similar applications as latex modified Portland cement mortars. They are not designed for chemical resistance.

**Furan Resin Mortar (ANSI A 118.5-1999)**

A mortar consisting of carbon and/or silica filled furan resin and hardener used in applications where chemical resistance is required. May be used as the bond coat on fully cured surfaces as per details 310F-2012-2014 and 311F-2012-2014. Follow manufacturer's instructions regarding surface preparation and installation.

**Organic Adhesive (ANSI A136.1-1999)**

A ready to use paste consistency adhesive in which the binder is an organic composition. They are normally either solvent based or water based adhesives and cure by evaporation of solvent or water. For use on interior surfaces only where temperatures do not exceed 50°C. Not used for applications involving immersion in water. Water resistance and bond strength varies depending on type and product. Organic adhesives may require an extended cure period when used for large tile and are not recommended for use on floors.

**SPEC NOTE: Select appropriate ANSI Materials Method for Installation Method.**

MATERIALS ANSI	INSTALLATION ANSI
ANSI A 118.1 Dry-set Portland Cement	ANSI A108.5
ANSI A 118.3 Chemical Resistant Epoxy	ANSI A108.6
ANSI A 118.4 Latex Portland Cement Mortar	ANSI A108.5
ANSI A 118.5 Chemical Resistant Furan Mortar & Grout	ANSI A108.8
ANSI A 118.6 Non-Modified Cement Grouts	ANSI A108.10
ANSI A 118.7 Polymer Modified Cement	ANSI A108.10
ANSI A 118.8 Epoxy Emulsion Mortar/Grout	ANSI A108.9
ANSI A136.1 Organic Adhesives	ANSI A108.4
No ANSI Standard for Portland Cement Mortar Bed Materials	ANSI A108.1 A, B or C

## GROUT GUIDE

These guidelines cannot address every installation. The type and size of tile, service level, climatic conditions, tile spacing, and individual manufacturer's recommendations are all factors that should be considered when selecting the proper grout.

Reprinted with permission from the Tile Council of America and the Materials & Methods Standards Association (rev. 1996)  W = wall use F = floor use	Grouts Containing Portland Cement					Others			
	Commercial (Sanded) A 118.6	Jobsite Mix (Sanded) A 118.6	Dry-Set (Unsanded) A 118.6 H-2,3	Commercial or Dry-Set with Latex (Polymer) A 118.7 H2,4	Mod. Epoxy Emulsion A 118.8	100% Solid Epoxy A 118.3	Furan A 118.5	Silicone or Urethane	Mastic Grout
	(4)		(4)	(4,9)	(4)	(1, 3, 4, 6)	(1,3,4,6)	(2,4)	(3,4)
<b>TILE TYPE</b>									
Glazed Wall Tile (7)	W		W	W		W		W	W
Glazed Floor Tile (7)	W,F	W,F	W,F	W,F	W,F	W,F			W,F
Ceramic Mosaics	W,F	W,F	W,F	W,F	W,F	W,F		W	W,F
Quarry, Paver, & Packing House Tile (8)	W,F	W,F		W,F	W,F	W,F	W,F		
Large Unit Porcelain or Vitreous Tile (8)	W,F	W,F	W,F	W,F	W,F	W,F	F	W	W,F
Dimension Stone (7,8) (Including Agglomerates)	W,F	W,F	W,F	W,F	W,F				
<b>USE</b>									
Dry/Ltd. Water Exposure	W,F	W,F	W,F	W,F	W,F	W,F			
Wet Areas (10)	W,F	W,F	W,F	W,F	W,F	W,F			
Exteriors (8, 9, 10)	W,F	W,F	W,F	W,F	W,F	W,F (4)	W,F (4)	W,F	
<b>PERFORMANCE</b>	<b>Note: There are 5 performance ratings, from Best (A) to minimal (E)</b>								
Suggested Joint Widths (5)	3 mm - 16 mm	3 mm - 16 mm	2 mm - 3 mm	2 mm - 16 mm	2 mm - 16 mm	2 mm - 16 mm	10mm - 16 mm	2 mm - 6 mm	2 mm - 6 mm
Stain Resistance	D	E	D	C	C	A	A	A	B
Crack Resistance	D	E	D	C	C	B	C	A	C
Colour Availability	D	D	B	B	B	B	Black only	B	B

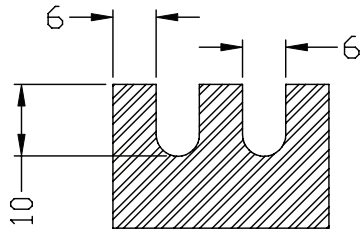
### NOTES:

1. Mainly used for chemical resistant properties.
2. Special tools needed for proper application. Silicone, urethane, and modified polyvinylchloride used in pre-grouted ceramic tile sheets. Silicone grout should not be used on kitchen countertops or other food preparation surfaces unless it meets the requirements of FDA Regulation No. 21, CFE 177.2600.
3. Special cleaning procedures and materials recommended.
4. Follow manufacturer's directions.
5. Joint widths are only guidelines. Individual grout manufacturer's products may vary. Consult manufacturer's instructions.
6. Epoxies are recommended for prolonged temperatures up to 60 degrees C, high-temperature-resistant epoxies and furans up to 177 degrees C.
7. Some types of glazed ceramic tiles, polished marble, marble agglomerates, and granite can be permanently scratched or damaged when grouted with sanded grout formulas. DO NOT use sanded grout or add sand to grout when grouting polished marble, marbled agglomerates, and ceramic wall tiles with soft glazes. Check the tile or marble manufacturer's literature and test grout on a separate sample area prior to grouting.
8. Some types of ceramic tiles and dimension stone may be permanently stained when grouted with pigmented grout of a contrasting colour. WHITE GROUT IS BEST SUITED FOR GROUTING WHITE OR LIGHT-COLOURED MARBLE OR GRANITE.
9. Latex modification may be required in areas subject to freezing temperatures. Consult grout manufacturer for recommended products and methods.
10. Coloured cementitious grouts may darken when wet.

TROWEL RECOMMENDATIONS

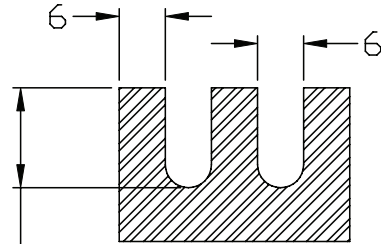
152 mm x 152 mm TO  
229 mm x 229 mm ON  
MASONRY OR  
CONCRETE WALLS

6 mm x 6 mm x 10 mm



305 mm x 305 mm  
AND LARGER ON  
MASONRY, CONCRETE  
OR DRY WALL

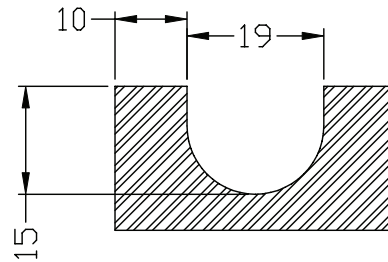
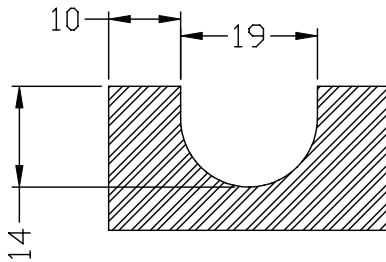
6 mm x 6 mm x 13 mm



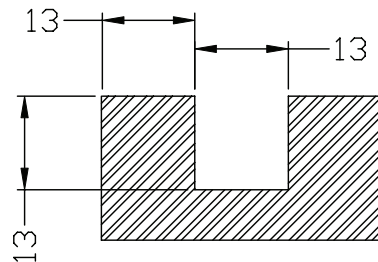
305 mm x 305 mm AND LARGER  
CONCRETE, ON MASONRY OR  
TILES WITH THICKNESS VARIATION

10 mm x 19 mm x 14 mm

10 mm x 19 mm x 15 mm

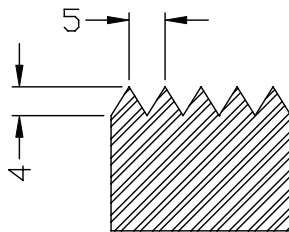


13 mm x 13 mm x 13 mm



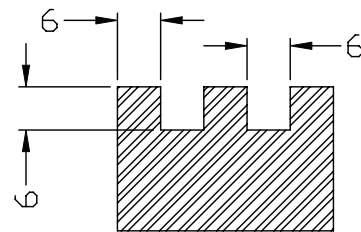
**108 mm WALL TILE AND CERAMIC MOSAICS ON DRY WALL**

**5 mm x 4 mm**



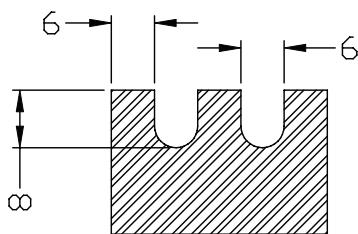
**152 mm x 152 mm TO 229 mm x 229 mm ON DRY WALL**

**6 mm x 6 mm x 6 mm**



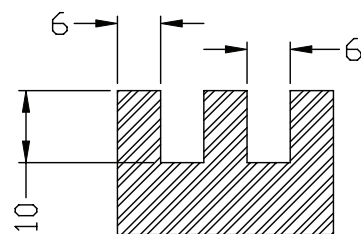
**108 mm WALL TILE AND CERAMIC MOSAICS ON MASONRY AND CONCRETE**

**6 mm x 6 mm x 8 mm**



**152 mm x 152 mm TO 229 mm x 229 mm ON MASONRY OR CONCRETE WALLS**

**6 mm x 6 mm x 10 mm**



**NOTE:** Guidelines do not address every installation setting practice. The substrate, type & size of tile intended, service level of the installation and individual manufacturer's recommendations all affect the approximate coverage of the given setting material.

**UNSUITABLE SUBSTRATES FOR THIN-SET METHODS** - some plywood, particleboard, waferboard and strandboard. Compatibility of substrate for thin-set material must be confirmed by the manufacturer.

## GROUTING MATERIALS

Notes for the specifier:

- Pigmented grouts may cause staining of some ceramic tile or natural stone, precast terrazzo tile, textured tile and other porous materials. Staining can be minimized by selecting grout colours close to the tile colour or by applying a topical (removable) coating to the face of the tile prior to grouting. It is recommended that all unglazed tile be tested with the grout that will be used prior to installation to determine whether staining will be a problem. For further information refer to the latest TTMAC Maintenance Guide.
- Sanded grouts may scratch some natural stone and agglomerates or soft glazes on ceramic tile.
- Test prior to use.
- Generally, epoxy grout is not recommended for exterior installations. Consult with manufacturer to ensure suitability of their products. Epoxy grouts should be tested prior to use to ensure that they do not stain the products being installed. When grouting thick tile with narrow joints, take special precaution to ensure joints are completely filled with grout. It is recommended that all unglazed tile be tested with the grout that will be used prior to installation to determine whether staining will be a problem.
- Grout joint width for floors and walls are normally 2 mm to 6 mm depending on the type of material. Required grout joint width (joint width is the space between vertical edges of tile) should be specified (butt joints are not acceptable). Tile with bevelled or cushioned edges will appear to have wider grout joints than specified. For ease of maintenance, grout joints must be level. Grout depth maximum tolerance must not exceed the depth of the bevelled or cushion edge of the tile. For straight edge tile, grout must be flush with the surface of the tile for joint widths up to 6 mm; maximum allowable grout concave depression not to exceed 1 mm for joints in excess of 6 mm up to 10 mm. Concave depression in the middle of the joints in excess of 10 mm width not to exceed 2 mm. For epoxy grouts, joints must be filled flush with tile edges to a maximum concave depression in the middle of the joint not exceeding 1 mm for joints up to 6 mm and 2 mm for wider joints up to 10 mm. Manufacturer's recommendations must be followed. A minimum of 2/3 of joint depth should be kept open for grouting and grout must penetrate the joint to the bond coat.
- For rough textured or irregular surface tile it is advisable to preseal or prewax tile prior to grouting.

**COMMERCIAL PORTLAND CEMENT GROUT (ANSI A 118.6-1999)** - A mixture of Portland cement, silica sand and pigments normally supplied as a bagged, pre-blended mixture which cures to a dense, water resistant material. Damp curing is normally required.

**STANDARD CEMENT GROUT (ANSI A 118.6-1999)** - A grout designed for use with wall tile consisting of a blend of Portland cement, calcium carbonate or other fine filler and a water retention agent. This grout can be used without pre-soaking absorptive wall tile. Damp curing may help develop greater strength and water resistance.

**LATEX-PORTLAND CEMENT GROUT (ANSI A 118.7-1999)** - A grout of the same composition as the two preceding grouts but mixed with a latex additive. May be supplied with a dry, redispersible latex additive in the packaged premixed grout in which case the product may be referred to as a polymer modified grout. Latex additives reduce the water absorption of grouts, improve stain resistance and increase the bond strength to ceramic tile. Normally dry cured for 24 hours. Damp curing may be required under some conditions.

**EPOXY GROUT (ANSI A 118.3-1992)** - A grout similar in composition to epoxy mortar but normally supplied in a variety of colours and formulated to permit clean up with water. Chemical resistance and temperature resistance of products should be determined by reference to manufacturer's literature. With tile thicker than 13 mm it may be very difficult to completely fill joints less than 6 mm wide.

**FURAN RESIN GROUT (ANSI A 118.5-1992)** - A grout similar in composition to furan resin mortar used where required for chemical resistance. Normally only supplied in black colour. Use of this grout requires special installation skills including the waxing of tile prior to setting and steam cleaning after grout has cured.

**NOTE:** Guidelines do not address every installation setting practice. The substrate, type and size of tile intended, service level of the installation and individual manufacturer's recommendations all affect the approximate coverage of the given setting material.

**UNSUITABLE SUBSTRATES FOR THIN-SET METHODS** – some plywood, particleboard, waferboard and strandboard. Compatibility of substrate for thin-set material must be confirmed by the manufacturer.

## PROFILES

Profiles are strips of metal or plastic incorporated into a tile installation. Floor profiles finish and protect tile edges where tiles transition to other floor coverings, such as hardwood, carpet, and vinyl. Sloped floor profiles additionally transition changes in height. Wall profiles can be used at outside corners, or as a cap on tile base or wainscoting in lieu of trim units. Movement joint profiles are an alternative to traditional sealant-filled joints. Cove profiles are used at inside corners as a transition between two walls or between floor and wall tile.

Profiles are available in various materials, finishes, colors, and heights. Select the correct material considering traffic and environmental conditions (chemical exposure, etc.) and the correct height considering the tile thickness and setting bed thickness.

There are no standards currently set for these products. As with any product for which there are no standards, consult manufacturer for all performance and installation criteria.

## MEMBRANES AND UNDERLAYMENTS

### WATERPROOF MEMBRANES (ANSI A 118.10-1993)

These membranes may be trowel applied, built up membranes, liquid applied or sheet applied materials. Some materials are suitable only for use under mortar bed installations while others may be used in either mortar bed or thin-set methods. Some products are designed to be used as both a waterproofing membrane and as a bond coat for setting ceramic tile. In all cases, refer to the manufacturer's recommendations and local building by-laws and codes regarding limitations and suitable applications. Most waterproof membranes are not suitable for use where hydrostatic pressure from below is present. Not all waterproof membranes are vapour retarders and as such are not suitable for steam rooms. Some membranes are resistant to high PH conditions. Contact manufacturer for suitability.

### CRACK ISOLATION MEMBRANES (ANSI A 118.12-2005)

Crack isolation membranes for thin-set ceramic tile and dimension stone installations isolate the tile or stone from minor in-plane substrate cracking. Membranes covered by this specification are bonded to a variety of manufacturer-approved substrates covered by ANSI specifications. In some cases the trowel-applied products can be used as the adhesive for the ceramic tile or dimension stone as well. Other products within the scope of this specification are allowed to cure or are applied as sheet goods and are then used as the substrate for the application of ceramic tiles and dimension stone by traditional methods and materials. This standard applies to trowel applied, liquid, and sheet membranes. Testing requirements are as follows: Fungus and Microorganism Resistance; Shear Bonds; Point Load Testing; Robinson Floor Test; and System Crack Resistance Test. Performance ratings are: **Standard Performance:** Tile failure occurs after 2 mm specimen gap opening, but before 3 mm gap opening. **High Performance;** Tile failure does not occur by 3 mm specimen gap opening.

These membranes provide the lowest profile (elevation) of the tile installation incorporating a crack isolation membrane. Consult individual manufacturers for specific instructions, application, performance levels, and limitations concerning their materials. Follow the individual manufacturer's written instructions precisely. This standard was developed to provide specifiers and installers with the minimum criteria necessary for a material to function as a deterrent to crack propagation from the substrate through the finished thin-set tile or stone installation.

The installation specification for Crack Isolation Membranes is ANSI A108.17. It is highly recommended that any or all crack isolation systems be evaluated by the split slab Tile Assembly Floor Tester (See Selection Table page 25).

**NOTE:** The TTMAC does not endorse any one material used as a crack isolation membrane. Consult the manufacturer to determine whether their product will withstand the anticipated movement and loads involved. A crack isolation membrane will not prevent cracking of ceramic tile if there is vertical movement of adjacent surfaces. The terms anti-fracture or crack suppression membranes are not appropriate designations for this type of product.

### **NEW!** BONDED SOUND REDUCTION MEMBRANES ANSI A 118.13 - 2010

Bonded Sound Reduction membranes lower the transmission of sound from one room to the room below. This test method was specifically designed to be used below ceramic tile. This test method can be used for stone but with caution as stone tile are relatively fragile and susceptible to cracking and chipping which can be even more predominating when stone is placed over sound reduction materials, which are almost always resilient or compressible by nature. This standard applies to trowel applied, liquid and flexible sheet membranes being such these membranes provide the lowest profile (elevation) for the tile installation incorporating a bonded sound reduction membrane. Testing requirements are as follows: Fungus and Microorganism Resistance; Shear Bonds, Robinson floor test (ASTMC 627) and sound testing ASTM E2179. ASTM C627 "Robinson Floor Test" min. Residential Rating. Sound performance requirements are the floor assembly shall obtain a Δ IIC rating of 10 or greater.

### VAPOR RETARDER MEMBRANES

There are no materials that can completely stop the transmission of water vapor except solid metal or glass. Vapor retarders however can be an effective means to control water vapor especially in steam room and steam showers. Vapor permeance is tested under ASTM E-96 and recently it was identified that for steam rooms and steam showers this testing requires should be under ASTM E-96 -E with 90 % humidity. Typically, most building codes require a minimum of less than 1.0 perm but as of 2012 for continuous use steamrooms such as in a fitness center or health spa the requirement recommended is .5 or less. Most membranes that meet ANSI A 118.10 for waterproof membranes do not necessarily perform as a vapor retarder. Please verify with manufacturer if their product qualifies as a vapor retarder.

**SPEC NOTE:** Select appropriate ANSI Materials Method for Installation Method.

MATERIALS ANSI	INSTALLATION ANSI
ANSI A 118.9 Cementitious Backer Units	ANSI A108.11
ANSI A 118.10 Load Bearing Bonded Waterproof Membranes	ANSI A108.13
ANSI A 118.12 Crack Isolation Membranes	ANSI A108.17
ANSI A 118.13 Sound Reduction Membranes	In Process

## \*SOUND CONTROL UNDERLAYMENTS

There are 2 types of ratings used for sound control: STC (Sound Transmission Class), which is airborne sound, such as speaking, music, etc. and IIC (Impact Insulation Class), which is sound from people walking, moving chairs, dropping objects, etc. Presenting the greatest challenge for the STC component of sound control is high-frequency sound energy, such as that which is produced by a blow-horn or a whistle. The greatest challenge for sound control in regard to IIC is low-frequency sound energy, such as that which occurs when a basketball is dropped on the floor.

### STC Ratings

The term STC refers to the single figure of evaluation used to quantify the transmission of airborne sound through building elements, such as walls or floor systems. These types of sounds would be the equivalent of voices, radio, or television in the context of a multi-family building. The term STC translates to Sound Transmission Class and is measured and stated in accordance with ASTM Standard number C634 and tested via the test methodology of ASTM Test Methods E90, E336, and E596. When done in an accredited test laboratory, these values are stated as an exact number to the right of the initials STC. When done in the field, using ASTM Method E336, the values are designated by the initials FSTC to the left of the numeric value. STC values are in a large part influenced by the solid mass of the structure, but are also dependent on isolation and resilience within the structure.

### IIC Ratings

The term IIC refers to the statistical measurement standards used to quantify the transmission of impact sound energy through a floor/ceiling assembly system. These types of sounds would be the equivalent of foot traffic, dropped articles, or furniture moving in the context of a multi-family building. The term IIC translates to Impact Isolation Class and is measured and stated in accordance with ASTM Standard numbers C634 and E989 and tested via the test methodology of ASTM Test Method E492. In addition, a new test protocol for concrete subfloors was introduced under ASTM E2179-03e. When done in an accredited test laboratory, these values are stated as an exact number to the right of the initials IIC. When done in the field, using ASTM Method E1007, the values are designated by the initials FIIC to the left of the numeric value. IIC values are not heavily influenced by the presence of solid mass in the structure. IIC values are usually dependent on the presence of a resilient material somewhere in the assembly to isolate and absorb the sonic energy created by impacts.

### STC and IIC Ratings and Building Codes

In multi-family construction, in Canada, there are minimum IIC and STC values that the floor/ceiling assembly must achieve in order to meet the National Building Code (NBC) standards. The NBC requires a minimum 50 STC rating and recommends but does not require a 50 IIC. The higher the IIC or STC, the better the sound attenuation, with 50 considered the minimum for multi-family dwellings. The NBC may not require a 50 IIC but it would be extremely advisable to meet a minimum of 50 IIC as impact sound is usually the most objectionable to people's privacy.

In addition to the building code standards, some condominium developers and condo homeowners associations have their own minimum standards written into their condo bylaws, which are often more stringent than the NBC. It is wise to consult your condo association in regard to their by-laws and standards for the required IIC and STC values before installing hard surface flooring materials in your unit or project.

### Challenges

A number of different materials are promoted and used for sound control in floors. Each material is only one component of a complete system in which each component is an essential part of the total assembly. Elimination of any component of the assembly can seriously deplete the sound rating desired. Most of the data available to the market relates to tests of floor/ceiling systems that are comprised of concrete slabs with gypsum wallboard hung on resilient furring channels (suspended or sound-rated ceiling system) with a layer of mineral wool or fiberglass insulation in the cavity. Unfortunately, most of the construction detail in the field does not have this type of ceiling treatment.

In addition, in 2003 a test protocol for concrete subfloors was introduced under ASTM E2179-03e. When done in an accredited test laboratory, these values are stated as an exact number to the right of the initials IIC and actually give a separate IIC contribution value number of the product assembly by itself indicated by the Delta symbol  $\Delta$ . This number provides an excellent way to evaluate different products, and to determine if additional key components (e.g., a suspended or sound-rated ceiling assembly) are needed. Products that have only Field Test reports (FIIC) and no laboratory testing should be considered with caution. Field tests are project specific; comparing different field tests done in different buildings is not an accurate way to make a proper assessment of product performance.

Many materials that are promoted for sound control in hard surface flooring may not be suitable for direct bond tile and stone installations, as they are too compressible and do not provide proper structural support for these installations. In many cases, it is necessary to use additional reinforcing materials, such as mortar beds, poured in place overlays, backer boards, epoxy mortars and grouts, thicker tiles, and other methods to provide a structurally sound installation.

It is recommended that all products/systems to be used for sound control be subjected to ASTM C627, commonly referred to as the Robinson Floor Test, and that such products/systems meet a minimum "Residential Rating." All components of the test assembly should be divulged to determine that the product in question is able to achieve the performance rating desired, for the given installation design and the same or similar materials should be used for the sound testing. In particular the size, thickness, and type of tile, mortar and grout should be consistent.

**ANSI A 118.13** New Standard for Bonded Sound Reduction Membranes for Thin-set Ceramic Tile and Dimension Stone.  
For details see page 25

#### Concrete Slab Subfloors

Concrete slabs come in a variety of thicknesses and compositions (e.g., hollow core, post-tensioned, prestressed). The most commonly cited are 150 mm and 200 mm concrete slabs with or without a suspended ceiling assembly. Test results for these two thicknesses vary when comparing field tests versus laboratory tests. The field tests result in a much higher range of values than those conducted in the labs.

If a suspended ceiling assembly is not possible, the most effective method to establish an improved IIC rating is to install a "floating" floor system. This can be done by utilizing a layer of some type of acoustically rated resilient material, followed by a layer of lightweight concrete, mortar bed, or gypsum concrete (typically 19 mm or more, depending on material), onto which the tile or stone is installed.

#### Wood Joist Floors

For aesthetics and design purposes, wood frame construction will normally have a gypsum wallboard ceiling assembly. To achieve a solid base of sound control, the use of resilient metal channels supporting the gypsum wallboard and sound-absorbing insulating batts in the cavity is recommended. An assembly of this nature with a single layer subfloor has an approximate IIC rating of 45. Adhering a tile or stone surface will actually lower the IIC to around 40. The reason for this is that the hard surface increases noise levels at the higher frequencies, thereby reducing the overall IIC rating. If the sub-floor thickness is doubled and the ceiling wallboard panels are doubled as well, the net effect will increase the STC rating, as well as the IIC rating.

#### Key Points to Remember

- It is not good practice to select materials or systems based solely on field tests. Lab tests are a more accurate model for predicting performance in a range of different construction types, field tests are accurate only for the site where the test was performed.
- If field tests are being conducted, require both before and after installation testing.
- Testing labs should be NVLAP certified and meet the criteria established in ASTM guidelines E548, E597 and in ASTM Standard E717.
- Sound abatement materials are often quite resilient, so a Robinson Floor Test (ASTM C627) is strongly recommended and is required by the new standard ANSI A 118.13. This test can be conducted by the TTMAC.
- The size, thickness and type of tile as well as the type of mortar and grout used in the Robinson Floor Test should be the same as that shown for the sound control rating desired.
- If a suspended sound rated ceiling is not being used, then a relatively thick assembly on top of the slab may be required (e.g. full mortar bed) to achieve a 50 IIC.
- See page 91 for Sound Control Systems on Interior Floors.

\*Portions of the preceding information reprinted with the permission of the MMSA and the TCNA.

## TESTING AND STANDARDS

Since the CAN/CGSB 75.1-M88 was withdrawn, the Terrazzo Tile and Marble Association has decided to adopt the ISO 10545 standards complimented by ASTM standards for missing topics. The ISO 10545 is written for ceramic tile only and not stone tile. The TTMAC Manual covers both so stone tile will be using the ASTM standards.

The test standards may be very useful for evaluating the performance of a particular type of tile, ceramic or stone. It is important to note the specific test number that has been used in order to confirm that results are comparable. The standardization of the testing methods is also critical to ensure comparability. It is that all tests are performed professionally, by independent laboratories to ensure useable results. Home-made tests lack controls and accurate measuring and are therefore discouraged.

ISO Canada has been a "P" participating country with the International Standards Organization for over 12 years now under TC (Technical Committee) 189. The TTMAC put together a committee of experts which report directly to the Standards Council of Canada the liaison to ISO. As a participating member, the member country eventual goal is to adopt the ISO standard as it's own standard, withdrawing the domestic equivalent. In the revision of this manual, the TTMAC Specifications Committee decided to identify the equivalent standards between ANSI and ISO so as to get the reader and the industry to get familiar to the ISO standards.

## ISO 13007 series tests

Under ANSI standards, a product must meet a minimum material standard to be included in a category such as ANSI A 118.4. With ISO 13007 standards, the products meet the standard for “normal” and can optionally be tested further for “improved” performance for a variety of identified product characteristics. When used in combination with the ANSI standards, the ISO 13007 standards make it easier for specifying the right mortar and grout for the right application, benefiting both the architect and the installer.

The ISO 13007 standards are bringing simplicity and specificity to the architect’s task of specifying the most appropriate product for each tile or stone installation. The standards express product classifications alphanumerically, using simple letters and numbers. Letters describe the chemical nature of the adhesive (such as cementbased, mastic, epoxy or urethane) along with special characteristics (such as fast-setting, slip-resistant or deformable). Numbers indicate whether the product performance is “normal” (such as normal bond strength, for light to medium traffic use) or “improved” (such as higher bond strength, for high traffic use).

	Adhesives				Grouts		
	TYPES	CLASSES	SPECIAL CHARACTERISTICS		TYPES	CLASSES	SPECIAL CHARACTERISTICS
	C = Cementitious (Thin-set mortars)	1 = Normal 2 = Improved	F = Fast-setting T = Slip-resistant E = Extended open time S1 = Deformable S2 = Highly deformable P1 = Plywood adhesion P2 = Improved plywood adhesion		CG = Cementitious grouts	1 = Normal 2 = Improved	F = Fast-setting A = High abrasion resistance W = Reduced water absorption
	D = Dispersion (Mastics)	1 = Normal 2 = Improved	A = Accelerated drying T = Slip-resistant E = Extended open time		RG = Reaction resin grouts	—	Higher performance characteristics than improved cementitious grouts
	R = Reaction resin (Epoxies & Urethanes)	1 = Normal 2 = Improved	T = Slip-resistant				

## ISO 10545 series tests

ISO 13006 is the International Standards Organization’s manual for ceramic tile excluding mosaics. The standard categorizes a tile by its forming method, either pressed or extruded, plus its water absorption. There is a further subcategory for extruded tiles as to whether they are natural or precision. The results are 12 categories and each is assigned a chart which will define acceptable tolerances for the tile.

The ISO tests are:

ISO 10545-1 Sampling	ISO 10545-9 Thermal Shock
ISO 10545-2 Dimensions and Surface Quality	ISO 10545-10 Moisture Expansion
ISO 10545-3 Water Absorption	ISO 10545-11 Crazeing (glazed)
ISO 10545-4 Modulus of Rupture and Breaking Strength	ISO 10545-12 Frost Resistance
ISO 10545-5 Impact Resistance	ISO 10545-13 Chemical resistance
ISO 10545-6 Resistance to Deep Abrasion	ISO 10545-14 Stain Resistance
ISO 10545-7 Resistance to Surface Abrasion	ISO 10545-15 Lead and Cadmium release from glaze
ISO 10545-8 Thermal Expansion	ISO 10545-16 Small Colour Differences

## ASTM

### ROBINSON FLOOR ASSEMBLY TEST

Various end use applications are listed in the following table together with recommended tile and installation methods. Results are based on ASTM C627-99 “Standard Method for Evaluating Ceramic Floor Tile Installation Systems”, using the Universal Floor Tester (Robinson-Type Floor Tester). All systems are material dependant. Performance system ratings should not exceed the weakest component. Consult each material manufacturer to determine individual product suitable rating. Other construction may be used, based upon a history of successful use under similar conditions.

This table should be viewed as a general guide to durability under the listed service conditions, but the specifier should determine the suitability of products and installation methods for a particular application. Factors that should be considered include thickness of tile, breaking strength (ASTM C648-96), abrasion resistance, coefficient of friction/slip resistance, size and the degree of contact that will be achieved when setting the tile.

APPLICATIONS	ASSEMBLY COMPONENTS & METHODS
<b>EXTRA HEAVY</b> (Passes ASTM C627-99 cycles 1 through 14) Extra Heavy and high impact use in shipping and receiving, food plants, dairies, breweries and commercial kitchens.	Concrete substrate only. Tile – 12+ mm quarry tile, 7 mm+ porcelain tile or packing house tile. Installation 309F-2012-2014, 310F-2012-2014 Wood – non
<b>HEAVY</b> (Passes ASTM C627-99 cycles 1 through 12) Latex modification recommended Shopping malls, stores, airport terminals, work areas, laboratories, auto showrooms and service areas.	Concrete Substrate. Tile–10 mm+ quarry tile, 7 mm+ porcelain tile, 13 mm+ terrazzo tile, 10 mm+ natural stone, 10 mm+ agglomerated, marble or granite. Installation – 325ED2012-2014 (A,E) Wood Substrate – 313F2012-2014(A) (100% solids epoxy mortar)
<b>MODERATE</b> (Passes ASTM C627-99 cycles 1 through 10) Normal commercial and light institutional use in public space of restaurants and hospitals (etc).	Concrete Substrate Tile – ceramic mosaic or heavier Installation – See above
<b>LIGHT</b> (Passes ASTM C627-99 cycle 1 through 6) Light commercial use in office space, reception areas, kitchens, bathrooms	Concrete Substrate Tile – ceramic, mosaic or heavier Installation – 314F-2012-2014, 325ED-2012-2014 (A,E) and latex Portland cement mortar bond coat over waterproof membrane. Wood – 325ED-2012-2014 (B,C,D)
<b>RESIDENTIAL</b> (Passes ASTM C627-99 cycles 1 through 3) Kitchens, bathrooms, foyers	Concrete Substrate Tile – ceramic, mosaic or heavier Installation – See Above Wood – See Above

This is a progressive test. For example, any assembly passing the “extra heavy” application will automatically pass all other categories of lesser requirements such as heavy, moderate, light and residential.

#### TTMAC UNIVERSAL FLOOR TESTER



The Universal Floor Tester is a unique machine. This machine is a redesign of the Robinson Type Floor Tester and is capable of carrying out the test for an ASTM C-627 designation. The ASTM test is designed to verify the suitability of a flooring system for a particular type of installation. The test method consists of preparing installation slabs that duplicate the type of installation under consideration, subjecting them to one or more tests, and evaluating the results in a prescribed manner. This test method provides a standardized procedure for evaluating performance of floor tile installations under conditions similar to actual specific usages.

A method to test long-span joists, underlayment, bonding material, tile, and grout was required. There was also a need to test a concrete understructure/base. In order to test crack isolation membranes and the result of concrete cracking, it was necessary to design a split slab method. The Universal Type Floor Tester was designed to meet all of these requirements. This tester can slowly open and split the slab or it can be set for fast acceleration.

The new design allows for suspended floors to be assembled and tested at almost any given length and construction height up to 1,015 mm. Engineered wood assemblies with spans up to 4,573 mm or even longer can now be tested, and valuable data such as curvature of the span, deflection, twisting, and vibrations can all be monitored. Post-tension and pre-stressed slabs will be able to be tested fully suspended under the carriage of the tester.

The split slab mechanism capability of the tester is specific to this tester and is not known to be duplicated by any other testing apparatus currently available.

Revenue gained by our Association will allow us to increase expenditures on Research and Development and provide the ability to produce accurate specification guides.

## SLIP RESISTANCE

### Coefficient of friction - slip resistance (COF)

ANSI A137.1 defines slip resistant tiles as having greater slip resistance characteristics due to an abrasive admixture, abrasive particles in the surfaces, grooves or patterns in the surface, or a glaze specifically designed for increased coefficient of friction. The designer, architect or specifier should make themselves familiar with the requirements referenced in this standard by purchasing it or speaking to a knowledgeable product representative before making any product selections where slip resistance is a concern.

The Static Coefficient of Friction (COF) is a measurement of the amount of force required to move an object across a tile surface using a device that is manually pulled across a tile face using the ASTM C1028 test method referenced in the outdated CAN/CGSB 75.1-M88 Tile, Ceramic standard. The ASTM test standard is no longer supported by North American flooring associations since it does not provide consistent results, and is being replaced by the Dynamic Coefficient of Friction (DCOF) test referenced in ANSI A137.1-2008 (Section 6.2) that uses a factory calibrated and validated, portable testing apparatus called the BOT-3000 Digital Tribometer.

The difference between the new DCOF is that it measures how much force is required to keep an object in motion (it measures slide force) where the Static COF (SCOF) measures how much force is required to get an object in motion (it measures slip force). SCOF is a good indicator to help determine the “grab” of a surface as it is stepped on, whereas DCOF is a better indicator of the potential for a small slip to progress into a more dangerous slide event. The SCOF test was also subject to a phenomenon called “stiction”. Just as two wet pieces of glass stick together, the smooth neolite sensor used in the ASTM C1028 test would stick to very smooth tiles when wet and cause a higher measurement than was evidenced by actual installed usage.

The new automated digital measurement device eliminates any unintentional operator bias from the old manual test, which resulted in the tile industry adopting a COF 0.60 as a comfort zone that neither ASTM nor ANSI endorsed. The BOT 3000 testing device provides more reliable information, and as a result a DCOF of 0.42 measured in a clean and level environment is accepted as the base line measurement for slip resistance; with the provision that when tile is intended to be installed in wet environments, that the tile is measured wet and provides a DCOF of 0.42. The designer, architect or specifier should confirm which test method was used to determine an advertised COF before selecting a product.

The DCOF measurement is prevalent in Europe, meaning that it will be easier to assess product performance against tests like the DIN 51130, Testing of Floor Coverings-Determination of Anti-Slip Properties (colloquially called the “German Ramp Method”). The DIN 51130 classifications assess a tile’s suitability in a given application, and is measured on a baseline DCOF of 0.45 for wet surfaces and provides an additional classification based on increased slope (ramp) to represent potential hazard as follows:

Table 3 – Assignment of the corrected mean of the total acceptance angle to slip resistance classification

Corrected mean of the total acceptance angle	Classification of slip resistance
6° to 10°	R 9
more than 10° to 19°	R10
more than 19° to 27°	R11
more than 27° to 35°	R12
more than 35°	R13

Slip Hazard Classification	Examples of work rooms and work areas
R9	Entry foyers of hotels, offices and public buildings (dry); shopping centres (not food areas); hospitals; supermarket aisles; lift lobbies; interior stairs; canteens; shops; packing areas; operating theatres and other dry health service areas; school areas excluding kitchens, toilets, machine and handicraft areas.
R10	External colonnades, walkways and pedestrian crossings; entry foyers of hotels, offices and public buildings (wet); shopping centre food courts; fast food outlets; shop/supermarket fresh fruit and vegetable areas; toilet facilities; undercover areas in sports stadia; storage areas (food preparation); coffee & tea preparation kitchens; sales areas for unpackaged bakery and cheese product areas; health service areas not covered under R9; garages, car parks; school areas not covered under R9.
R11	External stairs and stair nosings; aircraft hangars; vehicle repair workshop bays (pits are R12); wet or dry production areas not involving oils and fats; laundries; serving counters for unpackaged meat and vegetables; florists; catering establishments, including washing-up areas; wet sterilizing rooms; beverage bottling plants; chocolate and confectionary plants (excluding sugar and cocoa production areas).
R12	Production areas involving margarine, cooking oils, milk, butter, cocoa, sugar; meat processing areas (see also R13); vegetable processing; large catering areas; sales areas involving deep-fry and grill equipment; waste-water treatment rooms; fire stations; pickling, cleaning, hardening, galvanizing metal-working areas.
R13	Tanneries; vegetable processing and tinning areas; fish processing and delicatessen production facilities; abattoirs and meat processing areas; cooking oil and fat processing areas.

## STONE STANDARDS

The ASTM also offers Material Specifications for the stones that help to categorize the stone for suitability. These specifications offer the performance levels that are required for each type of stone.

Tests are performed to present a picture of how a product may be expected to perform. In the case of natural stones, testing is an example of performance but not a given. For larger projects, testing should be requested from the actual production of stone.

ASTM C615 Granite  
 ASTM C568 Limestone  
 ASTM C503 Marble  
 ASTM C629 Slate  
 ASTM C616 Quartz-based  
 ASTM C629, Slate  
 ASTM C1526 Serpentine  
 ASTM C1527 Travertine

Note: Abrasion Resistance is measured by ASTM C241 where a result of 10 minimum is suitable for use as flooring. The former Canadian Standard listed 12 as a minimum for commercial flooring.

## TESTING AFTER INSTALLION & SITE TESTING

When a problem occurs in an installation, there are methods of testing the application to determine the cause. It is important to use proper testing and professionals, as installation problems tend to be complicated and may involve more than one issue. The evaluation of the test is often more important than the test itself, therefore consultants are recommended.

**Pull Tests** can be done on site to assist in determining where a bonding failure is occurring. It involves a 75 mm – 150 mm core being drilled through the tile and thin-set and down into the substrate. The core is then pulled to determine where the failure occurred. ISO 13007 will provide testing criteria providing the installation is reasonable cured (minimum 28 days), longer for larger format or impervious tiles.

**Chain Drag, steel rod, steel ball bearing** can be used to identify hollow areas, although the test cannot determine whether hollow spots occur under the tile, under the thin-set or under the substrate. Core tests may be used to further identify the problem.

**Coefficient of Friction** tests can be done on site but are dependent on maintenance, as a single cleaning may not remove residue off the tile prior to running the test. “ The Bot 3000 is a portable machine that can be used for on-site testing however this method is not covered by ANSI 137.1 (which tests clean and uninstalled tiles)and caution must be exercised when interpreting the results as the slip resistance of installed tiles are affected by other things such as wear, maintenance and spills.

**Individual tile removal** can be used to identify problems, however, should be left to the professional tile contractor as interpretation is difficult.

**Site Inspections** by qualified tile inspectors are a good start to solving problem installations. Qualified professionals can see problems, often without the use of testing equipment and can recommend remedial work at the same time. The TTMAC offers a fully qualified inspection service, across the country.

**Forensic Testing** may involve chemical analysis to determine what the tile has been exposed to. It might also involve some investigation to determine what might have caused the damage. The TTMAC offers a fully qualified inspection service, across the country.

**Moisture Vapor Emission Rate** of concrete is used to determine the amount of moisture in the concrete slab and is useful in determining whether the concrete is ready to receive moisture sensitive products such as epoxy, some modified thin-sets, gypsum concrete screeds and limestone, i.e. Calcium Chloride Test.

**Test for Concrete Sealers** is a water droplet test performed in various locations that determines whether the moisture is absorbed into the concrete fast enough to indicate that the concrete is unsealed. Core tests can also be used to submit samples to a lab for inspection under a microscope.

# MOVEMENT JOINTS FOR TILE INSTALLATIONS

## 301MJ-2012-2014

Expansion and control joints are required in both floors and walls. Expansion joints must extend through both the tile and the substrate on which the tile is applied and are designed to accommodate continuing movement in the structure throughout the life of the building caused by expansion and/or contraction due to thermal or other effects. The installation of control joints in the openings left by the tile contractor are covered in the "Caulking and Sealants" section of the specification.

Control joints are:

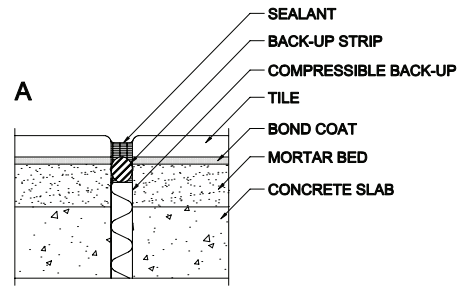
- A joint cut or tooled into the concrete surface to control the location of cracks. A control joint in the tile to be located above the control joint in the substrate or above any construction cold joints. Saw cuts to be applied within the first twelve hours of concrete placement.
- A joint in the ceramic tile, extending through the setting materials which is intended to minimize stresses in the bond layer due to differential movement of ceramic tile relative to the substrate, caused by thermal expansion and contraction.
- Saw cuts to penetrate a minimum of 1/3 of the thickness of the slab. Saw cutting of the slab is not the responsibility of the tile contractor. These joints should be applied to the concrete within the first 12 hours after being poured.

Control joints to be provided around the perimeter of floors, around columns, where tile abuts other hard materials, at the junction between horizontal and vertical surfaces and at transitions that include corridors and changes in direction, for example T's, L's and diagonals.

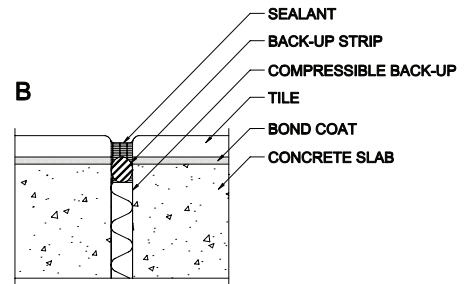
The location and type of expansion joints and control joints is the responsibility of the consultant. Exterior expansion or control joints to be caulked with suitable sealants. For interior expansion or control joints, prefabricated expansion joints or double metal or plastic terrazzo strips may be used with a suitable sealant. For narrower joints 6 mm or less a caulked joint with the appropriate sealant that is floor rated may be used. Some prefabricated expansion joints may be recommended by the manufacturer for exterior use.

Cold Joint – Cold joints are formed primarily between slab pours. A control joint to be installed over all cold joints in the slab. Where conditions do not allow one to install a control joint, the use of a crack isolation membrane may be considered, along with a control joint in the tile surface as close as possible to the cold joint in the substrate.

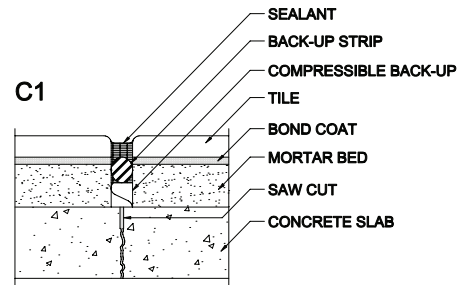
### EXPANSION JOINT



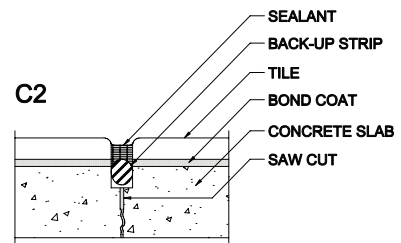
### EXPANSION JOINT



### CONTROL JOINT



### CONTROL JOINT



Continued

**Construction Joint** – The plane where two successive placements of concrete meet but do not bond cementitiously. Sometimes dowels or reinforcing steel are used to hold the concrete on both sides together. A control joint to be placed over this joint in the tile.

**Isolation Joint** – A separation between adjoining similar or dissimilar elements of a concrete structure, usually a vertical plane. Its purpose is to prevent movements of the individual parts from causing cracks in the concrete. Also, sometimes called an expansion joint.

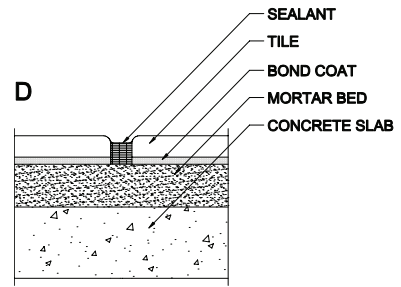
**Structural Joint** – An isolation joint intended to allow independent movement between adjoining sections of the building.

Recommended spacing and sizes for expansion joints and control joints are as follows:

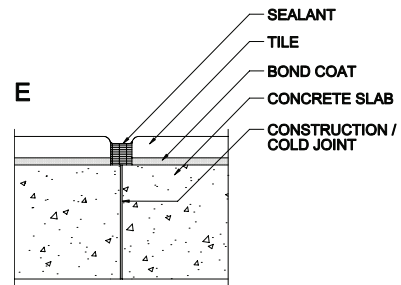
☀ **Interior tile** - control joints 4800 mm to 6100 mm in each direction - minimum 6 mm width. Areas exposed to moisture or direct sunlight - 2400 mm to 3700 mm in each direction - minimum 6 mm width. Above-grade concrete slab substrates - 2400 mm to 3700 mm in each direction - minimum 6 mm wide.

**Exterior tile** - Due to high temperature fluctuations, use minimum 10 mm wide control joints from 2440 mm to 3600 mm in each direction. In areas of extreme temperature variations (over 40°C) between summer highs and winter lows joint width shall be a minimum 13 mm. The consultant shall specify the required joint width and required distance between joints.

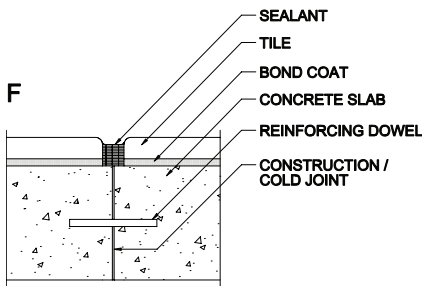
**CONTROL JOINT**



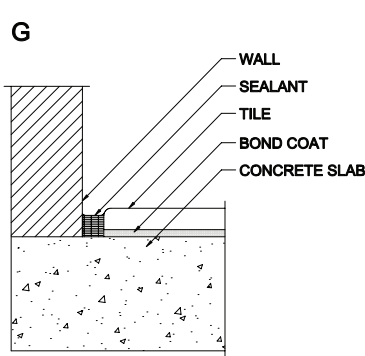
**CONSTRUCTION JOINT**



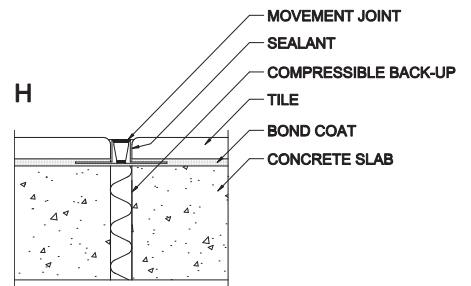
**CONSTRUCTION JOINT**



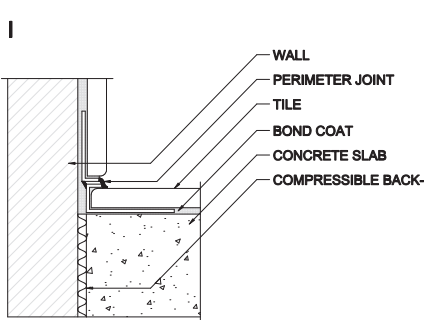
**PERIMETER JOINT**



☀ **PREFABRICATED MOVEMENT JOINT**



**PREFABRICATED PERIMETER JOINT**



# TILE INSTALLED ON CEMENT MORTAR OVER MASONRY OR CONCRETE WALLS

## 302W-2012-2014 INTERIOR/EXTERIOR

### SUITABLE SUBSTRATES

- Concrete or masonry.

### MATERIALS

- **TILE – Interior and dry areas:** All tile types as recommended by the manufacturer. **Exterior:** Frost resistant materials only.
- **SCRATCH COAT** (7 mm minimum) See Tile Guide Specification Section Mixes 2.5.1
- **MORTAR BED** (20 mm+) See Tile Guide Specification Section Mixes 2.5.3
- **BOND COAT – Interior:** Latex-Portland cement mortar (minimum acceptable standard ANSI A 118.4 or ISO C2) epoxy mortar (minimum acceptable standard ANSI 118.3 or ISO R1), dry-set mortar (minimum acceptable standard ANSI 118.1 or ISO C1), organic adhesives (minimum acceptable standard ANSI A136.1 or ISO D1). **Exterior:** Single or two component liquid latex-Portland cement mortar (minimum specification required ANSI A 118.4 or ISO C2S1).
- **GROUT**

### APPLICATION

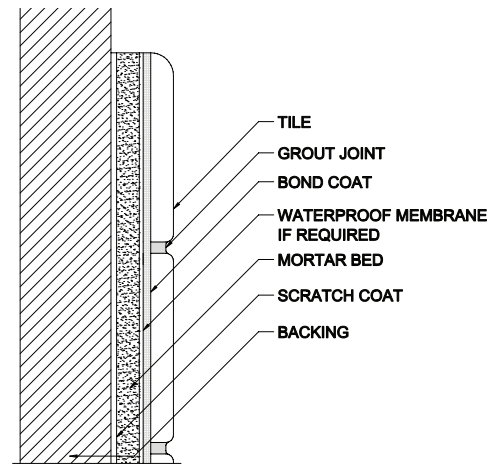
- Apply scratch coat and allow to cure a minimum of 24 hours at 20°C. Apply mortar bed to required thickness in an even plane. Finished tolerance of mortar bed not to exceed 6 mm in 3000 mm or 2 mm in 300 mm. For large format tile where one edge is 380 mm or larger, surface variation should not exceed 3 mm in 3000 mm. Allow up to 72 hours to cure. Apply bond coat to mortar bed surface. Slide tile firmly into position. Use sufficient bond coat to ensure minimum 95% contact on exterior surfaces and wet areas and minimum 80% on interior dry surfaces. Force grout into full depth of joint, remove excess grout and clean.

### LIMITATIONS

- Manufacturer's recommendations to be followed. Exterior tile installations not to be attempted with a temperature of less than 12°C. Do not use paper-back mounted tile. Mesh-back mounted tile for exterior use or in locations of extreme moisture should not be used unless the manufacturer guarantees that the material is suitable for this type of installation.

### OTHER CONSIDERATIONS

- Tile used on exterior applications to be frost resistant.
- Refer to Notes For the Professional and 301MJ-2012-2014.
- Waterproof membrane if required must be specified. (ANSI A 118.10) Follow manufacturer's recommendations.
- Latex Portland cement mortars may require 14 – 60 days cure before exposure to water. Verify with the manufacturer the correct cure time required. Alternatively, to reduce the curing time required, a rapid set mortar may be more suitable.



# TILE INSTALLED OVER MASONRY OR CONCRETE WALLS - THIN-SET METHOD

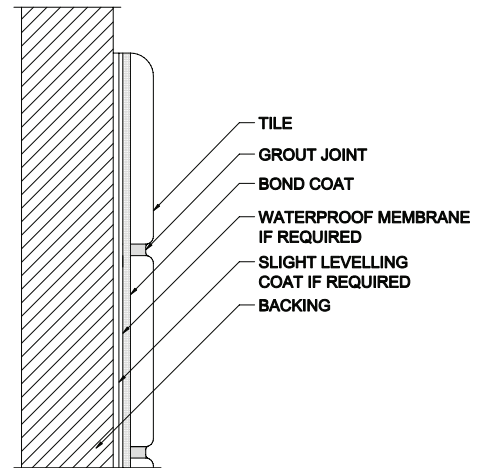
## 303W-2012-2014 INTERIOR/EXTERIOR

### SUITABLE SUBSTRATES

- Concrete or masonry.

### MATERIALS

- TILE – **Interior and dry areas:** All tile types as recommended by the manufacturer. **Exterior:** Frost resistant materials only.
- SLIGHT LEVELLING COAT, if required. – **Interior:** Latex-Portland cement mortar (minimum acceptable standard ANSI A 118.4 or ISO C2) or dry-set mortar (minimum acceptable standard ANSI 118.1 or ISO C1). **Exterior:** Latex-Portland cement mortar.
- BOND COAT – **Interior:** Latex-Portland cement mortar or dry-set mortar. **Exterior:** Single or two component liquid latex-Portland Cement mortar (minimum acceptable standard ANSI A 118.4 or ISO C2S1)
- GROUT – **Interior:** Commercial Portland cement, Latex-Portland cement grout (minimum acceptable standard ANSI 118.6 or ISO CG1), epoxy (minimum acceptable standard ANSI A 118.3 or ISO RG). **Exterior:** Latex-Portland cement grout (minimum acceptable standard ANSI 118.6 or ISO CG1).



### APPLICATION

- Surface variation not to exceed 6 mm in 3000 mm or 2 mm in 300 mm. For large format tile where one edge is 380 mm or larger, surface variation should not exceed 3 mm in 3000 mm. Apply levelling coat if required. Apply thin-set bond coat according to manufacturer's instructions. Use proper notched trowel to ensure adequate bond. Slide tile firmly into position. Use sufficient bond coat to ensure minimum 95% contact on exterior surfaces and wet areas and minimum 80% on interior dry surfaces. Force grout into full depth of joint, remove excess grout and clean.

### LIMITATIONS

- Manufacturer's recommendations to be followed. Exterior tile installations not to be attempted when temperature is less than 12°C. Do not use paper-back mounted tile. Mesh-back mounted tile for exterior use or in locations of extreme moisture should not be used unless the manufacturer guarantees that the material is suitable for this type of installation.

### OTHER CONSIDERATIONS

- Tile used on exterior applications to be frost resistant.
- Refer to Notes For The Professional and 301MJ-2012-2014.
- Waterproof membrane if required must be specified. (ANSI A 118.10). Follow manufacturer's recommendations.
- Latex Portland cement mortars may require 14 – 60 days cure before exposure to water. Verify with the manufacturer the correct cure time required. Alternatively, to reduce the curing time required, a rapid set mortar may be more suitable.

# TILE INSTALLED OVER GYPSUM BOARD - THIN-SET METHOD

## 304W-2012-2014

DRY AREAS ONLY

SUITABLE SUBSTRATES

- Gypsum board
- Wood or metal strapping, or studs. Maximum 406 mm o.c.

MATERIALS

- TILE
- TAPE – 51 mm drywall tape
- BOND COAT – Latex-Portland cement mortar or organic adhesive Type I or Type II (minimum acceptable standard ANSI A136.1 or ISO D1).
- GROUT – Epoxy grout (minimum acceptable standard ANSI 118.3 or ISO RG) or latex-Portland cement grout (minimum acceptable standard ANSI 118.6 or ISO CG1).

APPLICATION

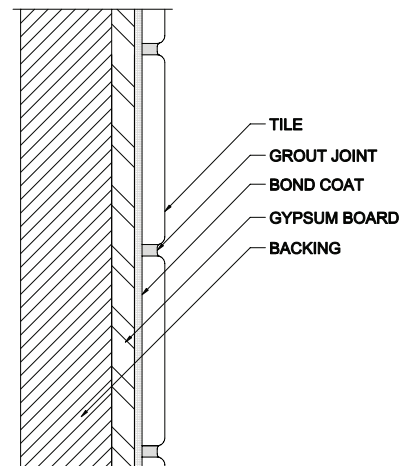
- Gypsum board (13 mm minimum) to be stable, plumb, square and screwed to studs. All joints to be taped and sanded, if necessary. Apply bond coat and install tile while bond coat is wet and tacky. Slide tile into position. Use sufficient bond coat to ensure minimum 80% contact. Force grout into full depth of joint. Remove excess grout and clean.

LIMITATIONS

- Organic adhesives are not recommended for use in areas exposed to temperatures above 60°C. Type of organic adhesives to be recommended by the manufacturer.
- Organic adhesives – Manufacturer's recommendations must be followed for use and suitability with non-absorbent tile.

OTHER CONSIDERATIONS

- Heavy lug tiles are not recommended, but if used, to be set only with latex cement mortars.
- Special care to be taken when installing tile thicker than 13 mm to prevent slippage or debonding.
- Refer to Notes For The Professional and 301MJ-2012-2014.
- This system not to be used in wet or exterior areas such as showers, bath surrounds, steam rooms or exterior installations.



# TILE INSTALLED ON CEMENTITIOUS BACKER UNIT (CBU) – THIN-SET METHOD/WALLS

## 305W-2012-2014

### DETAIL A - INTERIOR WET/DRY AREAS AND EXTERIOR USE

#### SUITABLE SUBSTRATES

- Wood studs for interior use only or metal studs maximum 406 mm o.c.

#### MATERIALS

- VAPOUR RETARDER – 6 mils polyethylene film – Required in exterior and wet areas
- CEMENTITIOUS BACKER UNIT (CBU) – minimum 13 mm thick meeting ANSI A 118.9 or nominal 11 mm thick fibre-cement backer board meeting ASTM C1288.
- TILE – **Interior:** Usually non-vitreous glazed wall tile, but suitable for other types of ceramic tile and mosaic. Consult with manufacturer. **Exterior:** Use frost resistant materials only.
- TAPE – 51 mm fibre-mesh
- SLIGHT LEVELLING COAT – if required.
- BOND COAT – **Interior:** Latex-Portland cement mortar (minimum acceptable standard ANSI A 118.4 or ISO C2) or dry-set mortar (minimum acceptable standard ANSI 118.1 or ISO C1). **Exterior:** Single or two component liquid latex-Portland cement mortar (minimum acceptable standard ANSI A 118.4 of ISO C2S1).
- GROUT – Single or two component – **Interior:** Commercial Portland cement, Latex-Portland (minimum specification required ANSI 118.6 or ISO CG1), epoxy. **Exterior:** Latex-Portland cement grout (minimum acceptable standard ANSI 118.6 or ISO CG1).

#### APPLICATION

- Cementitious backer unit (CBU) must be stable, plumb, square and screwed to studs with corrosion resistant fasteners. Surface variation in the backing not to exceed 6 mm in 3000 mm or 2 mm in 300 mm. For large format tile where one edge is 380 mm or larger, surface variation should not exceed 3 mm in 3000 mm. Apply levelling coat if required. All joints must be taped with 51 mm fibre-mesh tape, fill with a dry-set or latex mortar and sand, and sanded if required to be smooth. Apply thin-set bond coat to cement board surface using proper notched trowel to ensure adequate bond. Slide tile firmly into position while bond coat is wet and tacky. Use sufficient bond coat to ensure minimum 95% contact on exterior surfaces and wet areas and a minimum 80% on interior dry surfaces. Force grout into full depth of joint, remove excess grout and clean.

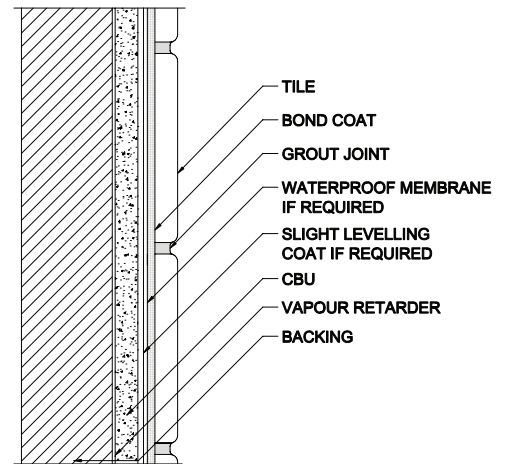
#### LIMITATIONS

- Manufacturer's recommendations must be followed. Exterior tile installations should not be attempted when temperature is less than 12°C. Do not use paperback or mesh-back mounted tile for exterior use or in locations of extreme moisture unless the manufacturer guarantees that the material is suitable for this type of installation.
- All requirements for exterior applications must be met.

#### OTHER CONSIDERATIONS

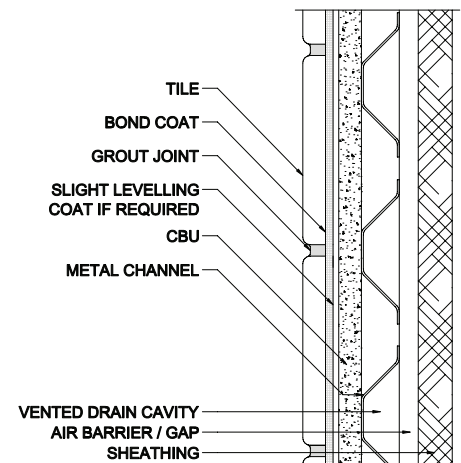
- Spacing and minimum gauge of steel studs as per instructions of manufacturer of cementitious backer unit (CBU). On exterior installation, drill approximately 6 mm weep holes in grout joints at the bottom of the wall to prevent spalling of cementitious backer unit (CBU) due to freeze-thaw action or follow manufacturers recommendations.
- Waterproof membrane if required must be specified. (ANSI A 118.10) Follow manufacturer's recommendations.
- Special care must be taken when installing tile thicker than 13 mm to prevent slippage or debonding.
- Tile used on exterior applications must be frost resistant.
- Refer to Notes For The Professional and 301MJ-2012-2014.
- For high use showers (hotels, gang showers, sports facilities, etc.) a waterproof membrane must be used. Refer to detail 319SR-2012-2014.
- Insulation and vapour retarder location to be specified by consultant.
- Refer to local codes and bylaws with respect to vented drain cavity for exterior applications.
- All openings and cuts must be treated to ensure waterproof integrity.
- Latex Portland cement mortars may require 14 – 60 days cure before exposure to water. Verify with the manufacturer the correct cure time required. Alternatively, to reduce the curing time required, a rapid set mortar may be more suitable.
- Sheathing and backing to be designed and detailed by the consultant.

A



Please refer to page 8.

**EXTERIOR**



# TILE INSTALLED ON COATED GLASS MAT BACKER BOARD 305W-2012-2014

## DETAIL B - INTERIOR WET/DRY AREAS

### SUITABLE SUBSTRATES

- Wood or metal studs, maximum 406 mm o.c.

### MATERIALS

- Coated glass mat backer board – minimum 13 mm thick. (ASTM C1178)
- TILE
- TAPE – 51 mm fibre-mesh
- BOND COAT – Latex-Portland cement grout (minimum acceptable standard ANSI 118.6 or ISO CG1) Type 1 organic adhesive (for porosity only) (minimum acceptable standard ANSI A136.1 or ISO D1)
- GROUT – Latex-Portland cement grout (minimum acceptable standard ANSI A 118.6 or ISO CG1), epoxy grout (minimum acceptable standard ANSI A 118.3 or ISO RG)

### APPLICATION

- Attach coated glass mat backer board to studs with corrosion resistant fasteners and shall be spaced 150 mm o.c. with coated grey side away from the studs. Drive fasteners flush with coated surface. Do not countersink. Surface variation in the backing not to exceed 6 mm in 3000 mm or 2 mm in 300 mm and can be applied either parallel or perpendicular to framing. For large format tile where one edge is 380 mm or larger, surface variation should not exceed 3 mm in 3000 mm. Apply levelling coat if required. All joints must be taped with 51 mm fibre-mesh tape, fill with a dry-set or latex mortar. Do not sand coated glass mat backer board unless a waterproof membrane is used after sanding. Apply thin-set bond coat to coated glass mat backer board using proper notched trowel to ensure adequate bond. Use sufficient bond coat to ensure 95% contact in wet areas and 80% contact on interior dry surfaces. Slide tile firmly into position while bond coat is wet and tacky. Force grout into full depth of tile joint. Remove excess grout and clean.

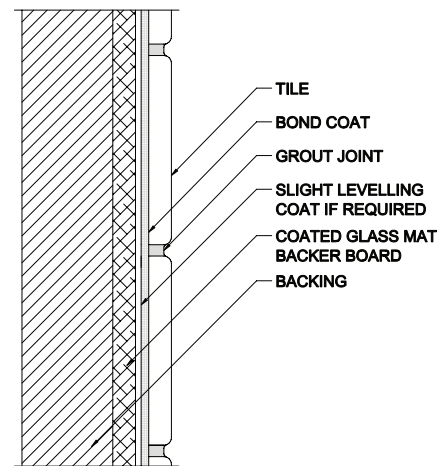
### LIMITATIONS

- Follow manufacturer's recommendations. Coated glass mat backer board not to be used where prolonged exposure to heat exceeds 52°C and not to be used for exterior use unless recommended by the manufacturer. It is not recommended for use with passive solar heat systems. Maximum tile size is 356 mm x 356 mm x 10 mm thick. Do not apply directly over concrete or masonry block.
- Do not use paper back or mesh back mounted tile in wet areas unless the manufacturer guarantees that the material is suitable for this type of installation.

### OTHER CONSIDERATIONS

- Movement joints, spacing and minimum gauge of steel studs as per manufacturer's instructions of coated glass mat backer board.
- Waterproof membrane if required must be specified. (ANSI A 118.10) Follow manufacturer's recommendations.
- All openings and cuts must be treated to ensure waterproof integrity.
- Tile used on exterior applications must be frost resistant.
- Refer to Notes For The Professional and 301MJ-2012-2014.
- A waterproof membrane or vapour retarder not to be used behind coated glass mat backer board.
- For high use showers (hotels, gang showers, sports facilities, etc.) a waterproof membrane shall be used on the side to receive tile. Refer to Detail 319SR-2012-2014.
- Do not apply coated glass mat backer board over a vapour barrier or waterproof membrane.
- Latex Portland cement mortars may require 14 – 60 days cure before exposure to water. Verify with the manufacturer the correct cure time required. Alternatively, to reduce the curing time required, a rapid set mortar may be more suitable.

## B



# TILE INSTALLED OVER CEMENTITIOUS BACKER UNIT (CBU) 306W-2012-2014

## DETAIL A - ON BATH TUB/WALLS - THIN-SET METHOD

### SUITABLE SUBSTRATES

- Wood or metal studs, maximum 406 mm o.c.

### MATERIALS

- VAPOUR RETARDER – 6 mils polyethylene film
- CEMENTITIOUS BACKER UNIT (CBU) – Minimum 13 mm thick (ANSI A 118.9) or nominal 11 mm thick fibre-cement backer board meeting ASTM C1288.
- TILE
- TAPE – 51 mm fibre-mesh
- BOND COAT – Latex-Portland cement mortar (minimum acceptable standard ANSI A 118.4 or ISO C2) or Type 1 organic adhesive when recommended by the manufacturer (minimum acceptable standard ANSI A136.1 or ISO D1).
- GROUT – Latex-Portland cement grout (minimum acceptable standard ANSI A 118.6 or ISO CG1) or epoxy grout (minimum acceptable standard ANSI A 118.3 or ISO RG).
- SEALANT – Silicone rubber or prefabricated movement joint (PMJ).

### APPLICATION

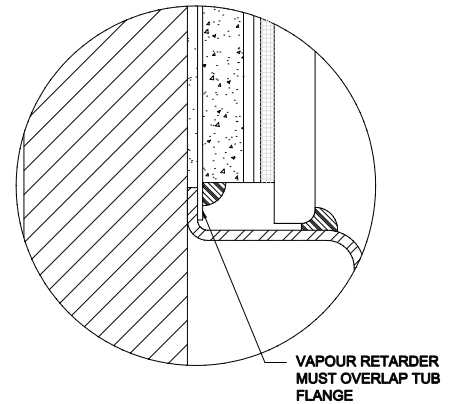
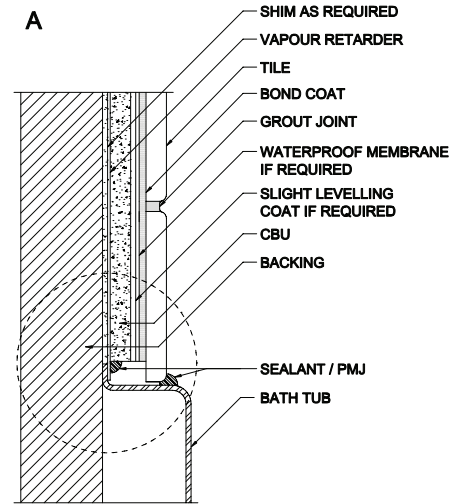
- Surface variation in the backing not to exceed 6 mm in 3000 mm or 2 mm in 300 mm. For large format tile where one edge is 380 mm or larger, surface variation should not exceed 3 mm in 3000 mm. Attach cementitious backer unit (CBU) to studs with corrosion resistant fasteners 150 mm o.c. Leave 3 mm space around perimeter of each board. Leave 6 mm space between bottom of tile and bath to allow for stud shrinkage and bath deflection during filling or emptying. All joints to be taped with 51 mm fibre-mesh tape. Fill with dry-set or latex mortar and sand if needed. Apply bond coat to cement board using proper notched trowel. Use sufficient bond coat to ensure a minimum of 95% contact in wet areas and minimum of 80% contact in dry areas. Slide tile firmly into position before bond coat skins over. Allow bond coat to cure before grouting. Force grout into full depth of joint, remove excess grout and clean.

### LIMITATIONS

- Manufacturer's recommendations to be followed. Exterior tile installations not to be attempted with a temperature of less than 12°C. Do not use paper-back mounted tile. Mesh-back mounted tile for exterior use or in locations of extreme moisture should not be used unless the manufacturer guarantees that the material is suitable for this type of installation.
- Manufacturer's recommendations must be followed.
- Do not use paper-back or mesh-back mounted tile for exterior use or in locations of extreme moisture unless the manufacturer guarantees that the material is suitable for this type of installation.

### OTHER CONSIDERATIONS

- This detail may be used with water-resistant gypsum board provided that a suitable waterproof membrane is installed over gypsum board prior to application. (ANSI A 118.10)
- Prefabricated movement joints (PMJ) may be used in place of sealant, where showing on drawings or where two planes meet.
- Refer to Notes For The Professional and 301MJ-2012-2014.
- Tile used on exterior applications must be frost resistant.
- Refer to Notes For The Professional and 301MJ-2012-2014.
- For high use showers (hotels, gang showers, sports facilities etc.) a waterproof membrane shall be used.
- All openings and cuts must be treated to ensure waterproof integrity.
- Waterproof membrane if required must be specified. (ANSI A 118.10) Follow manufacturer's recommendations.
- For defective substrates fill tub with water prior to applying caulking to tub sill.



Continued

# TILE INSTALLED OVER COATED GLASS MAT BACKER BOARD 306W-2012-2014

## DETAIL B - ON BATH TUB/WALLS – THIN-SET METHOD INTERIOR ONLY

### SUITABLE SUBSTRATES

- Wood or metal studs, maximum 406 mm o.c.

### MATERIALS

- Coated glass mat backer board – minimum 13 mm thick (ASTM C1178)
- TILE
- TAPE – 51 mm wide fibre-mesh tape
- BOND COAT – Latex-Portland cement mortar or Type 1 organic adhesive when recommended by manufacturer (minimum acceptable standard ANSI A136.1 or ISO D1).
- GROUT – Latex-Portland cement grout (minimum acceptable standard ANSI A 118.6 or ISO CG1) or epoxy grout (minimum acceptable standard ANSI A 118.3 or ISO RG).
- SEALANT – Silicone rubber or prefabricated movement joint (PMJ).

### APPLICATION

- Attach coated glass mat backer board to studs with rust resistant screws or nails. Fasteners shall be spaced 150 mm o.c. with coated grey side away from the studs. Leave 6 mm space between bottom of tile and bath to allow for stud shrinkage and bath deflection during filling and emptying. Drive fasteners flush with coated surface. Do not countersink. Surface variation in the backing not to exceed 6 mm in 3000 mm or 2 mm in 300 mm and can be applied either parallel or perpendicular to framing. For large format tile where one edge is 380 mm or larger, surface variation should not exceed 3 mm in 3000 mm. Apply levelling coat if required. Tape joints with 51 mm fibre-mesh tape, fill with a dry-set or latex mortar. Do not sand coated glass mat backer-board unless a waterproof membrane is used after sanding. Apply thin-set bond coat to coated glass mat backer board using proper notched trowel to ensure adequate bond. Use sufficient bond coat to ensure a minimum 95% contact in wet areas. Slide tile firmly into position while bond coat is wet and tacky. Force grout into full depth of tile joint. Remove excess grout and clean.

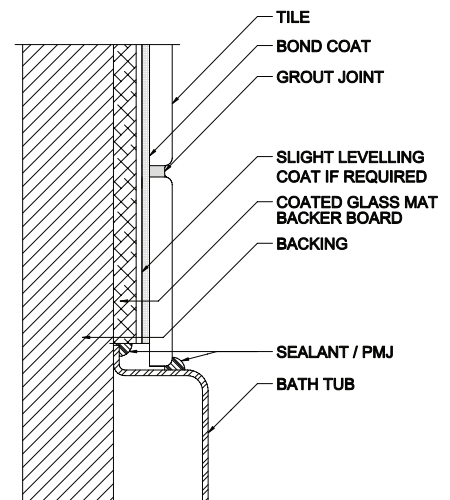
### LIMITATIONS

- Follow manufacturer's recommendations. Coated glass mat backer board should not be used where prolonged exposure heat exceeds 52°C. It is not recommended for use with passive solar heat systems. Maximum tile size is 356 mm x 356 mm x 10 mm. Do not apply directly over concrete or masonry block. Do not use paper-back or mesh-back mounted tile in locations of extreme moisture unless the manufacturer guarantees that the material is suitable for this type of installation. A waterproof membrane or vapour retarder not be used behind coated glass mat backer board.

### OTHER CONSIDERATIONS

- Movement joints, spacing and minimum gauge of steel studs as per manufacturer's instructions of coated glass mat backer board.
- Prefabricated movement joints (PMJ) may be used in place of sealant, where shown on drawings where two planes meet.
- All openings and cuts must be treated to ensure waterproof integrity.
- Refer to Notes For The Professional and 301MJ-2012-2014.
- Latex Portland cement mortars may require 14 – 60 days cure before exposure to water. Verify with the manufacturer the correct cure time required. Alternatively, to reduce the curing time required, a rapid set mortar may be more suitable.
- For deflective substrates fill tub with water prior to applying caulking to tub sill.

**B**



# TILE INSTALLED ON CEMENT MORTAR OVER SOLID BACKING ON INTERIOR/EXTERIOR WALLS

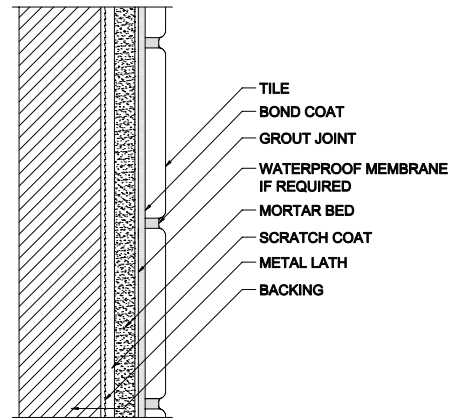
## 307W-2012-2014

### SUITABLE SUBSTRATES

- Concrete or masonry.

### MATERIALS

- TILE
- METAL LATH (optional) – 1.4kg/m<sup>2</sup> (ASTM C847)
- SCRATCH COAT – 7mm minimum. See Tile Specification Section Mixes 2.5.1
- MORTAR BED – (20 mm+) See Tile Guide Specification Section Mixes 2.5.3.
- BOND COAT – **Interior:** Portland cement slurry on fresh mortar bed or dry-set (minimum acceptable standard ANSI A 118.1 or ISO C1) mortar on mortar bed cured for a minimum of 24 hours. Organic adhesives (Type 1, interior dry surfaces only) (minimum acceptable standard ANSI A136.1 or ISO D1) on mortar bed cured for minimum of 7 days. Metal lath may be required for surfaces that present bonding problems. **Exterior:** Single or two component liquid latex-Portland cement mortar (minimum acceptable standard ANSI A 118.4 of ISO C2S1).
- GROUT – **Interior:** Latex-Portland cement grout (minimum acceptable standard ANSI 118.6 or ISO CG1) epoxy grout (minimum acceptable standard ANSI A 118.3 or ISO RG). **Exterior:** Latex-Portland cement grout (minimum acceptable standard ANSI A 118.6 or ISO CG1).



### APPLICATION

- Attach metal lath, if required, according to manufacturer's recommendations. Apply scratch coat and cure overnight. Apply mortar bed to required thickness. Finished tolerance of mortar bed not to exceed 6 mm in 3000 mm or 2 mm in 300 mm. For large format tile where one edge is 380 mm or larger, surface variation should not exceed 3 mm in 3000 mm. Apply tile to bond coat, before bond coat skins over. Use sufficient bond coat to ensure minimum 95% contact on exterior surfaces and wet areas and minimum 80% on interior dry surfaces. Slide tile firmly into position. Allow bond coat to cure. Force grout into full depth of joint, remove excess grout and clean.

### LIMITATIONS

- Manufacturer's recommendations to be followed. Exterior tile installations not to be attempted with a temperature of less than 12°C. Do not use paper-back mounted tile. Mesh-back mounted tile for exterior use or in locations of extreme moisture should not be used unless the manufacturer guarantees that the material is suitable for this type of installation.

### OTHER CONSIDERATIONS

- Latex additive is recommended for modification of scratch coat, mortar bed and Portland cement bond coat. Follow manufacturer's recommendations. Where job conditions require additional thickness, allow 24 hours cure between coats.
- Tile used on exterior applications must be frost resistant.
- Refer to Notes For The Professional and 301MJ-2012-2014.
- Waterproof membrane if required must be specified. (ANSI A 118-10) Follow manufacturer's recommendations.
- Latex Portland cement mortars may require 14 – 60 days cure before exposure to water. Verify with the manufacturer the correct cure time required. Alternatively, to reduce the curing time required, a rapid set mortar may be more suitable.

# TILE INSTALLED ON INTERIOR/EXTERIOR WALLS ON CEMENT MORTAR OVER WOOD OR METAL STUDS 308W-2012-2014

## SUITABLE SUBSTRATES

- Metal Lath on wood or metal studs, maximum 406 mm o.c.

## MATERIALS

- TILE
- METAL LATH – 1.4kg/m<sup>2</sup> (ASTM C847)
- SCRATCH COAT – 7mm minimum. See Tile Specification Section Mixes 2.5.1
- MORTAR BED – (20 mm+) See Tile Guide Specification Section Mixes 2.5.3
- VAPOUR RETARDER – Minimum 0.10 mm (6 mils) polyethylene film.
- BOND COAT – **Interior:** Portland cement slurry on fresh mortar bed or dry-set mortar (minimum acceptable standard ANSI 118.1 or ISO C1) or latex-Portland cement or mortar bed cured for a minimum of 24 hours. Organic adhesive Type 1 (minimum acceptable standard ANSI A136.1 or ISO D1) (interior dry surfaces only) on mortar bed cured a minimum of 7 days. **Exterior:** Single or two component liquid latex-Portland cement mortar (minimum acceptable standard ANSI A 118.4 or ISO C2S1).
- GROUT – **Interior:** Latex-Portland cement grout (minimum acceptable standard ANSI 118.6 or ISO CG1), or epoxy grout (minimum acceptable standard ANSI A 118.6 or ISO RG). **Exterior:** Latex-Portland cement grout (minimum acceptable standard ANSI A 118.6 or ISO CG1).

## APPLICATION

- Attach metal lath according to manufacturer's recommendations. Apply scratch coat and cure overnight. Apply mortar bed to required thickness. Finished tolerance of mortar bed not to exceed 6 mm in 3000 mm or 2 mm in 300 mm. For large format tile where one edge is 380 mm or larger, surface variation should not exceed 3 mm in 3000 mm. Apply tile to bond coat before bond coat skins over. Use sufficient bond coat to ensure minimum 95% contact on exterior surfaces and wet areas and minimum 80% on interior surfaces. Slide tile firmly into position. Allow bond coat to cure. Force grout into full depth of joint, remove excess grout and clean.

## LIMITATIONS

- Manufacturer's recommendations must be followed.
- Do not use paper-back mounted tile. Mesh-back mounted tile for exterior use or in locations of extreme moisture should not be used unless the manufacturer guarantees that the material is suitable for this type of installation.

## OTHER CONSIDERATIONS

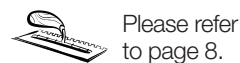
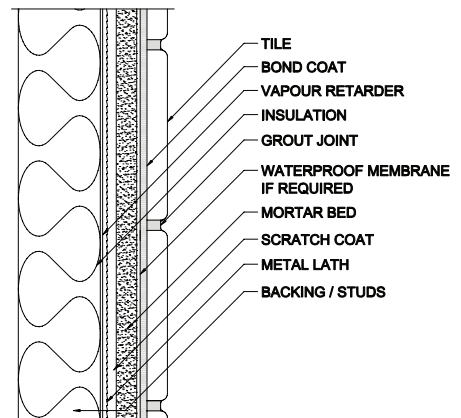
- Latex additive is recommended for modification of scratch coat, mortar bed and Portland cement bond coat. Follow manufacturer's recommendations. If mortar bed must be applied in multiple coats, allow 24 hours between coats.
- Tile used on exterior applications must be frost resistant.
- Refer to Notes For The Professional and 301MJ-2012-2014.
- Consultant to specify waterproof membrane if required.
- Waterproof membrane if required must be specified. (ANSI A 118.10) Follow manufacturer's recommendations.

## For Detail B

- Latex Portland cement mortars may require 14 – 60 days cure before exposure to water. Verify with the manufacturer the correct cure time required. Alternatively, to reduce the curing time required, a rapid set mortar may be more suitable. ANSI A 118.4 (Latex modified mortar for exterior alternative quick-set) for freeze thaw cycles.
- The difference between interior and exterior installations is the placement of the vapour retarder. Placement to be specified by the consultant.

## INTERIOR

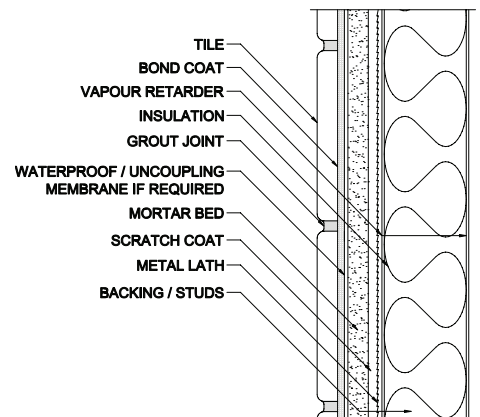
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Please refer to page 8.

## EXTERIOR

B



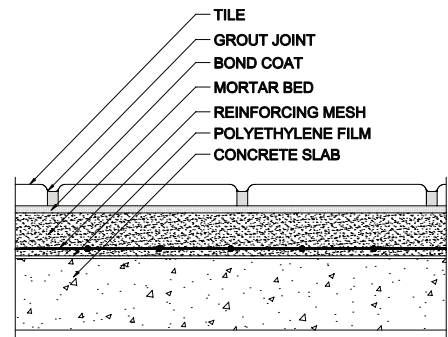
# TILE OVER MORTAR BED WITH CLEAVAGE MEMBRANE INTERIOR ONLY 309F-2012-2014

## SUITABLE SUBSTRATES

- Floor systems over which the tile will be installed shall be in conformance with the National Building Code 2005 and applicable local building codes taking into consideration anticipated live and dead loads.

## MATERIALS

- TILE
- CLEAVAGE MEMBRANE – 0.10 mm (6 mils) polyethylene (optional 15lb felt).
- REINFORCING MESH – 51 mm x 51 mm x 1.6 mm – welded wire/fabric (galvanized square wire mesh) (ASTM A82, ASTM A185)
- BOND COAT – Portland cement slurry on fresh mortar bed or dry set (minimum acceptable standard ANSI A 118.1 or ISC C1), latex-Portland cement mortar (minimum acceptable standard ANSI A 118.4 or ISO C2) or modified epoxy emulsion mortars (minimum acceptable standard ANSI A 118.3 or ISO R1) over mortar bed, cured for minimum of 24 hours. 100% solid epoxy mortar on mortar bed, cured for a minimum of 7 days.
- GROUT – Portland cement, latex-Portland cement grout (minimum acceptable standard ANSI A 118.6 or ISO CG1) or epoxy grout (minimum acceptable standard ANSI A 118.3 or ISO RG).



## APPLICATION

- Maintain a minimum of 16 mm of mortar under wire reinforcement. Apply mortar bed (see Tile Guide Specification Section Mixes 2.5.5) to required thickness. Finished tolerance of mortar bed not to exceed 6 mm in 3000 mm or 2 mm in 300 mm. For large format tile where one edge is 380 mm or larger, surface variation should not exceed 3 mm in 3000 mm. Apply tile to bond coat before bond coat skins over. Use sufficient bond coat to ensure minimum 80% contact. Contact shall be evenly distributed to give full support of the tile. On fresh mortar bed, beat tile into position. On dry set mortar, slide tile into position. Beat mosaic tile into position. Allow bond coat to cure. Force grout into full depth of joint, remove excess grout and clean.

## LIMITATIONS

- Manufacturer's recommendations must be followed.
- The thickness of the mortar bed should be 51 mm minimum.

## OTHER CONSIDERATIONS

- Latex additive used in place of water is recommended for Portland cement bond coat, and may be used in modification of mortar bed.
- Where required for chemical resistance, 100% solids epoxy setting material and/or grout should be used.
- Refer to Notes For The Professional and 301MJ-2012-2014.
- Refer to notes on Crack Isolation Membranes and 311F-2012-2014 Detail C.

# TILE INSTALLED ON INTERIOR/EXTERIOR CEMENT MORTAR BED ON CONCRETE SLAB

## 310F-2012-2014

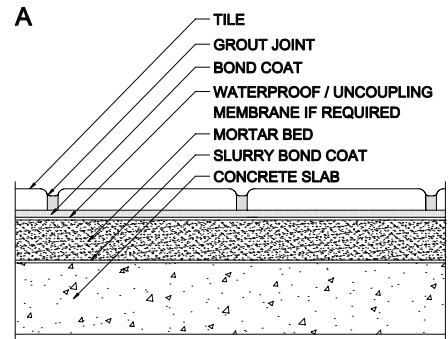
### DETAIL A

#### SUITABLE SUBSTRATES

- Floor systems over which the tile will be installed shall be in conformance with the Canadian National Building Code 2005 and applicable local building codes taking into consideration anticipated live and dead loads.

#### MATERIALS

- TILE
- BOND COAT – **Interior:** Portland cement slurry on concrete slab and on fresh mortar bed. Dry-set mortar (minimum acceptable standard ANSI A 118.1 or ISO C1), latex-Portland cement mortar (minimum acceptable standard ANSI A 118.4 or ISO C2S1), or modified epoxy emulsion mortars (minimum acceptable standard ANSI A 118.3 or ISO R1), over mortar bed, cured for minimum of 24 hours. 100% solids epoxy mortar on mortar bed, cured a minimum of 7 days. **Exterior:** Single or two component liquid latex-Portland cement mortar (minimum acceptable standard ANSI A 118.4 or ISO C2S1).
- GROUT – **Interior:** Portland cement, latex-Portland cement (minimum acceptable standard ANSI A 118.6 or ISO CG1) or epoxy grouts (minimum acceptable standard ANSI A 118.3 or ISO RG). **Exterior:** Latex-Portland cement.



#### APPLICATION

- Apply mortar bed (see Tile Guide Specification Section Mixes 2.5.5) to required thickness over fresh slurry bond coat (see Tile Guide Specification Section Mixes 2.5.2). Finished tolerance of mortar bed not to exceed 6 mm in 3000 mm or 2 mm in 300 mm. For large format tile where one edge is 380 mm or larger, surface variation should not exceed 3 mm in 3000 mm. Apply tile to bond coat before bond coat skins over. Use sufficient bond coat to ensure minimum 95% contact on exterior surfaces and wet areas and minimum of 80% contact on interior. Contact shall be evenly distributed to give full support of the tile. On fresh mortar bed, beat tile into position. On dry-set mortar, slide tile into position. Beat mosaic tile into position. Allow bond coat to cure. Force grout into full depth of joint, remove excess grout and clean.

#### LIMITATIONS

- Manufacturer's recommendations must be followed.
- The thickness of the mortar bed should be 32 mm minimum interior and 38 mm minimum exterior.
- Use method 309F-2012-2014 for precast floor systems, post tensioned concrete floor systems and other floors subject to movement or deflection.

#### OTHER CONSIDERATIONS

- Latex additive is recommended for Portland cement bond coat, and may be used in modification of mortar bed. Follow manufacturer's recommendations.
- Tile used on exterior applications must be frost resistant.
- For industrial and chemical resistant floors use the appropriate setting and grouting materials as per manufacturer's recommendations. Must meet extra heavy duty rating. See page 25.
- Refer to Notes For The Professional and 301MJ-2012-2014.
- If installation is over an occupied living space, use Detail 325ED-2012-2014 Detail A.
- Waterproof membrane if required must be specified. (ANSI A 118.10) Follow manufacturer's recommendations.
- For moderate commercial to industrial applications for tile that are larger than 300 mm x 300 mm, a minimum of 95% coverage must be achieved.

Continued

# TILE INSTALLED ON INTERIOR/EXTERIOR CEMENT MORTAR BED ON CONCRETE SLAB

## 310F-2012-2014

### DETAIL B - CHEMICAL RESISTANCE

#### SUITABLE SUBSTRATES

- Interior only concrete slab where chemical resistance is desired. Suitable for food plants, dairies, breweries and commercial kitchens. Concrete floor systems, over which the tile will be installed shall be in conformance with the Canadian National Building Code 2005 and applicable local building codes taking into consideration anticipated live and dead loads.

#### MATERIALS

- TILE
- BOND COAT – **Interior:** Portland cement slurry on concrete slab and on fresh mortar bed. 100% solids epoxy mortar (minimum acceptable standard ANSI A 118.3 or ISO R1) on chemical resistant membrane on mortar bed, cured a minimum of 7 days.
- GROUT – 100% solids epoxy (minimum acceptable standard ANSI A 118.3 or ISO RG)

#### APPLICATION

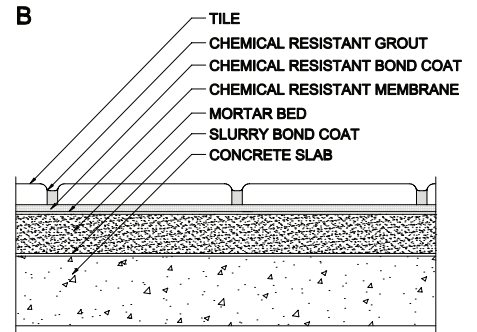
- Apply mortar bed (see Tile Guide Specification Section 2.5.5) to required thickness over fresh slurry bond coat (see Tile Guide Specification Section 2.5.2). Finished tolerance of mortar bed not to exceed 6 mm in 3000 mm or 2 mm in 300 mm. For large format tile where one edge is 380 mm or larger, surface variation should not exceed 3 mm in 3000 mm. Apply chemical resistant membrane to mortar bed as recommended by manufacturer. Apply tile to bond coat before bond coat skins over. Use sufficient bond coat to ensure a minimum 80% contact on tile back. If 95% coverage is specified refer to 3.3.10. Contact shall be evenly distributed to give full support of the tile. Allow bond coat and grout to cure as recommended by the manufacturer for the type of environment and exposure anticipated. Force grout into full depth of joint, flush with tile surface. Remove excess grout by using float at a 90° angle and clean with a sponge and plenty of water.

#### LIMITATIONS

- Thickness of the mortar bed should be 32 mm minimum.
- Epoxy grout should not be used where subjected to heat surpassing 100° C or as per manufacturer's recommendations. Use furan resin grout for areas subjected to excessive heat.

#### OTHER CONSIDERATIONS

- Refer to Notes For The Professional and 301MJ-2012-2014.
- Movement joints must be chemical resistant sealant or prefabricated movement joints.
- Waterproof membrane if required must be specified. (ANSI A 118.10) Follow manufacturer's recommendations.
- Uncoupling membrane installed as manufacturer's recommendations.
- For moderate commercial to industrial applications for tile that are larger than 300 mm x 300 mm, a minimum of 95% coverage must be achieved.



# TILE BONDED TO CONCRETE SLAB - THIN-SET METHOD 311F-2012-2014

## DETAIL A INTERIOR/EXTERIOR

### SUITABLE SUBSTRATES

- Floor systems over which the tile will be installed shall be in conformance with the Canadian National Building Code 2005 and applicable local building codes taking into consideration anticipated live and dead loads.

### MATERIALS

- TILE
- BOND COAT – **Interior:** Dry-set mortar (minimum acceptable standard ANSI A 118.1 or ISO C1), latex-Portland cement mortar (minimum acceptable standard ANSI A 118.4 or ISO C2S1), modified epoxy emulsion mortars, 100% solids epoxy mortar, epoxy adhesive (minimum acceptable standard ANSI A 118.3 or ISO R1), or organic adhesives (minimum acceptable standard ANSI A 118.3 or ISO R1). **Exterior:** Single or two component liquid latex-Portland cement mortar (minimum acceptable standard ANSI A 118.4 or ISO C2S1).
- GROUT – **Interior:** Portland cement, latex-Portland cement (minimum acceptable standard A 118.6 or ISO CG1), or epoxy grouts (minimum acceptable standard ANSI A 118.3 or ISO RG). **Exterior:** Latex-Portland cement (minimum acceptable standard ANSI A 118.6 or ISO CG1).

### APPLICATION

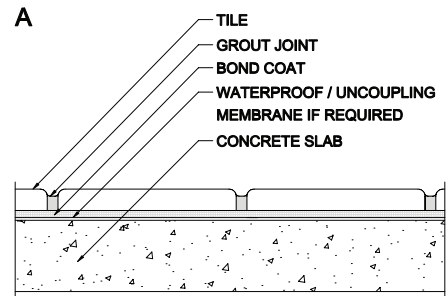
- Maximum variation of slab should not exceed 6 mm in 3000 mm or 2 mm in 300 mm. For large format tile where one edge is 380 mm or larger, surface variation should not exceed 3 mm in 3000 mm. Apply tile to bond coat before bond coat skins over. Use sufficient bond coat to ensure minimum 95% contact on exterior surfaces and wet areas and minimum of 80% contact on interior dry surfaces. Contact shall be evenly distributed to give full support of the tile. Slide tile firmly into position. Allow bond coat to cure. Force grout into full depth of joint, remove excess grout and clean.

### LIMITATIONS

- Manufacturer's recommendations must be followed.
- Provide positive drainage below exterior slabs; use latex-Portland cement mortars on exterior slabs. Use of epoxy mortars and grouts is recommended for interior surfaces only or where improved chemical resistance is required.
- Use method 309F-2012-2014 or crack isolation/uncoupling membrane if recommended by the manufacturer for precast floor systems, post tensioned concrete floor systems and other floors subject to movement or deflection.
- Not a roof assembly. (For roof assembly see Detail 325F-2012-2014 Detail A)

### OTHER CONSIDERATIONS

- For exterior installations, use a suitable latex-Portland cement mortar. Back-buttering of the tile is required to achieve 95% contact.
- Tile used in exterior applications must be frost resistant.
- Refer to Notes For The Professional and 301MJ-2012-2014.
- Waterproof membrane if required must be specified. (ANSI A 118.10) Follow manufacturer's recommendations.
- For exterior use concrete slab must be sloped to provide positive surface drainage and adequate drainage below slab must be provided.
- Uncoupling membrane may require unmodified dry-set mortar for tile bond coat. Follow manufacturer's recommendations.



Continued

# TILE BONDED TO CONCRETE SLAB - THIN-SET METHOD 311F-2012-2014

## DETAIL B – EPOXY METHOD INTERIOR ONLY

### SUITABLE SUBSTRATES

- Interior only concrete slab where chemical resistance is desired. Suitable for food plants, dairies, breweries and commercial kitchens. Concrete floor systems, over which the tile will be installed shall be in conformance with the
- Canadian National Building Code 2005 and applicable local building codes taking into consideration anticipated live and dead loads.

### MATERIALS

- TILE
- BOND COAT – 100% solids epoxy mortar (minimum acceptable standard ANSI A 118.3 or ISO R1).
- GROUT – 100% solids epoxy (minimum acceptable standard ANSI A 118.3 or ISO RG).

### APPLICATION

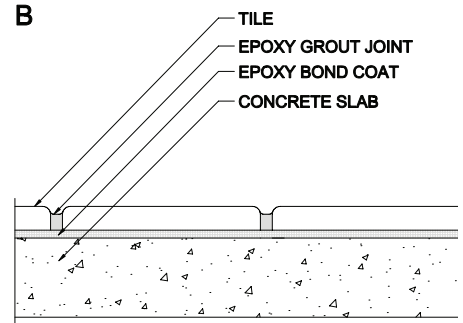
- Maximum variation of slab should not exceed 6 mm in 3000 mm or 2 mm in 300 mm. For large format tile where one edge is 380 mm or larger, surface variation should not exceed 3 mm in 3000 mm. Apply tile to bond coat before bond coat skins over. Use sufficient bond coat to ensure a minimum 80% contact. If 95% coverage is specified. Refer to 3.3.10. Contact shall be evenly distributed to give full support of the tile. Allow bond coat and grout to cure as recommended by the manufacturer for the type of environment and exposure anticipated. Force grout into full depth of joint flush with tile surface. Remove excess grout by using fl oat at 90° angle and clean with a sponge and plenty of water.

### LIMITATIONS

- Epoxy grout should not be used where subjected to heat surpassing 100°C or as per manufacturer's recommendations. Use furan resin grout for areas subjected to excessive heat.

### OTHER CONSIDERATIONS

- Refer to Notes For The Professional and 301MJ-2012-2014.
- Movement joints must be chemical resistant sealant or prefabricated movement joints.
- For industrial and chemical resistant floors, use the appropriate chemical resistant membrane, setting material and grouts in place of materials mentioned above. If specified, system must meet extra heavy duty rating. Follow manufacturer's instructions carefully.



Continued

# TILE BONDED TO CONCRETE SLAB - THIN-SET METHOD 311F-2012-2014

## DETAIL C – CRACK CONCRETE INTERIOR/EXTERIOR – FULL COVERAGE

### SUITABLE SUBSTRATES

- Floor systems over which the tile will be installed shall be in conformance with the Canadian National Building Code 2005 and applicable local building codes taking into consideration anticipated live and dead loads.

### MATERIALS

- TILE
- BOND COAT – **Interior:** Dry-set mortar (minimum acceptable standard ANSI A 118.1 or ISO C1), latex-Portland cement mortar (minimum acceptable standard ANSI A 118.4 or ISO C2S1), modified epoxy emulsion mortars, 100% solids epoxy mortar (minimum acceptable standard ANSI A 118.3 or ISO R1). **Exterior:** Single or two component liquid latex cement mortar (minimum acceptable standard ANSI A 118.4 or ISO C2S1).
- GROUT – **Interior:** Portland cement, latex-Portland cement (minimum acceptable standard A 118.6 or ISO CG1), or epoxy grouts (minimum acceptable standard ANSI A 118.3 or ISO RG). **Exterior:** Latex-Portland cement (minimum acceptable standard ANSI A 118.6 or ISO CG1).
- Crack Isolation membrane conforming to ANSI A 118.12
- Consult manufacturer for product compatibility
- Membrane Bond Coat as required by manufacturers recommendations.

### APPLICATION

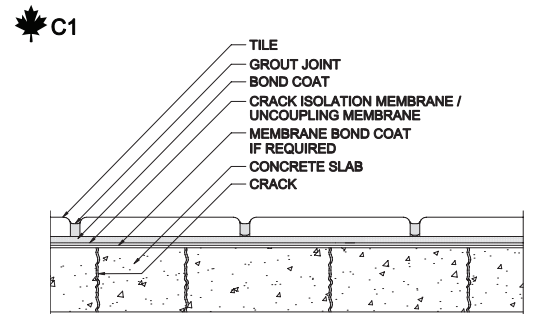
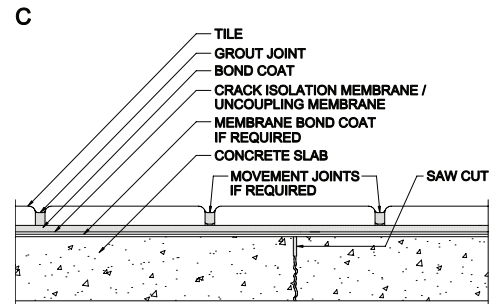
- Maximum variation of slab should not exceed 6 mm in 3000 mm or 2 mm in 300 mm. For large format tile where one edge is 380 mm or larger, surface variation should not exceed 3 mm in 3000 mm. Apply crack isolation membrane or uncoupling membrane as per manufacture's recommendations. Apply movement joints if required on one or on both sides of the tile bridging the existing crack. Apply tile to bond coat before bond coat skins over. Use sufficient bond coat to ensure minimum 95% contact on exterior surfaces and wet areas and minimum of 80% contact on interior dry surfaces. Contact shall be evenly distributed to give full support of the tile. Slide tile firmly into position. Allow bond coat to cure. Force grout into full depth of joint, remove excess grout and clean.

### LIMITATIONS

- Manufacturers' recommendations must be followed.
- Verify with manufacturer if product is sensitive to high PH levels in concrete.
- Verify with manufacturer if product is suitable for exterior installations and follow manufacturer's recommendations for suitable bond coat materials.

### OTHER CONSIDERATIONS

- Not to be used over expansion joints, cold joints or structural joints.
- Tile used in exterior installations must be frost resistant.
- Refer to Notes For The Professional and 301MJ-2012-2014.
- For exterior use, concrete slab must be sloped to provide positive surface drainage and adequate drainage below slab must be provided.
- Some manufacturers recognize the use of their products for partial coverage, over existing cracks. Follow manufacturer's recommendations/guidelines.
- Uncoupling membrane may require unmodified dry-set mortar for tile bond coat. Follow manufacturer's recommendations.



# TILE BONDED TO CONCRETE SLAB - THIN-SET METHOD 311F-2012-2014

## DETAIL D – UNCOUPLING OVER GREEN/YOUNG CONCRETE

### SUITABLE SUBSTRATES

- Concrete floor systems over which the tile will be installed shall be in conformance with the Canadian National Building Code 2010 and applicable local building codes taking into consideration anticipated live and dead loads.

### MATERIALS

- TILE
- BOND COAT – Follow uncoupling membrane manufacturer's directions.
- Uncoupling Membrane – Follow manufacturer's recommendations.
- GROUT – **Interior:** Portland cement, latex-Portland cement (minimum acceptable standard A 118.6 or ISO CG1), or epoxy grouts (minimum acceptable standard ANSI A 118.3 or ISO RG). **Exterior:** Latex-Portland cement (minimum acceptable standard ANSI A 118.6 or ISO CG1).

### APPLICATION

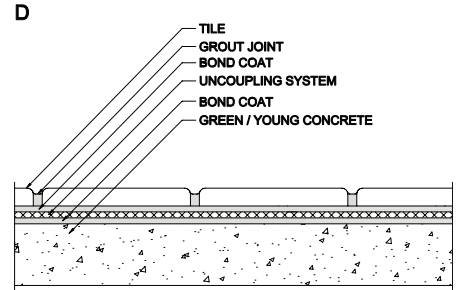
- Over green/young concrete cured a minimum of 48 hours and suitable to support tile installation traffic as determined by the project design professional, construction manager or general contractor.
- Maximum variation of slab should not exceed 6 mm in 3000 mm or 2 mm in 300 mm. For large format tile where one edge is 380 mm or larger, surface variation should not exceed 3 mm in 3000 mm.
- Apply uncoupling membrane as per manufacturer's recommendations.
- Apply tile to bond coat before bond coat skins over. Use sufficient bond coat to ensure minimum 95% contact on exterior surfaces and wet areas and minimum of 80% contact on interior dry surfaces. Contact shall be evenly distributed to give full support of the tile. Slide tile firmly into position. Allow bond coat to cure. Force grout into full depth of joint, remove excess grout and clean.

### LIMITATIONS

- Manufacturers' recommendations must be followed.
- Verify with manufacturer if product is suitable for exterior installations and follow manufacturer's recommendations for suitable bond coat materials.

### OTHER CONSIDERATIONS

- Tile used in exterior installations must be frost resistant.
- Refer to Notes For The Professional and 301MJ-2012-2014.
- For exterior use, concrete slab must be sloped to provide positive surface drainage and adequate drainage below slab must be provided.



# TILE APPLIED OVER WOOD SUBFLOOR IN DRY AREAS

## THIN-SET METHOD

### 313F-2012-2014

#### SUITABLE SUBSTRATES

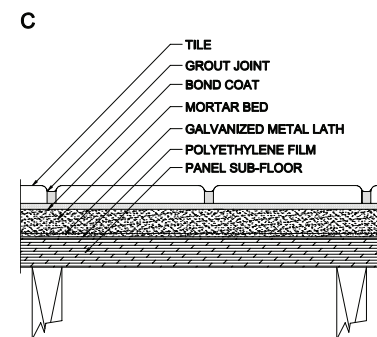
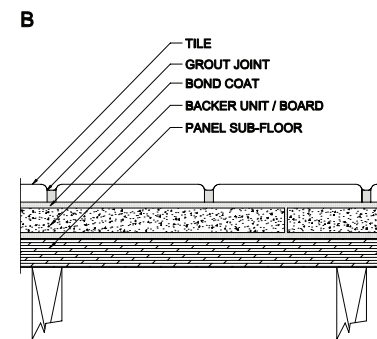
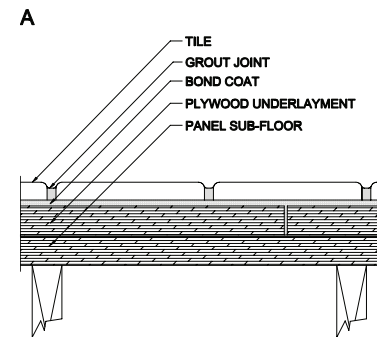
- Floor systems, including the framing system and subfloor panels, over which the tile will be installed shall be in conformance with the Canadian National Building Code 2010 and applicable local building codes taking into consideration anticipated live and dead loads.

#### MATERIALS

- TILE
- BOND COAT – Latex-Portland cement mortars (minimum acceptable standard ANSI A 118.11 or ISO C2S1), modified epoxy emulsion mortars or 100% solids epoxy mortars (minimum acceptable standard ANSI A 118.3 or ISO R1).
- GROUT – **Interior:** Portland cement, latex-Portland cement (minimum acceptable standard A 118.6 or ISO CG1), or epoxy grouts (minimum acceptable standard ANSI A 118.3 or ISO RG). **Exterior:** Latex-Portland cement (minimum acceptable standard ANSI A 118.6 or ISO CG1).

#### DETAIL A – THIN-SET ON PLYWOOD

Suitable Sub-floor: Douglas Fir plywood, Canadian Softwood plywood, Poplar plywood, Construction sheathing or OSB. Joists to be spaced 406 mm o.c. Apply both layers of panel with top grain at right angles to joist, and with top layer staggered to give 50% overlap of sheets of sub-floor. Gap the top layer of plywood 6 mm between sheets. Underlayment: Only 16 mm or thicker Douglas Fir exterior-grade plywood Select Tight-faced, meeting CSA-0121. Attach underlayment with 30 mm screws placed 150 mm o.c. around perimeter and 200 mm o.c. throughout the body of the panel. Underlayment screws to go through the total thickness of the assembly but should not penetrate the joists or cross bridging/solid blocking. Use sufficient bond coat to ensure minimum 80% contact. Contact shall be evenly distributed to give full support of the tile. Slide tile firmly into position. Allow bond coat to cure. Force grout into full depth of joint, remove excess grout and clean.



#### DETAIL B – THIN-SET ON BACKER UNIT/BOARD

Suitable Sub-floor: Douglas Fir plywood, Canadian Softwood plywood, Poplar plywood, Construction sheathing or OSB. Underlayment: Minimum 13 mm cementitious backer unit (CBU) or coated glass mat backer board or nominal 11 mm thick fibre-cement backer board meeting ASTM C1288 bedded in latex-Portland cement mortar (minimum acceptable standard ANSI A 118.4 or ISO C2) and gapped 3 mm. Fasten underlayment to sub-floor with 30 mm galvanized screws 200 mm o.c. throughout the body of the panel. Do not countersink screws for coated glass mat backer board. Treat joints as per manufacturer's directions. Apply bond coat, filling gaps in underlayment. Apply tile to bond coat before bond coat skins over. Use sufficient bond coat to ensure minimum 80% contact. Contact shall be evenly distributed to give full support of the tile. Slide tile firmly into position. Allow bond coat to cure. Force grout into full depth of joint, remove excess grout and clean.

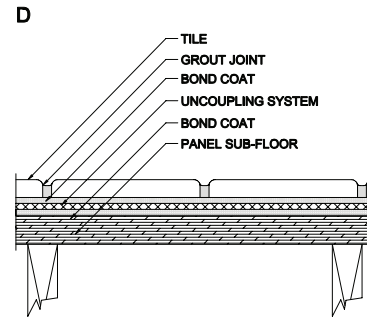
#### DETAIL C – MORTAR BED WITH CLEAVAGE MEMBRANE

Install polyethylene film, galvanized metal lath, 32 mm mortar bed (see Tile Guide Specification Section Mixes 2.5.3) and tile as per application directions of detail 314F-2012-2014. Finished tolerance of mortar bed not to exceed 6 mm in 3000 mm or 2 mm in 300 mm.

Continued

#### DETAIL D – THIN-SET ON UNCOUPLING SYSTEM

Suitable Subfloor: Minimum 15 mm Douglas Fir plywood, Canadian Softwood plywood, Poplar plywood, Construction sheathing or OSB for joists spaced 406 mm o.c. For floor trusses or I-joists spaced 480 mm o.c., subfloor minimum 20 mm meeting CSA as indicated above. For floor trusses or I-joists spaced 600 mm o.c. subfloor minimum 20 mm with overlay of 10 mm minimum of plywood meeting CSA 0121 or O.S.B. meeting CSA 0437.0 or CSA 0325.0, with 3 mm gap between sheets. Underlayment screws to go through the total thickness of the assembly but should not penetrate the joists or cross bridging/solid blocking. Install uncoupling system to manufacturer's recommendations. Use sufficient bond coat to ensure minimum 80% contact. Contact shall be evenly distributed to give full support of the tile. Slide tile firmly into position. Allow bond coat to cure. Force grout into full depth of joint, remove excess grout and clean. Floor systems, including the framing system and subfloor panels, over which the tile will be installed shall be in conformance with the Canadian National Building Code 2010 and applicable local building codes taking into consideration anticipated live and dead loads. Uncoupling system to be placed over heating system, follow manufacturer's recommendations. For definition of uncoupling system see Glossary.



#### LIMITATIONS

- For use on interior floors in dry areas. For residential or light commercial use only.
- Waferboard, particleboard and similar products should not be used for subfloors or underlayment.

#### OTHER CONSIDERATIONS

- Local practice sometimes incorporates an expanded metal lath attached to the plywood. This is an acceptable method of installation, providing that two layers of plywood is used as per detail (A) and the material used to fill the metal lath is one of the bond coats listed above.
- Cross bridge floor joists but preferably solid blocking.
- Refer to Notes For The Professional and 301MJ-2012-2014.
- When using detail (C), recess floor joist with respect to adjacent areas to accommodate the thickness of the finished tile installation, or use transition strip where tile work abuts other floor coverings.
- For residential only a 25 mm mortar bed may be used. The subfloor shall have a minimum thickness of 16 mm.
- For natural stone and some tile larger than 300 mm x 300 mm deflection must not exceed  $L/720$  of span.
- Some thicker uncoupling membranes can be applied on floor trusses and I-joists spaced at 600 mm on a single layer subfloor 20 mm minimum thickness.
- Uncoupling membrane may require unmodified dry-set mortar for tile bond coat. Follow manufacturer's recommendations.

# TILE OVER HEATED FLOOR SYSTEMS

## 314F-2012-2014

### DETAIL A - MORTAR BED OVER PLYWOOD (INTERIOR)

#### SUITABLE SUBSTRATES

- Floor systems, including the framing system and subfloor panels, over which the tile will be installed shall be in conformance with the Canadian National Building Code 2010 and applicable local building codes taking into consideration anticipated live and dead loads.

#### MATERIALS

- CLEAVAGE MEMBRANE – 6 mils polyethylene film or 6.8 kg meeting CAN/CGSB-51.34M, asphalt saturated roofing felt, meeting CSA A123.3-98.
- GALVANIZED DIAMOND METAL LATH – 1.4 kg/m<sup>2</sup> (ASTM C847-95).
- MORTAR BED – See Tile Guide Specification Section Mixes 2.5.3 or cementitious self-levelling underlayment. Primer/Sealer as recommended by manufacturer.
- SUITABLE PANEL SUB-FLOOR – Douglas Fir plywood, Canadian Softwood plywood, Poplar plywood, Construction Sheathing or OSB. Minimum 16 mm exterior grade plywood meeting CSA 0121 or oriented strandboard meeting CSA 0437.0 or CSA 0325.0, on joists spaced 406 mm o.c.
- TILE
- BOND COAT – **Interior:** Dry-set mortar (minimum acceptable standard ANSI A 118.1 or ISO C1), latex-Portland cement mortar (minimum acceptable standard ANSI A 118.4 or ISO C2S1), modified epoxy emulsion mortars, 100% solids epoxy mortar, epoxy adhesive (minimum acceptable standard ANSI A 118.3 or ISO R1), or organic adhesives (minimum acceptable standard ANSI A 118.3 or ISO R1). **Exterior:** Single or two component liquid latex-Portland cement mortar (minimum acceptable standard ANSI A 118.4 or ISO C2S1).
- GROUT – **Interior:** Portland cement, latex-Portland cement (minimum acceptable standard ANSI A 118.6 or ISO CG1), or epoxy grouts (minimum acceptable standard ANSI A 118.3 or ISO RG). **Exterior:** Latex-Portland cement (minimum acceptable standard ANSI A 118.6 or ISO CG1).

#### APPLICATION

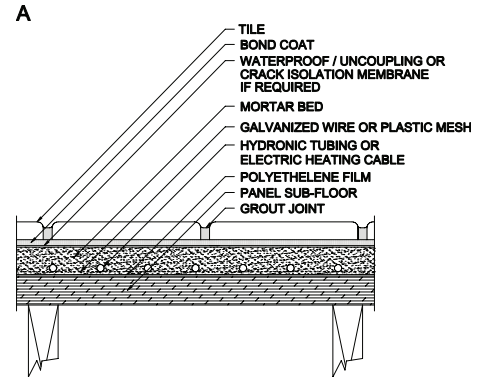
- Apply polyethylene film lapped at least 100 mm. Nail galvanized diamond metal lath butted, not overlapped, to the plywood. After the heating/electrical contractor has placed the heating element over the metal or plastic lath, apply mortar bed to required thickness of 32 mm min. Allow mortar bed to cure. Apply bond coat to cured mortar bed. Finished tolerance of mortar bed not to exceed 6 mm in 3000 mm or 2 mm in 300 mm. For large format tile where one edge is 380 mm or larger, surface variation should not exceed 3 mm in 3000 mm. Apply tile to bond coat before bond coat skins over. Use sufficient bond coat to ensure minimum 80% contact. Contact shall be evenly distributed to give full support of the tile. On fresh mortar bed, beat tile into position. On dry-set mortar, slide tile into position. Beat tile into position. Allow bond coat to cure. Force grout into full depth of joint, remove excess grout and clean.

#### LIMITATIONS

- Manufacturer's recommendations must be followed.
- The thickness of the mortar bed to be 32 mm minimum interior.
- For residential or light commercial use only.
- Do not use lightweight aggregate in mortar bed.
- If using electric heating cable/conduit, plastic mesh should be used.

#### OTHER CONSIDERATIONS

- Where incorporating heating cable on interior or exterior concrete substrates is desired, refer to details 309F-2012-2014 and 310F-2012-2014 and incorporate heating cables in the bottom of the mortar bed. When hydronic heating system is used in mortar bed, increase thickness of mortar bed to achieve a minimum 32 mm thickness over heating tubing.
- Certain proprietary systems may allow thin-set installation with latex-Portland cement.
- Heating system - design, installation and inspection by others. Pre heating and testing of the heating system needs to be done prior to the installation of the tile. The tile installation cannot be done when floor heat is in use and may need a minimum of 7 days after tile installation before the radiant heating system can be turned on. Verify with manufacturer
- Refer to Notes For The Professional and 301MJ-2012-2014.
- Movement joints shall be installed at a maximum 3600 mm for radiant heated floors. Width and spacing of joints to be specified by consultant.
- Insulation layer may be required between joists or on top of subfloor for maximum heating efficiency. Consult heating manufacturer for type and thickness.
- Waterproof membrane (ANSI A 118.10) or crack isolation membrane (ANSI A 118.12), if required, must be specified. Follow manufacturer's recommendations.



Continued

# TILE OVER HEATED FLOOR SYSTEMS

## 314F-2012-2014

### DETAIL B – GYPSUM CONCRETE OVER PLYWOOD

#### SUITABLE SUBSTRATES

- Floor systems, including the framing system and subfloor panels, over which the tile will be installed shall be in conformance with the Canadian National Building Code 2010 and applicable local building codes taking into consideration anticipated live and dead loads.

#### MATERIALS

- TILE
- SUITABLE PANEL SUB-FLOOR – Douglas Fir plywood, Canadian Softwood plywood, Poplar plywood, Construction Sheathing or OSB. Minimum 16 mm exterior grade plywood meeting CSA 0121 or oriented strandboard meeting CSA 0437.0 or CSA 0325.0, on joists spaced 406 mm o.c.
- GYPSUM CONCRETE – Underlayment meeting performance requirements of ASTM C627 minimum. Compressive strength of 15 MPa when tested by ASTM C472.
- BOND COAT – Dry-set mortar (minimum acceptable standard ANSI A 118.1 or ISO C1), latex-Portland cement mortar (minimum acceptable standard ANSI 118.4 or ISO C2S1) over gypsum concrete, cured for a minimum of 72 hours or less than 3% residual moisture.
- PRIMER/SEALER – As recommended by manufacturer.
- GROUT - Portland cement, latex-Portland cement (minimum acceptable standard A 118.6 or ISO CG1), or epoxy grouts (minimum acceptable standard ANSI A 118.3 or ISO RG).

#### APPLICATION

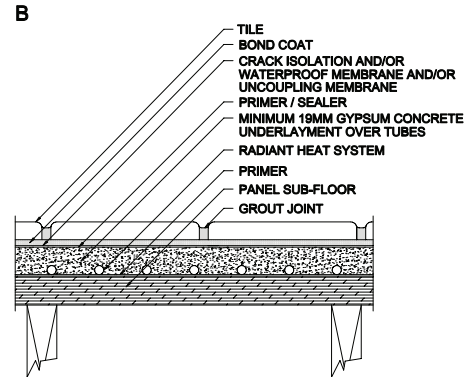
- Following installation of electric heating cable or hydronic tubing (by others), apply gypsum concrete to required thickness over primer/sealer as required by manufacturer. Finished tolerance of gypsum concrete not to exceed 6 mm in 3000 mm or 2 mm in 300 mm. For large format tile where one edge is 380 mm or larger, surface variation should not exceed 3 mm in 3000 mm. Apply tile to bond coat before bond coat skins over. Use sufficient bond coat to minimum 80% contact on interior surfaces. Contact shall be evenly distributed to five full support of the tile. Apply dry-set mortar (minimum acceptable standard ANSI A 118.1 or ISO C1) or latex-Portland cement mortar (minimum acceptable standard ANSI A 118.4 or ISO C2S1) over cured gypsum concrete. Slide tile into position. Allow bond coat to cure. Force grout into full depth of joint, remove excess grout and clean.

#### LIMITATIONS

- Manufacturer's recommendations must be followed.
- The thickness of the gypsum concrete should be 15 mm minimum.
- For residential or light commercial use only.

#### OTHER CONSIDERATIONS

- If an uncoupling system is used, one single layer of plywood minimum thickness of 20 mm is acceptable providing the floor trusses or I – joist are spaced at no more than 480 mm o.c.
- Some gypsum concrete underlayment manufacturers recommend the use of plastic lath for application over wood substrate, follow manufacturers recommendations for best practice.
- Cross bridge floor joist but preferably solid blocking.
- Refer to Notes For The Professional and 301MJ-2012-2014.
- Heating system: design, installation and inspection by others. Pre heating and testing of the heating system needs to be done prior to the installation of the tile. The tile installation cannot be done when floor heat is in use and may need a minimum of 7 days after tile installation before the radiant heating system can be turned on. Verify with manufacturer.
- Movement joints shall be installed at a maximum 3600 mm for radiant heated floors. Width and spacing of joints to be specified by consultant.
- Consult membrane manufacturer for maximum residual moisture before installation.



Continued

# TILE OVER HEATED FLOOR SYSTEMS

## 314F-2012-2014

### DETAIL C – THIN ELECTRIC HEATING CABLE ON PLYWOOD INTERIOR ONLY

#### SUITABLE SUBSTRATES

- Floor systems, including the framing system and subfloor panels, over which the tile will be installed shall be in conformance with the Canadian National Building Code 2010 and applicable local building codes taking into consideration anticipated live and dead loads.

#### MATERIALS

- TILE
- BOND COAT – Dry-set mortar (minimum acceptable standard ANSI A 118.1 or ISO C1), latex-Portland cement mortar (minimum acceptable standard ANSI A 118.4 or ISO C2S1), modified epoxy emulsion mortars, 100% solids epoxy mortar, epoxy adhesive (minimum acceptable standard ANSI A 118.3 or ISO R1), or organic adhesives (minimum acceptable standard ANSI A 118.3 or ISO R1).
- GROUT - Portland cement, latex-Portland cement (minimum acceptable standard A 118.6 or ISO CG1), or epoxy grouts (minimum acceptable standard ANSI A 118.3 or ISO RG).

#### APPLICATION

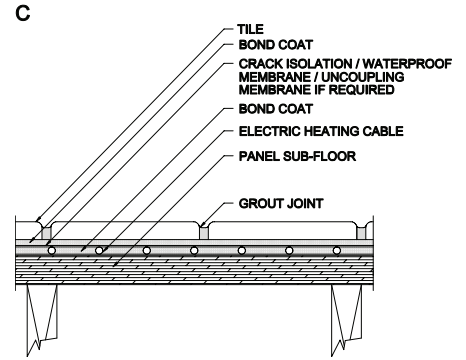
- Following installation of electric heating cable or mat (by others) apply tile to bond coat before bond coat skins over. Use sufficient bond coat to ensure minimum 80% contact. Contact shall be evenly distributed to give full support of the tile. Slide tile firmly into position. Allow bond coat to cure.
- Force grout into full depth of joint, remove excess grout and clean.

#### LIMITATIONS

- Manufacturer's recommendations must be followed.
- Not to be used in wet areas unless recommended by manufacturer.

#### OTHER CONSIDERATIONS

- If waterproof/crack isolation membrane is required follow manufacturer's recommendations (ANSI A 118.10, ANSI A 118.12)
- Heating system - design, installation and inspection by others. Pre heating and testing of the heating system needs to be done prior to the installation of the tile. The tile installation cannot be done when floor heat is in use and may need a minimum of 7 days after tile installation before the radiant heating system can be turned on. Verify with manufacturer.
- Refer to Notes For The Professional and 301MJ-2012-2014.
- Uncoupling system to be placed over heating system. Follow manufacturers' recommendations.
- Insulation layer may be required below plywood subfloor for maximum heating efficiency. Consult heating manufacturer for types and thicknesses.



Continued

# TILE OVER HEATED FLOOR SYSTEMS

## 314F-2012-2014



Please refer to page 8.

### DETAIL C1 – THIN ELECTRIC HEATING CABLE WITH CEMENTITIOUS SELF-LEVELING ON PLYWOOD INTERIOR ONLY

#### SUITABLE SUBSTRATES

- Floor systems, including the framing system and subfloor panels, over which the tile will be installed shall be in conformance with the Canadian National Building Code 2010 and applicable local building codes taking into consideration anticipated live and dead loads.

#### MATERIALS

- TILE
- BOND COAT – Dry-set mortar (minimum acceptable standard ANSI A 118.1 or ISO C1), latex-Portland cement mortar (minimum acceptable standard ANSI A 118.4 or ISO C2S1), modified epoxy emulsion mortars, 100% solids epoxy mortar, epoxy adhesive (minimum acceptable standard ANSI A 118.3 or ISO R1), or organic adhesives (minimum acceptable standard ANSI A 118.3 or ISO R1).
- Crack isolation membrane – ANSI A 118.12 or waterproof membrane – ANSI A 118.10.
- Uncoupling system to manufacturer's recommendations.
- CEMENTITIOUS SELF-LEVELLING UNDERLAYMENT – as per manufacturer's recommendations.
- GROUT – Portland cement, latex-Portland cement (minimum acceptable standard A 118.6 or ISO CG1), or epoxy grouts (minimum acceptable standard ANSI A 118.3 or ISO RG).

#### APPLICATION

- Install electric heating cable or mat (by others)
- Primer must be used over prepared surface as required by self-leveling manufacturer's recommendations
- Apply thickness of self-leveling to the recommended thickness by manufacturer
- Curing/drying of cementitious self-leveling must be strictly followed as instructed by manufacturer before installation of tile.
- Apply tile to bond coat before bond coat skins over. Use sufficient bond coat to ensure minimum 80% contact. Contact shall be evenly distributed to give full support of the tile. Slide tile firmly into position. Allow bond coat to cure.
- Force grout into full depth of joint, remove excess grout and clean.

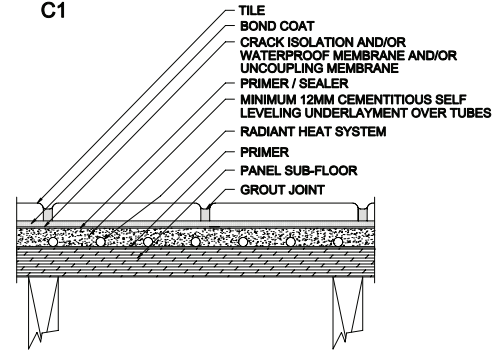
#### LIMITATIONS

- Manufacturer's recommendations must be followed.
- Follow manufacturer's recommendations for manufacturer's maximum applied thicknesses
- Depending on Manufacturer double layer plywood may be required see Detail 313F-A

#### OTHER CONSIDERATIONS

- If waterproof/crack isolation membrane is required follow manufacturer's recommendations (ANSI A 118.10, ANSI 118.12)
- Heating system - design, installation and inspection by others. Pre heating and testing of the heating system needs to be done prior to the installation of the tile. The tile installation cannot be done when floor heat is in use and may need a minimum of 7 days after tile installation before the radiant heating system can be turned on. Verify with manufacturer.
- Refer to Notes For The Professional and 301MJ-2012-2014.
- Uncoupling system to be placed over heating system. Follow manufacturers' recommendations.
- Insulation layer may be required below plywood subfloor for maximum heating efficiency. Consult heating manufacturer for types and thicknesses.
- Radiant pipe/tube may be substituted for electric wire radiant heat system
- Electric radiant heat system conforming to UL (CAN/CSA) C22.2 #217

C1



Continued

# TILE OVER HEATED FLOOR SYSTEMS

## 314F-2012-2014



Please refer to page 8.

### DETAIL C2 MODULAR SCREED SYSTEM OVER PLYWOOD INTERIOR ONLY

#### SUITABLE SUBSTRATES

- Floor systems, including the framing system and subfloor panels, over which the tile will be installed shall be in conformance with the Canadian National Building Code 2010 and applicable local building codes taking into consideration anticipated live and dead loads

#### MATERIALS

- TILE
- BOND COAT – Dry-set mortar (minimum acceptable standard ANSI A 118.1 or ISO C1 or C2F).
- MODULAR SCREED PANEL – Expanded polystyrene panel with density no less than 32 kg/m<sup>3</sup>.
- GROUT – Portland cement, latex-Portland cement (minimum acceptable standard A 118.6 or ISO CG1), or epoxy grouts (minimum acceptable standard ANSI A 118.3 or ISO RG).

#### APPLICATION

- Apply mortar bed (see Tile Guide Specification Section 2.5.5) to required thickness (see Tile Guide Specification Section 2.5.2). Finished tolerance of mortar bed not to exceed 6 mm in 3000 mm or 2 mm in 300 mm. For large format tile where one edge is 380 mm or larger, surface variation should not exceed 3 mm in 3000 mm. Apply membrane to mortar bed as recommended by manufacturer. Apply tile to bond coat before bond coat skins over. Use sufficient bond coat to ensure a minimum 80% contact on tile back. If 95% coverage is specified refer to 3.3.10. Contact shall be evenly distributed to give full support of the tile. Allow bond coat and grout to cure as recommended by the manufacturer for the type of environment and exposure anticipated. Force grout into full depth of joint, flush with tile surface. Remove excess grout by using fl oat at a 90° angle and clean with a sponge and plenty of water.

#### LIMITATIONS

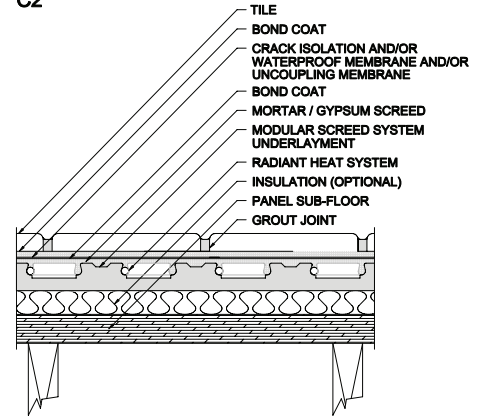
- Thickness of the mortar bed should not exceed more than 25 mm above the top of the pedestals of the modular screed panel.
- Verify with manufacturer maximum weight capacity.

#### OTHER CONSIDERATIONS

- Refer to Notes For The Professional and 301MJ-2012-2014.
- Insulation layer may be required between joists or on top of subfloor for maximum heating efficiency. Consult manufacturer for type and thickness
- Heating system - design, installation and inspection by others. Pre heating and testing of the heating system needs to be done prior to the installation of the tile. The tile installation cannot be done when floor heat is in use and may need a minimum of 7 days after tile installation before the radiant heating system can be turned on. Verify with manufacturer.
- Movement joints to be installed only at the tile surface at a maximum of 3600 mm for radiant heated floors. Width and spacing to be determined by consultant or manufacturer.
- Gypsum cement may be substituted for cementitious mortar bed
- Modular screed panel can be used without radiant heat.

Continued

C2



# TILE OVER HEATED FLOOR SYSTEMS

## 314F-2012-2014

### DETAIL D – MORTAR BED BONDED TO CONCRETE SLAB – INTERIOR/EXTERIOR

#### SUITABLE SUBSTRATES

- Floor systems over which the tile will be installed shall be in conformance with the Canadian National Building Code 2010 and applicable local building codes taking into consideration anticipated live and dead loads.

#### MATERIALS

- TILE
- MORTAR BED – See Tile Specification Section Mixes 2.5.3 or cementitious self-levelling underlayment.
- BOND COAT – **Interior:** Portland cement slurry on concrete slab and on fresh mortar bed. Dry-set mortar (minimum acceptable standard ANSI A 118.1 or ISO C1), latex-Portland cement mortar (minimum acceptable standard ANSI A 118.4 or ISO C2S1), or modified epoxy emulsion mortars (minimum acceptable standard ANSI A 118.3 or ISO R1), over mortar bed, cured for minimum of 24 hours. 100% solids epoxy mortar on mortar bed, cured a minimum of 7 days. **Exterior:** Two component liquid latex-Portland cement mortar (minimum acceptable standard ANSI A 118.4 or ISO C2S1).
- GROUT – **Interior:** Portland cement, latex-Portland cement (minimum acceptable standard ANSI A 118.6 or ISO CG1) or epoxy grouts (minimum acceptable standard ANSI A 118.3 or ISO RG). **Exterior:** latex-Portland cement (minimum acceptable standard ANSI A 118.6 or ISO CG1).

#### APPLICATION

- Following installation of electric heating cable or hydronic tubing (by others), apply mortar bed (see Tile Guide Specification Section Mixes 2.5.3) to required thickness over fresh slurry bond coat (see Tile Guide Specification Section
- Mixes 2.5.2). Finished tolerance of mortar bed not to exceed 6 mm in 3000 mm or 2 mm in 300 mm. For large format tile where one edge is 380 mm or larger, surface variation should not exceed 3 mm in 3000 mm. Apply tile to bond coat before bond coat skins over. Use sufficient bond coat to ensure minimum 95% contact on exterior surfaces and wet areas and a minimum 80% contact on interior surfaces. Contact shall be evenly distributed to give full support of the tile. Apply Portland cement paste on fresh mortar bed, and dry-set mortar or latex-Portland cement mortar over mortar bed cured for minimum of 24 hours. On fresh mortar bed, beat tile into position. On cured mortar bed, slide tile into position. Allow bond coat to cure. Force grout into full depth of joint, remove excess grout and clean.

#### LIMITATIONS

- Manufacturer's recommendations must be followed.
- The thickness of the mortar bed / cementitious self levelling underlayment should be 32 mm minimum interior and 38 mm minimum exterior above heating pipes.
- Follow manufacturers requirements for maximum moisture content in concrete slab prior to application of underlayment. eg. 1.36K per 93m<sup>2</sup> per 24 hours.
- Do not use light weight aggregate in mortar bed.
- For residential or light commercial use only.

#### OTHER CONSIDERATIONS

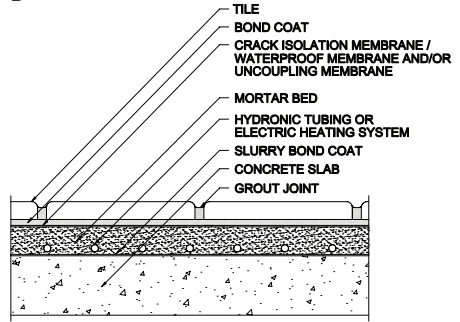
- Latex additive is recommended for Portland cement bond coat, and may be used in modification of mortar bed. Follow manufacturer's recommendations. Use of latex additive in mortar bed and bond coat is mandatory in exterior applications.
- Tile used on exterior applications must be frost resistant.
- Refer to Notes For The Professional and 301MJ-2012-2014.
- Where incorporating heating cable on interior or exterior concrete substrates is desired, refer to details 309F-2012-2014 and 310F-2012-2014 and incorporate heating cables in the bottom of the mortar bed. When hydronic heating is used in mortar bed, increase thickness of mortar bed to give minimum 32 mm of mortar bed over heating tubing.
- Certain proprietary systems may allow thin-set installation with latex-Portland cement as per Detail C and Detail E.
- Heating system: design, installation and inspection by others. Pre heating and testing of the heating system needs to be done prior to the installation of the tile. The tile installation cannot be done when floor heat is in use and may need a minimum of 7 days after tile installation before the radiant heating system can be turned on. Verify with manufacturer.
- Movement joints shall be installed at a maximum 3600 mm for radiant heated floors. Width and spacing of joints to be specified by consultant.
- Latex-Portland cement mortars (minimum acceptable standard ANSI A 118.4 or ISO C2S1) may require 14-60 days cure before exposure to water. Verify with the manufacturer the correct time required. Alternatively, to reduce curing time required, a rapid set mortar (ISO C1F or C2F) may be more suitable.

Continued



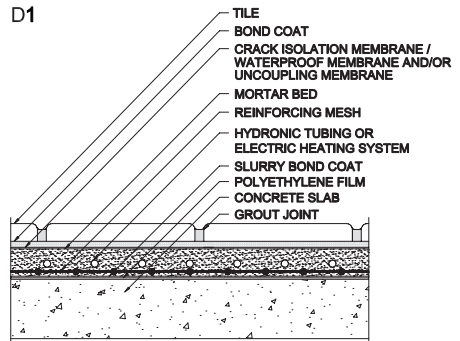
Please refer to page 8.

D



Please refer to page 8.

D1



# TILE OVER HEATED FLOOR SYSTEMS 314F-2012-2014



Please refer to page 8.

## DETAIL E – THIN-SET ON CONCRETE SLAB INTERIOR ONLY

### SUITABLE SUBSTRATES

- Floor systems, including the framing system and subfloor panels, over which the tile will be installed, shall be in conformance with the Canadian National Building Code 2010 and applicable local building codes taking into consideration anticipated live and dead loads.

### MATERIALS

- TILE
- BOND COAT – Dry-set mortar (minimum acceptable standard ANSI A 118.1 or ISO C1), latex-Portland cement mortar (minimum acceptable standard ANSI A 118.4 or ISO C2S1), modified epoxy emulsion mortars, 100% solids epoxy mortar, epoxy adhesive (minimum acceptable standard ANSI A 118.3 or ISO R1), or organic adhesives (minimum acceptable standard ANSI A 118.3 or ISO R1).
- GROUT – Portland cement, latex-Portland cement (minimum acceptable standard A 118.6 or ISO CG1), or epoxy grouts (minimum acceptable standard ANSI A 118.3 or ISO RG).

### APPLICATION

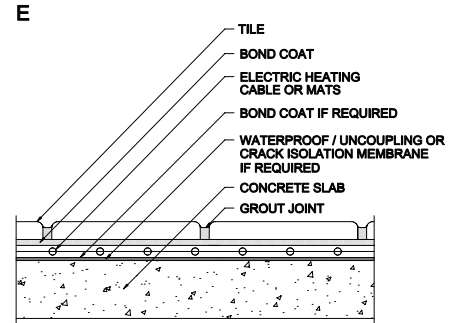
- Following installation of electric heating cable or mat (by others) apply tile to bond coat before bond coat skins over. Use sufficient bond coat to ensure minimum 80% contact. Contact shall be evenly distributed to give full support of the tile. Slide tile firmly into position. Allow bond coat to cure.
- Force grout into full depth of joint, remove excess grout and clean.

### LIMITATIONS

- Manufacturer's recommendations must be followed.

### OTHER CONSIDERATIONS

- If waterproof/crack isolation membrane is required follow manufacturer's recommendations (ANSI A 118.10)
- Heating system - design, installation and inspection by others. Pre heating and testing of the heating system needs to be done prior to the installation of the tile. The tile installation cannot be done when floor heat is in use and may need a minimum of 7 days after tile installation before the radiant heating system can be turned on. Verify with manufacturer.
- Refer to Notes For The Professional and 301MJ-2012-2014.
- Uncoupling system to be placed over heating system. Follow manufacturers recommendations.
- Insulation layer may be required below concrete slab for maximum heating efficiency. Consult heating manufacturer for types and thicknesses.
- Radiant pipe/tube may be substituted for electric wire radiant heat system
- Electric radiant heat system conforming to UL (CAN/CSA) C22.2 #217



Continued

# TILE OVER HEATED FLOOR SYSTEMS

## 314F-2012-2014



Please refer to page 8.

### DETAIL F – GYPSUM UNDERLAYMENT OVER CONCRETE SLAB

#### SUITABLE SUBSTRATES

- Interior concrete slabs, steel trowel or fine broom finish where no moisture intrusion occurs.
- Floor systems, including the framing system and subfloor panels, over which the tile will be installed shall be in conformance with the Canadian National Building Code 2010 and applicable local building codes taking into consideration anticipated live and dead loads.

#### MATERIALS

- TILE
- BOND COAT – Latex-Portland cement mortar (minimum acceptable standard ANSI A 118.4 or ISO C2), modified epoxy emulsion mortar (minimum acceptable standard ANSI A 118.3 or ISO R1).
- Gypsum concrete underlayment meeting performance requirements of ASTM C627. Minimum compressive strength of 15 MPa when tested by ASTM C472.
- Primer/sealer as per gypsum manufacturer recommendations.
- Crack isolation membrane – ANSI A 118.12 or waterproof membrane – ANSI A 118.10.
- Uncoupling system to manufacturer's recommendations.
- Radiant heat system (by others).
- GROUT – Latex-Portland cement (minimum acceptable standard ANSI A 118.6 or ISO CG1), epoxy (minimum acceptable standard ANSI A 118.3 or ISO RG).

#### APPLICATION

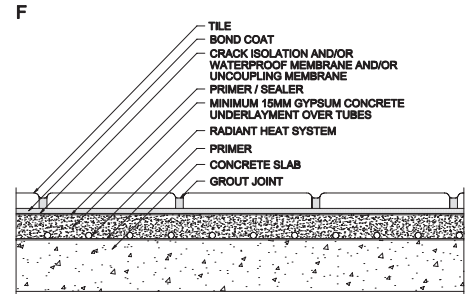
- Concrete slab to be well cured, dimensionally stable, free of contaminants such as oil, sealers, hardening or curing chemicals applied to the surface or incorporate in the mix. Following installation of radiant heat system, apply a minimum of 19 mm gypsum concrete underlayment over heating tubes, consult the manufacturer for specific recommendations when used with floor heating system. Maximum variation of screed should not exceed 6 mm in 3000 mm. For large format tile where one edge is 380 mm or larger, surface variation should not exceed 3 mm in 3000 m Gypsum underlayment must be fully dry /cured prior to installation of primer / sealer, crack isolation membrane, waterproof membrane or uncoupling membrane, follow manufacturer's recommendations. Primer / sealer must be compatible with setting material. Apply tile to bond coat before bond coat skims over. Use sufficient bond coat to ensure minimum of 80% contact. Contact shall be evenly distributed to give full support of the tile. Slide tile firmly into position. Allow bond coat to cure. Force grout into full depth of joints, remove excess grout and clean.

#### LIMITATIONS

- Manufacturers recommendations must be followed.
- For residential or light commercial use only.
- Not recommended for below – grade installations and areas subject to extreme moisture.
- Thickness of gypsum concrete should be 15 mm minimum
- Prior to application of gypsum concrete underlayment consult with waterproof membrane manufacturer.
- Consult with gypsum concrete manufacturer for proper curing time prior to application of tile and to the minimal time required before heat system is activated.
- Gypsum concrete underlayment installation only by a manufacturer qualified installer in accordance with the manufacturer's instructions and recommendations.

#### OTHER CONSIDERATIONS

- Gypsum concrete underlayment may also be used over wood floors providing that two layers of plywood are used. See detail 313F-2012-2014 drawing (A).
- If an uncoupling system is used, one single layer of plywood minimum thickness of 20 mm is acceptable providing the floor trusses or l – joist are spaced at no more than 480 mm o.c.
- Some gypsum concrete underlayment manufacturers recommend the use of plastic lath for application over wood substrate, follow manufacturers recommendations for best practice.
- Cross bridge floor joist but preferably solid blocking.
- Refer to Notes For The Professional.
- Uncoupling system to be placed over heating system. Follow manufacturers recommendations
- Control joints as per detail 301MJ-2012-2014 and gypsum concrete manufacturer recommendations.
- Heating system - design, installation and inspection by others. Pre heating and testing of the heating system needs to be done prior to the installation of the tile. The tile installation cannot be done when floor heat is in use and may need a minimum of 7 days after tile installation before the radiant heating system can be turned on. Verify with manufacturer.



Continued

# TILE OVER HEATED FLOOR SYSTEMS

## 314F-2011/2013

### DETAIL G – MODULAR SCREED SYSTEM

#### SUITABLE SUBSTRATES

- Interior or exterior concrete slabs. Floor systems over which the tile is installed shall be in conformance with the Canadian National Building Code 2010 and applicable local building codes taking into consideration anticipated live and dead loads.

#### MATERIALS

- TILE
- BOND COAT – **Interior:** Dry-set mortar (minimum acceptable standard ANSI A 118.1 or ISO C1), latex-Portland cement mortar (minimum acceptable standard ANSI A 118.4 or ISO C2). **Exterior:** Two component liquid latex-Portland cement mortar (minimum acceptable standard ANSI A 118.4 or ISO C2S1) or follow uncoupling manufacturer's recommendations.
- UNCOUPLING MEMBRANE – following manufacturer's recommendations
- MODULAR SCREED PANEL – Expanded polystyrene panel with density no less than 32 kg/m<sup>3</sup>.
- GROUT – **Interior:** Portland cement, latex-Portland cement (minimum acceptable standard ANSI A 118.6 or ISO CG1) or epoxy (minimum acceptable standard ANSI A 118.3 or ISO RG). **Exterior:** Latex-Portland cement (minimum acceptable standard ANSI A 118.6 or ISO CG1).

#### APPLICATION

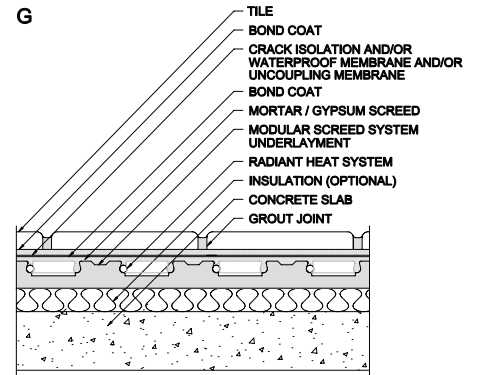
- Apply mortar bed (see Tile Guide Specification Section 2.5.5) to required thickness (see Tile Guide Specification Section 2.5.2). Finished tolerance of mortar bed not to exceed 6 mm in 3000 mm or 2 mm in 300 mm. For large format tile where one edge is 380 mm or larger, surface variation should not exceed 3 mm in 3000 m. Apply membrane to mortar bed as recommended by manufacturer. Apply tile to bond coat before bond coat skins over. Use sufficient bond coat to ensure a minimum 80% contact on tile back. If 95% coverage is specified refer to 3.3.10. Contact shall be evenly distributed to give full support of the tile. Allow bond coat and grout to cure as recommended by the manufacturer for the type of environment and exposure anticipated. Force grout into full depth of joint, flush with tile surface. Remove excess grout by using fl oat at a 90° angle and clean with a sponge and plenty of water.

#### LIMITATIONS

- Thickness of the mortar bed should not exceed more than 25 mm above the top of the pedestals of the modular screed panel.
- Verify with manufacturer maximum weight capacity.

#### OTHER CONSIDERATIONS

- Refer to Notes For The Professional and 301MJ-2013/2013. Extra insulation layer may be required between concrete slab and Modular screed panel. Consult manufacturer for type and thickness.
- Heating system - design, installation and inspection by others. Pre heating and testing of the heating system needs to be done prior to the installation of the tile. The tile installation cannot be done when floor heat is in use and may need a minimum of 7 days after tile installation before the radiant heating system can be turned on. Verify with manufacturer.
- Movement joints to be installed only at the tile surface at a maximum of 3600 mm for radiant heated floors. Width and spacing to be determined by consultant or manufacturer.
- Gypsum cement may be substituted for cementitious mortar bed.
- Modular screed panel can be used without radiant heat.



# TILE INSTALLED ON INTERIOR/EXTERIOR CEILINGS OR SOFFITS

## 315C-2012-2014

### DETAIL A – MORTAR BED OVER CONCRETE

#### SUITABLE SUBSTRATES

- Clean, sound, stable concrete.

#### MATERIALS

- TILE
- METAL LATH (optional) 1.4 kg/m<sup>2</sup> (ASTM C847 corrosion resistant lath).
- SCRATCH COAT (7 mm minimum). See Tile Guide Specification Section Mixes 2.5.1.
- MORTAR BED – (20 mm+). See Tile Guide Specification Section Mixes 2.5.3.
- BOND COAT – **Interior:** Portland cement slurry on fresh mortar bed, latex-Portland cement mortars (minimum acceptable standard ANSI A 118.4 or ISO C2) or dry-set mortar (minimum acceptable standard ANSI A 118.1 or ISO C1) on mortar bed cured for minimum of 24 hours. See Tile Guide Specification Section Mixes 2.5.3. Metal Lath may be required for surfaces that present bonding problems. **Exterior:** Single or two component liquid latex-Portland cement mortar (minimum acceptable standard ANSI A 118.4 or ISO C2S1).
- GROUT – **Interior:** Latex-Portland cement (minimum acceptable standard ANSI A 118.6 or ISO CG1) or epoxy (minimum acceptable standard ANSI A 118.3 or ISO RG). **Exterior:** Latex-Portland cement (minimum acceptable standard ANSI A 118.6 or ISO CG1).

#### APPLICATION

- Attach metal lath, if required, according to manufacturer's recommendations. Apply scratch coat and cure overnight. Apply mortar bed to required thickness. Finished tolerance of mortar bed not to exceed 6 mm in 3000 mm or 2 mm in 300 mm. For large format tile where one edge is 380 mm or larger, surface variation should not exceed 3 mm in 3000 m. Apply tile to bond coat, before bond coat skins over. Use sufficient bond coat to ensure minimum 95% contact on exterior surfaces and wet areas and a minimum 80% on interior surfaces. Contact to be evenly distributed to give full support of the tile. Slide tile firmly into position. Beat mosaic tile into position. Allow bond coat to cure. Force grout into full depth of joint, remove excess grout and clean.

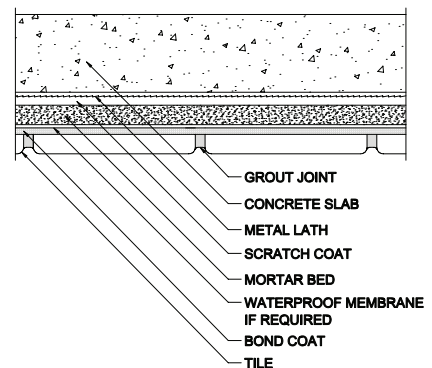
#### LIMITATIONS

- Manufacturer's recommendations must be followed.
- Do not use paper-back or mesh-back mounted tile for exterior use or in locations of extreme moisture unless the manufacturer guarantees that the material is suitable for this type of installation.
- For thin-set method concrete surface must be clean, dimensionally stable, cured and free of contaminants such as oil, sealers, paint and curing compounds.

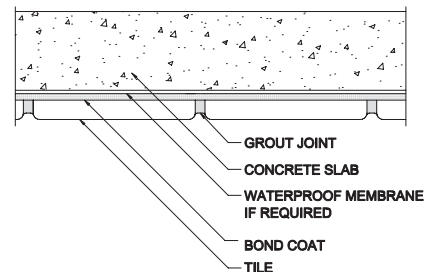
#### OTHER CONSIDERATIONS

- Latex additive is recommended for modification of scratch coat, mortar bed and Portland cement bond coat. Follow manufacturer's recommendations. Where job conditions require additional thickness, allow 24 hours cure between coats.
- Tile used on exterior applications must be frost resistant.
- Refer to Notes For The Professional and 301MJ-2012-2014.
- Waterproof membrane if required must be specified. (ANSI A 118.10)
- Follow manufacturer's recommendations
- Latex-Portland cement mortars may require 14 – 60 days cure before exposure to water. Verify with the manufacturer the correct cure time required. Alternatively, to reduce the curing time required, a rapid set mortar may be more suitable.
- For ease of installation a non sag mortar or light weight mortar may be considered.
- For thin-set applications see Detail A-2.

A1



A2



Continued

# TILE INSTALLED ON INTERIOR/EXTERIOR CEILINGS OR SOFFITS

## 315C-2012-2014

### DETAIL B – THIN-SET METHOD OVER BACKER UNIT/BOARD

#### SUITABLE SUBSTRATES

- Wood or metal studs, maximum 406 mm o.c.

#### MATERIALS

- VAPOUR RETARDER – 6 mils polyethylene film – required in wet areas.
- Cementitious backer units (CBU) (ANSI A 118.9) or coated glass mat backer board (ASTM C1178) or gypsum board (ASTM C36) (dry areas only).
- TILE
- TAPE – Alkali-resistant fibre-mesh at least 51 mm wide
- SLIGHT LEVELLING COAT – if required
- BOND COAT – **Interior:** Latex-Portland cement (minimum acceptable standard ANSI A 118.4 or ISO C2), mortar, dry-set mortar (minimum acceptable standard ANSI A 118.1 or ISO C1) or modified epoxy emulsion mortar (minimum acceptable standard ANSI A 118.3 or ISO R1). **Exterior:** Two component liquid latex-Portland cement mortar (minimum acceptable standard ANSI A 118.4 or ISO C2S1).
- GROUT – **Interior:** Latex-Portland cement (minimum acceptable standard ANSI A 118.6 or ISO CG1), epoxy (minimum acceptable standard ANSI A 118.3 or ISO RG). **Exterior:** Latex-Portland cement (minimum acceptable standard ANSI A 118.6 or ISO CG1).

#### APPLICATION

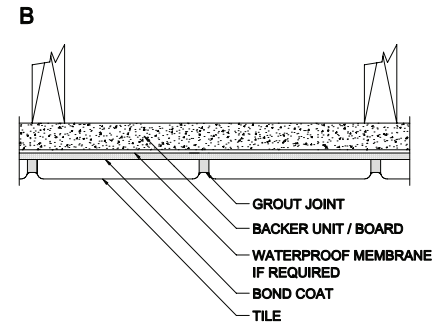
- Cementitious backer unit (CBU) or coated glass mat backer board must be level, stable, square and screwed to studs with corrosion resistant screws. Do not countersink screws. Surface variation in the backing not to exceed 6 mm in 3000 mm or 2 mm in 300 mm. For large format tile where one edge is 380 mm or larger, surface variation should not exceed 3 mm in 3000 m. Apply levelling coat if required. All joints must be taped with 51 mm fibre mesh tape, filled with a dry-set or latex mortar, and sanded. Do not sand coated glass mat backer board unless a waterproof membrane is used after sanding. Apply thin-set bond coat to cement board surface using proper notched trowel to ensure adequate bond. Slide tile or beat mosaic firmly into position while bond coat is wet and tacky. Use sufficient bond coat to ensure minimum 95% contact on exterior surfaces and wet areas and minimum 80% on interior surfaces. Force grout into full depth of joint, remove excess grout and clean.

#### LIMITATIONS

- Manufacturer's recommendations must be followed. Exterior tile installations should not be attempted when temperature is less than 12°C. Do not use paper-back or mesh-back mounted tile for exterior use or in locations of extreme moisture unless the manufacturer guarantees that the material is suitable for this type of installation.
- Framing for ceiling shall be capable of supporting weight of tile and backup system.
- A waterproof membrane or vapour retarder not to be used behind coated glass mat backer board.
- All requirements for exterior applications must be met.
- Coated glass mat backer board is not recommended for exterior applications.

#### OTHER CONSIDERATIONS

- Spacing and minimum gauge of steel studs as per instructions of manufacturer of cementitious backer unit (CBU) or coated glass mat backer board on exterior installation.
- Waterproof membrane if required must be specified. (ANSI A 118.10) Follow manufacturer's recommendations
- Tile used on exterior applications must be frost resistant.
- Refer to Notes For The Professional and 301MJ-2012-2014.
- For high use showers (hotels, gang showers, sports facilities, etc.) a waterproof membrane shall be used.
- All openings and cuts must be treated to ensure waterproof integrity.
- Latex-Portland cement mortars may require 14 – 60 days cure before exposure to water. Verify with the manufacturer the correct cure time required. Alternatively, to reduce the curing time required, a rapid set mortar may be more suitable.



# TILE TUB OVER WOOD FRAME - THIN-SET METHOD OVER MORTAR BED

## 316B-2012-2014



Please refer to page 8.

### SUITABLE SUBSTRATES

- Minimum 16 mm exterior-grade plywood over wood joist, maximum 406 mm o.c. covered with waterproof membrane.

### MATERIALS

- TILE
- METAL LATH – 1.4 kg/m<sup>2</sup> (ASTM C847)
- MORTAR BED – Minimum 20 mm on vertical surface, and 32 mm on horizontal surface. See Tile Guide Specification Section Mixes 2.5.3 and 2.5.5.
- BOND COAT – Latex-Portland cement mortar (minimum acceptable standard ANSI A 118.4 or ISO C2 or better).
- GROUT – Portland cement, latex-Portland cement (minimum acceptable standard ANSI A 118.6 or better or ISO CG1) or epoxy (minimum acceptable standard ANSI A 118.3 or ISO RG).

### APPLICATION

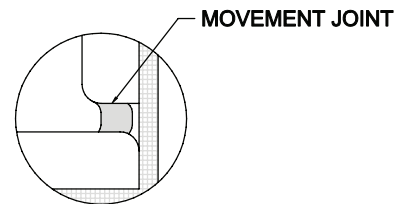
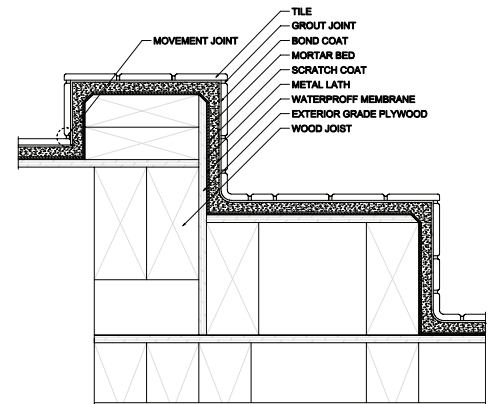
- Install waterproof membrane over plywood following manufacturers' recommendations. Installation of drainage fittings and testing for leaks by others prior to tile work. Install metal lath attaching only to substrate above water line. Apply scratch coat. Let cure 24 hours minimum. Apply mortar bed to required thickness and let cure minimum of 48 hours. Finished tolerance of mortar bed not to exceed 6 mm in 3000 mm or 2 mm in 300 mm. For large format tile where one edge is 380 mm or larger, surface variation should not exceed 3 mm in 3000 m. Slope floor to drain. Apply bond coat to mortar bed in sufficient quantity to provide minimum 95% contact with back of tile. Slide tile firmly into position. Beat mosaic into position. Contact should be evenly distributed to give full support of the tile. Allow bond coat to cure minimum 7 days before grouting. Force grout into full depth of joint, remove excess grout and clean.

### LIMITATIONS

- For use on interior applications only.

### OTHER CONSIDERATIONS

- Under conditions of low temperatures or high humidity, required drying time before grouting can vary from 14 to 60 days. Where job conditions permit, longer drying time is recommended.
- Drains should be designed to permit drainage of water at the tile surface and the surface of the waterproof membrane.  
For drainage see Detail 326DR-2012-2014.
- Where necessary provide a control joint around perimeter of curb.
- Shorter curing times may be achieved with specific products as recommended by the manufacturer.
- For installation of waterproof membrane follow manufacturer's recommendations (ANSI A 118.10)
- Refer to Notes For The Professional and 301MJ-2012-2014.
- For high use showers (hotels, gang showers, sports facilities, etc.) refer to Detail 319SR-2012-2014 Detail A & B. All openings and cuts must be treated to ensure waterproof integrity
- Latex-Portland cement mortars may require 14 – 60 days cure before exposure to water. Verify with the manufacturer the correct cure time required. Alternatively, to reduce the curing time required, a rapid set mortar may be more suitable.
- If required, an underbed may be installed over a fresh scratch coat.



# TILE INSTALLED OVER CONCRETE IN SWIMMING POOLS OR TANKS

## 317SP-2012-2014



Please refer to page 8.

### SUITABLE SUBSTRATES

- Interior or exterior: cured concrete designed for no deflection when pool or tank is full.

### MATERIALS

- TILE
- Scratch coat mortar bed and bond coat to be single or 2 component liquid latex-Portland cement mortar (minimum acceptable standard ANSI A 118.4 or ISO C2S1).
- GROUT – Latex modified grout (minimum acceptable standard ANSI A 118.6 or ISO CG1) qualified for swimming pool installations, epoxy grout (minimum acceptable standard ANSI A 118.3 or ISO RG).
- Waterproof membrane (ANSI A 118.10).

### APPLICATION

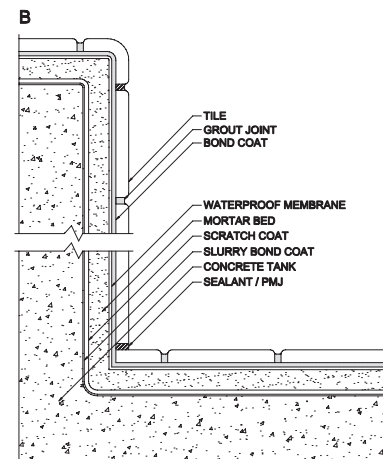
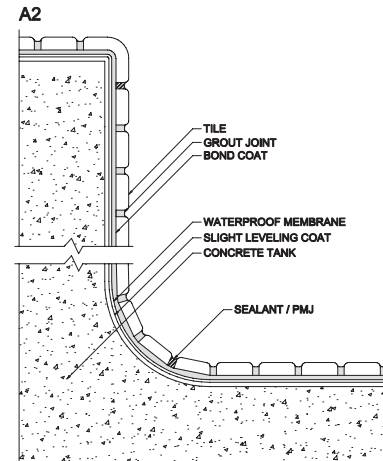
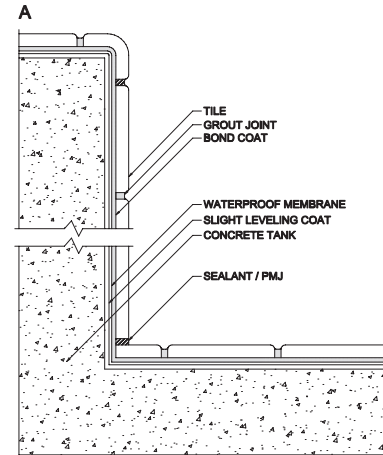
- Apply slight levelling coat as required. Install waterproof membrane over concrete according to manufacturers' recommendations. Installation of fittings and testing for leaks by others prior to tile work. Apply bond coat and grout as per detail 316B-2012-2014. For detail (B), install scratch coat (see Tile Guide Specification Section Mixes 2.5.1) and mortar bed (see Tile Guide Specification Section Mixes 2.5.3 and 2.5.5) in accordance with 302W-2012-2014 and 310F-2012-2014 and cure minimum of seven days. Finished tolerance of mortar bed not to exceed 6 mm in 3000 mm or 2 mm in 300 mm. For large format tile where one edge is 380 mm or larger, surface variation should not exceed 3 mm in 3000 mm. Apply bond coat in sufficient quantity to provide minimum 95% contact with back of tile. Contact should be evenly distributed to give full support of the tile. Slide tile firmly into position. Beat mosaic tile into position. Allow bond coat to cure minimum of seven days before grouting. Force grout into full depth of joint, remove excess grout and clean.
- It is mandatory to have movement joints provided for both interior and exterior.

### LIMITATIONS

- Ensure bond coat is compatible with waterproof membrane.
- Manufacturer's recommendations must be followed. Exterior tile installations should not be attempted with a temperature of less than 12°C.
- Thin-set application substrate surface variation not to exceed 6 mm in 3000 mm and/or 2 mm in 300 mm. For large format tile where one edge is 380 mm or larger, surface variation should not exceed 3 mm in 3000 mm. For a slight substrate irregularity, a latex Portland cement mortar or an epoxy mortar levelling coat may be required prior to installation by a thin-set method up to 5 mm thick and allowed to set before application of other materials. A levelling coat in excess of 5 mm should be installed with the mortar bed method. If required, the method must be specified by the consultant.

### OTHER CONSIDERATIONS

- Under conditions of low temperature or high humidity, drying time before grouting can vary from 14 to 60 days. Where job conditions permit, longer drying time is recommended. Swimming pools used in competition must have accurate dimensions, which may require use of detail (B) to meet tolerances. Waterproof membrane may be eliminated if concrete tank is constructed to be watertight or if tank is installed in ground with suitable drainage provided. Provide drains to permit drainage of water at the tile surface and the surface of the waterproof membrane. For drainage see Detail 326DR-2012-2014.
- Tile must be moisture resistant.
- Tile used on exterior applications must be frost resistant.
- Shorter curing times may be achieved with specific products as recommended by the manufacturer.
- Refer to Notes For The Professional and 301MJ-2012-2014.
- All pipes and protrusions must be treated to ensure waterproof integrity.



# TILE INSTALLED ON INTERIOR/EXTERIOR STAIRS

## 318S-2012-2014

### (A) STEEL PAN

- Steel rod and reinforcing mesh approximately 13 mm above pan bottom. Application as per Detail 309F-2012-2014 but omit cleavage membrane or vapour retarder.

### (B) STEEL STAIRS

- Metal lath fastened to metal stair on steel treads and risers by tie wires or spot welded by steel fabricator. Application as per Detail 308W-2012-2014 but omit cleavage membrane or vapour retarder.

### (C) WOOD STAIRS - INTERIOR ONLY

- Nail galvanized metal lath to wood substrate over cleavage membrane (vapour retarder). Install mortar bed and tile according to Detail 308W-2012-2014 but increase thickness of mortar bed on horizontal surface to a minimum of 32 mm.

- (D) Application of materials as per Detail 310F-2012-2014 (A) for treads and 302W-2012-2014 for risers.

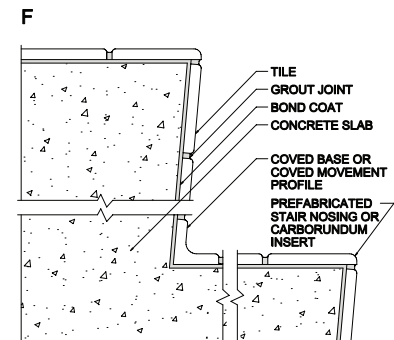
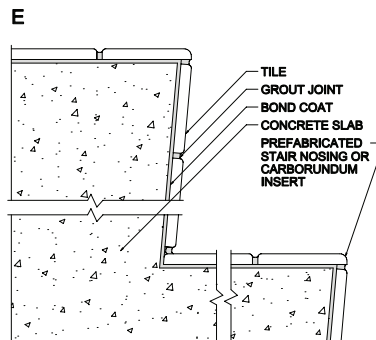
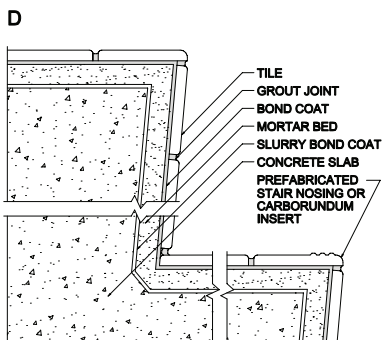
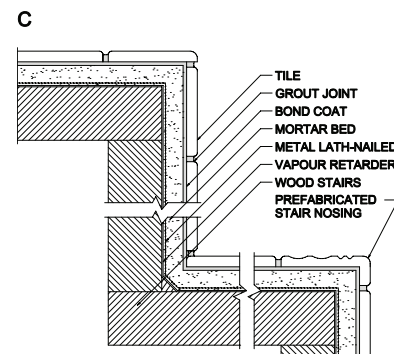
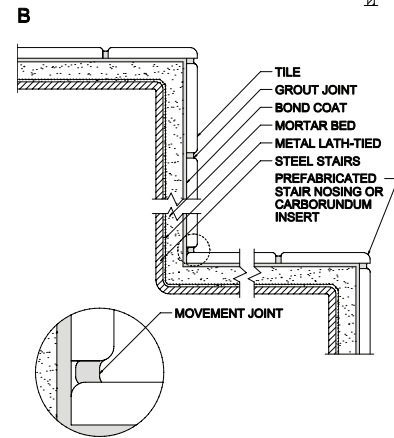
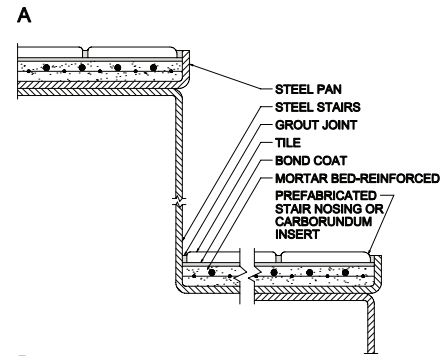
- (E) Application of material as per Detail 303W-2012-2014 and 311F-2012-2014 but apply slight levelling coat to substrate if required and cure a minimum of 24 hours before application of tile.

### LIMITATIONS

- Organic adhesives are not acceptable for these applications.

### OTHER CONSIDERATIONS

- For easy maintenance, use cove base tile or cove movement profile at junction of riser and tread. Wood stairs not recommended for exterior applications. On exterior stairs, a slight slope on treads is preferred to provide drainage. Provide tactile surface prior to stairs where required for visually handicapped. Where required, use a 51 mm strip of contrasting colour at edge of first and last step.
- Precast terrazzo and natural stone tile may be used providing that slip resistant properties are acceptable.
- For detail B and C, mortar bed may be installed over fresh scratch coat.
- Prefabricated stair nosings or carborundum inserts should be used for increased safety precautions.
- Slip resistance for stair treads must be a minimum of 0.6 wet or dry.
- Tile used in exterior applications must be frost resistant.
- To minimize the potential for cracking use a sealant or prefabricated movement joint at the junction between the riser and tread.
- For exterior applications a waterproof membrane is recommended. Follow manufacturer's recommendations. (ANSI A 118.10)
- Stair risers to be not less than 125 mm and not more than 180 mm.
- Treads & risers must have uniform rise and run in any one flight.
- Treads must have run not less than 280 mm between successive steps.
- Stair nosing cannot be canter levered over the riser and edge. The leading edge of the stair tread shall have either a radius or a bevel between 8 mm and 13 mm in horizontal dimensions.
- Refer to Notes For The Professional and 301MJ-2012-2014.
- For Detail A, B, D, and E use sufficient bond coat to ensure a minimum 95% contact on exterior surfaces and wet areas and minimum 80% on interior surfaces.
- For Detail C use sufficient bond coat to ensure minimum 80% contact.



# TILE ON SHOWER RECEPTORS

## 319SR-2012-2014

### DETAIL A - ON SOLID BACKING OR MORTAR BED OVER WOOD OR METAL STUDS

#### SUITABLE SUBSTRATES

- Shower pan or waterproof membrane over structural base.
- Wall constructed in accordance with Details 303W-2012-2014, 307W-2012-2014 and 308W-2012-2014.

#### MATERIALS

- TILE
- SHOWER PAN OR MEMBRANE – Installed over sloped base.
- MORTAR BED – Minimum of 32 mm to 51 mm sloped to drain. See Tile Guide Specification Mixes 2.5.3 and 2.5.5.
- BOND COAT – Portland cement paste on fresh mortar bed, and dry set mortar (minimum acceptable standard ANSI A 118.1 or ISO C1) or latex-Portland cement mortar (ANSI A 118.4 or ISO C2) or modified epoxy emulsion mortar (ANSI A 118.3 or ISO R1) over mortar bed cured for minimum of 24 hours.
- GROUT – Portland cement or latex-Portland cement (minimum acceptable standard ANSI A 118.6 or ISO CG1), epoxy grout (minimum acceptable standard ANSI A 118.3 or ISO RG).

#### APPLICATION

- Provide 6 mm in 300 mm slope to drain in floor. For heavy duty installations, wall constructed according to Detail 303W-2012-2014, 307W-2012-2014 or 308W-2012-2014 is recommended. Carry membrane or pan at least 75 mm above shower curb, or 150 mm above floor in showers without curbs. Latex additive use in place of water is recommended for Portland cement bond coat, and may be used in modification of mortar bed.

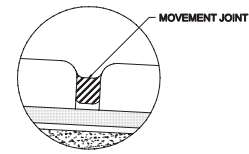
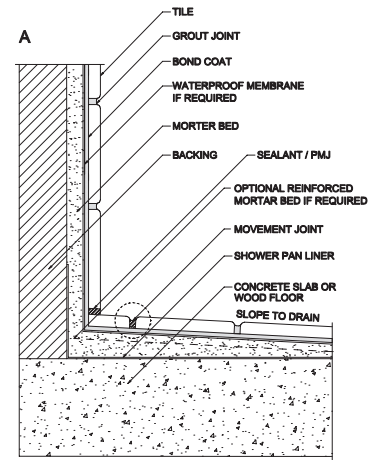
#### LIMITATIONS

- Do not use paper back or mesh back mounted tile in wet areas unless the manufacturer guarantees that the material is suitable for this type of installation.
- Ensure bond coat is compatible with waterproof membrane.
- Manufacturers' recommendations must be followed.

#### OTHER CONSIDERATIONS

- Drains should be designed to permit drainage of water at the tile surface and the surface of the waterproof membrane. For drainage see Detail 326DR-2012-2014. A drainage layer may be incorporated over the waterproof membrane as recommended by the manufacturer if a traditional double weep hole drain is used.
- When using a shower pan, a waterproof membrane is recommended below bond coat.
- Tile should be moisture resistant. Type MR1 or some MR2. Refer to page 7.
- For high use showers (hotels, gang showers, sports facilities, etc.) a waterproof membrane shall be used.\*
- Waterproof membrane if required must be specified. (ANSI A 118.10) Follow manufacturer's recommendations.
- If waterproof membrane is not used a vapor retarder must be used behind the mortar bed or solid backing
- All openings and cuts must be treated to ensure waterproof integrity.
- Refer to Notes For The Professional.
- If waterproof membrane is not specified a slurry bond coat must be applied to concrete slab.
- Solid backing must be suitable for a wet environment.

- \* If the shower is high use or is actually a steam shower, and the waterproof membrane is acting as both the waterproofing membrane and the vapor retarder the waterproof membrane must have a perm rating of .5 or less using ASTM E-96 Procedure E with 90 % humidity. If the waterproof membrane has a perm rating higher than .5 then a vapor retarder should be used behind the solid backing that has a perm rating 1.0 or less when tested with ASTM E-96 Procedure A.



Continued

# TILE ON SHOWER RECEPTORS

## 319SR-2012-2014

### DETAIL B – THIN-SET ON BACKER UNIT/BOARD

#### SUITABLE SUBSTRATES

- Wood or metal studs, maximum 406 mm o.c.
- Shower pan or waterproof membrane over structural base
- Wall constructed in accordance with Details 305W-2012-2014 Detail A or B.

#### MATERIALS

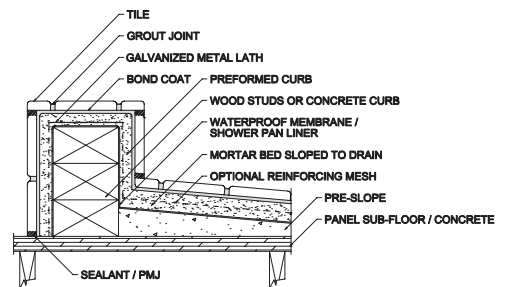
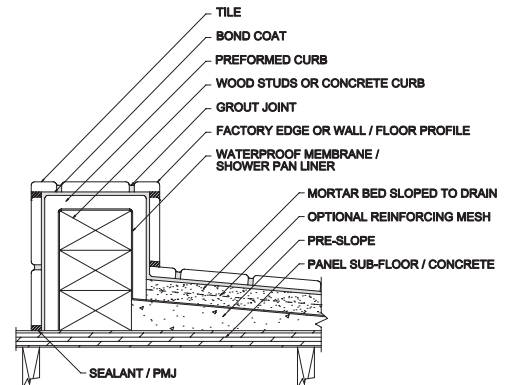
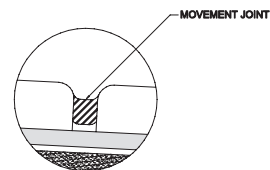
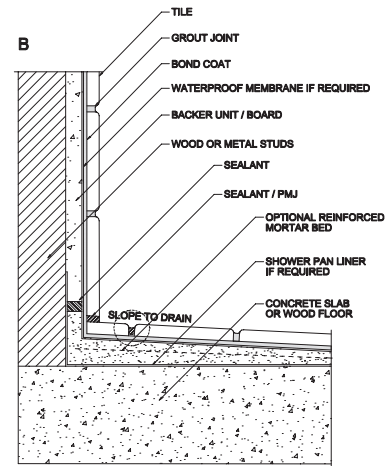
- Cementitious backer unit (ANSI A 118.9) or nominal 11 mm thick fibre-cement backer board meeting ASTM C1288 or coated glass mat backer board (ASTM C1178) – minimum 13 mm thick.
- TILE
- SHOWER PAN – a membrane installed over sloped base.
- MORTAR BED – minimum of 32 mm to 51 mm sloped drain. See Tile Guide Specification Section Mixes 2.5.5.
- TAPE – 51 mm wide fibre-mesh tape
- BOND COAT – Single or two component liquid latex-Portland cement mortar (minimum acceptable standard ANSI A 118.4 or ISO C2S1)
- GROUT – Portland cement or latex-Portland cement (minimum acceptable standard ANSI A 118.6 or ISO CG1), epoxy grout (minimum acceptable standard ANSI A 118.3 or ISO RG).

#### APPLICATION

- Attach backer unit or coated glass mat backer board to studs with rust resistant screws or nails. Fasteners shall be spaced 150 mm o.c. Backer unit must be stable, plumb and square with coated grey side of coated glass mat backer board away from the studs. Drive fasteners flush with coated surface. Do not countersink. Surface variation in the backing not to exceed 6 mm in 3000 mm or 2 mm in 300 mm and can be applied either parallel or perpendicular to framing. For large format tile where one edge is 380 mm or larger, surface variation should not exceed 3 mm in 3000 m. Apply levelling coat, if required. All joints and angles must be taped with alkali-resistant 51 mm fibre-mesh tape, filled with a latex-Portland cement mortar and sanded. Do not sand coated glass mat backer board. For all joints and angles embed an alkali-resistant 51 mm wide fibre-mesh tape in the same bond coat material used to set the tiles and let dry. Apply thin-set bond coat material used to set the tiles and let dry. Apply thin-set bond coat to cementitious backer unit (CBU) or coated glass mat backer board using proper notched trowel to ensure adequate bond. Use sufficient bond coat to ensure 95% contact in wet areas. Slide tile firmly into position while bond coat is wet and tacky. Force grout into full depth of tile joint. Remove excess grout and clean.

#### LIMITATIONS

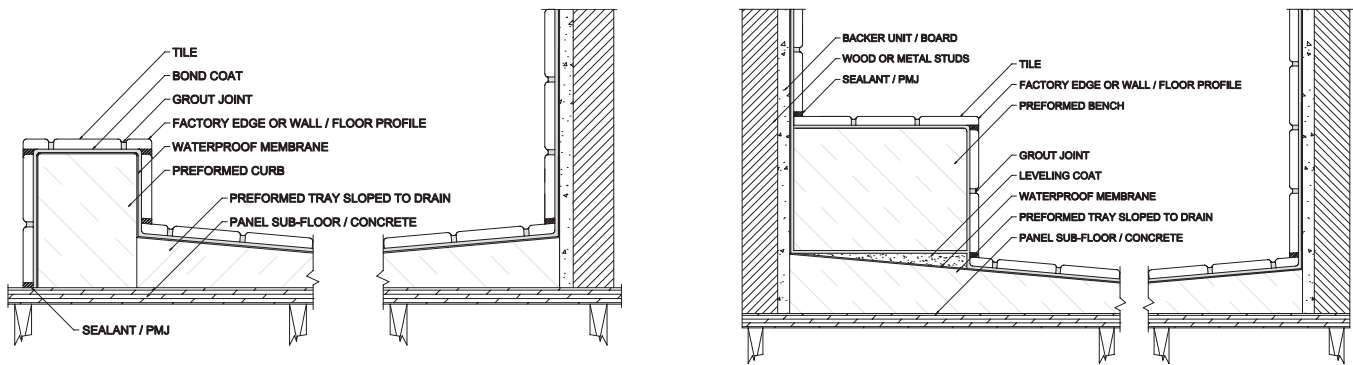
- Manufacturer's recommendations must be followed. Coated glass mat backer board should not be used where prolonged exposure to heat exceeds 52° C and not to be used for exterior use. It is not recommended for use with passive solar heat systems. Maximum tile size is 356 mm x 356 mm x 10 mm. Do not apply directly over concrete or masonry block.
- Coated glass mat backer board should not be used in shower floors.



OTHER CONSIDERATIONS

- Movement joints, spacing and minimum gauge of steel studs as per instructions of manufacturer of cementitious backer board (CBU) or coated glass mat backer board.
- Provide 6 mm in 300 mm slope to drain in floor. Carry membrane or pan at least 75 mm above shower curb, or 150 mm above floor in showers without curbs. Latex additive use in place of water is recommended for Portland cement bond coat and may be used in modification of mortar bed.
- Drains should be designed to permit drainage of water at the tile surface and the surface of the waterproof membrane. For drainage see Detail 326DR-2012-2014. A drainage layer may be incorporated over the waterproof membrane as recommended by the manufacturer if a traditional double weep hole drain is used.
- When using a shower pan, a waterproof membrane is recommended below bond coat.
- Tile should be moisture resistant. Type MR1 or some MR2. Refer to page 7.
- For high use showers (hotels, gang showers, sports facilities, etc.) a waterproof membrane shall be used over cementitious backer unit (CBU).\*
- Waterproof membrane if required must be specified. (ANSI A 118.10) Follow manufacturer's recommendations.
- All openings and cuts must be treated to ensure waterproof integrity.
- Refer to Notes For The Professional and 301MJ-2012-2014.
- A waterproof membrane or vapour retarder not to be used behind coated glass mat backer board.
- If waterproof membrane is not specified a slurry bond coat must be applied to concrete slab.
- Vapour retarder must be used when recommended by manufacturer.

\* If the shower is high use or is actually a steam shower, and the waterproof membrane is acting as both the waterproofing membrane and the vapor retarder the waterproof membrane must have a perm rating of .5 or less using ASTM E-96 Procedure E with 90 % humidity. If the waterproof membrane has a perm rating higher than .5 then a vapor retarder should be used behind the solid backing that has a perm rating 1.0 or less when tested with ASTM E-96 Procedure A.



# TILE OVER INSULATION IN REFRIGERATION ROOMS 320R-2012-2014



Please refer to page 8.

## DETAIL A – ON MORTAR BED

### SUITABLE SUBSTRATES

- Block-type insulation with acceptable compressive strength over masonry or concrete walls.

### MATERIALS

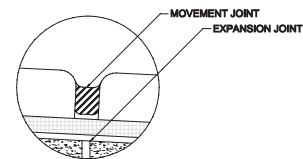
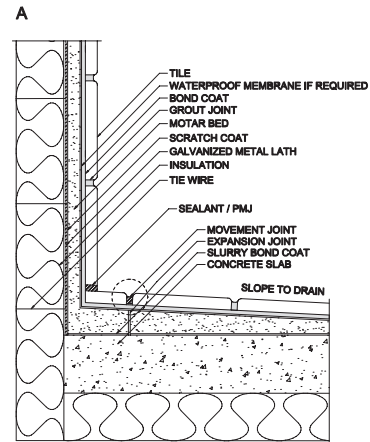
- TILE
- GALVANIZED METAL LATH – 1.4 kg/m<sup>2</sup> (ASTM C847).
- BOND COAT – Single or two component liquid latex-Portland cement mortar (minimum acceptable standard ANSI A 118.4 or ISO C2S1)
- GROUT – Portland cement or latex-Portland cement (minimum acceptable standard ANSI A 118.6 or ISO CG1), epoxy grout (minimum acceptable standard ANSI A 118.3 or ISO RG).

### APPLICATION

- Attach metal lath to tie wire. Apply scratch coat (see Tile Guide Specification Section Mixes 2.5.1) and let dry overnight. Apply mortar bed (minimum 25 mm for walls and 38 mm for floors) (see Tile Guide Specification Section Mixes 2.5.3 and 2.5.5). Surface variation not to exceed 6 mm in 3000 mm or 2 mm in 300 mm. Cure minimum of 72 hours. Apply tile to bond coat before bond coat skins over. Use sufficient bond coat to ensure minimum of 95% contact. Contact should be evenly distributed to give full support of the tile. Slide tile into position. Allow bond coat to cure. Force grout into full depth of joint, remove excess grout and clean.

### OTHER CONSIDERATIONS

- Design of vapour retarder and reinforced concrete slab by others. Floor should be sloped 20 mm per 1000 mm. Provide drains as required. Latex additive use in place of water is recommended for Portland cement bond coat, and may be used in modification of mortar bed.
- Drains should be designed to permit drainage of water at the tile surface and the surface of the waterproof membrane. A drainage layer may be incorporated over the waterproof membrane as recommended by the manufacturer. For drainage see Detail 326DR-2012-2014.
- Refer to Notes For The Professional and 301MJ-2012-2014.
- For thin-set applications over backer units refer to Detail B.
- Refer to Detail 319SR-2012-2014 Detail B for drain.
- If a waterproof membrane is required – See Detail B.
- For heavy vehicular traffic, confirm compressive strength of insulation by manufacturer.



Continued

# TILE OVER INSULATION IN REFRIGERATION ROOMS 320R-2012-2014



Please refer to page 8.

## DETAIL B – THIN-SET ON CEMENTITIOUS BACKER UNIT (CBU)

### SUITABLE SUBSTRATES

- On solid backing block-type insulation with acceptable compressive strength.

### MATERIALS

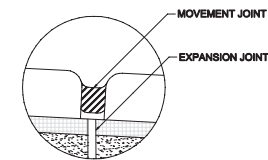
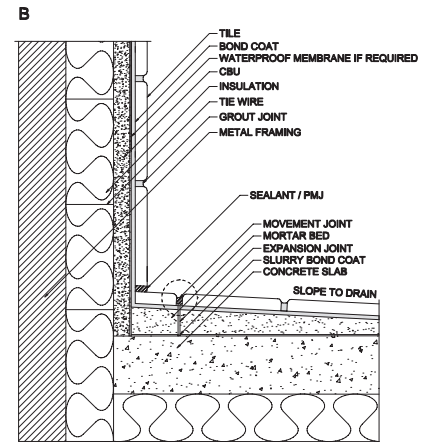
- Cementitious backer unit (CBU) (ANSI A 118.9) or nominal 11 mm thick fibre-cement backer board meeting ASTM C1288)
- TILE
- GALVANIZED TIE WIRE – on 300 mm o.c. through insulation for fastening to backing.
- Rigid polystyrene insulation CAN/ULC 5701 Type A
- BOND COAT – Single or two component liquid latex-Portland cement mortar (minimum acceptable standard ANSI A 118.4 or ISO C2S1)
- GROUT – Portland cement or latex-Portland cement (minimum acceptable standard ANSI A 118.6 or ISO CG1), epoxy grout (minimum acceptable standard ANSI A 118.3 or ISO RG).

### APPLICATION

- Cementitious backer unit (CBU) must be stable, plumb, square and tied to backing. Surface variation not to exceed 6 mm in 3000 mm or 2 mm in 300 mm. For large format tile where one edge is 380 mm or larger, surface variation should not exceed 3 mm in 3000 m. Apply levelling coat if required. All joints must be taped with 51 mm fibre-mesh tape, filled with a dry-set or latex mortar and sanded. Apply thin-set bond coat to cementitious backer unit (CBU), fibre-cement backer board using proper notched trowel to ensure minimum 95% contact. Slide tile firmly into position while bond coat is wet and tacky. Force grout into full depth of joint, remove excess grout and clean.

### OTHER CONSIDERATIONS

- Design of vapour retarder and reinforced concrete slab by others. Floor should be sloped 20 mm per 1000 mm. Provide drains as required. Latex additive use in place of water is recommended for Portland cement bond coat and may be used in modification of mortar bed.
- Drains should be designed to permit drainage of water at the tile surface and the surface of the waterproof membrane. A drainage layer may be incorporated over the waterproof membrane as recommended by the manufacturer. For drainage see Detail 326DR-2012-2014.
- Refer to Notes For The Professional and 301MJ-2012-2014.
- Refer to Detail 319SR-2012-2014 Detail B for drain.
- Waterproof membrane if required must be specified. (ANSI A 118.10) Follow manufacturer's recommendations.
- If waterproof membrane is not specified, a slurry bond coat must be applied to concrete slab.
- For heavy vehicular traffic, confirm compressive strength of insulation by manufacturer.



# TILE INSTALLED IN STEAM ROOMS

## 321SR-2012-2014



Please refer to page 8.

### DETAIL A – CONCRETE OR MASONRY CONSTRUCTION

#### SUITABLE SUBSTRATES

- Frame construction, masonry or concrete backing.

#### MATERIALS

- TILE
- MORTAR BED AND BOND COAT – Single or two component liquid latex-Portland cement mortar (minimum acceptable standard ANSI A 118.4 or ISO C2S1)
- GROUT – per manufacturer’s recommendations.

#### APPLICATION

- Tie wire spaced at 300 mm vertically and 406 mm to 600 mm horizontally. Attach to 6 mm steel pencil rods vertically over insulation; attach metal lath to pencil rods. Install scratch coat (see Tile Guide Specification Section Mixes 2.5.1), mortar bed (see Tile Guide Specification Section Mixes 2.5.3 and 2.5.5) and bond coat as per detail 307W-2012-2014 or 308W-2012-2014 (walls), Detail 310F-2012-2014 A (floors) and 315C-2012-2014 (ceilings)

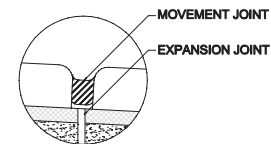
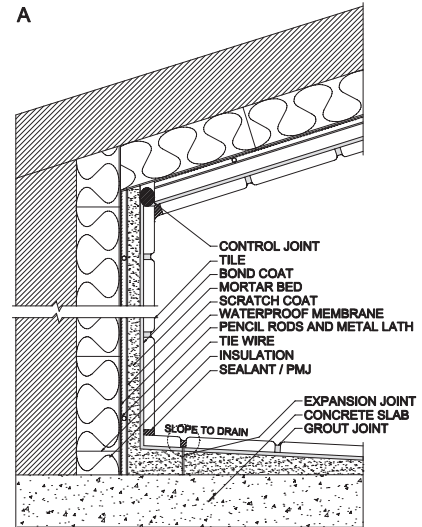
#### LIMITATIONS

- Waterproof membrane must be suitable for operating temperatures.

#### OTHER CONSIDERATIONS

- Detail 311F-2012-2014 may be used for floor installation provided that proper slope to drain is in the substrate.
- Drains should be designed to permit drainage of water at the tile surface and the surface of the waterproof membrane. A drainage layer may be incorporated over the waterproof membrane as recommended by the manufacturer. For drainage see Detail 326DR-2012-2014.
- Refer to Notes For The Professional and 301MJ-2012-2014.
- For high use showers and wet areas (hotels, gang showers, sports facilities etc.) a waterproof membrane shall be used.\*
- All openings and cuts must be treated to ensure waterproof integrity.
- Refer to Detail 319B-2012-2014 for drainage detail.
- If waterproof membrane is not specified a slurry bond coat must be applied to concrete slab.
- Slope ceilings 150 mm per 1000 mm and floors 20 mm per 1000 mm.

\* For continuous steamrooms if the waterproof membrane is acting as both the waterproofing membrane and the vapor retarder the waterproof membrane must have a perm rating of .5 or less using ASTM E-96 Procedure E with 90 % humidity. If the waterproof membrane has a perm rating higher then .5 then a vapor retarder should be used that has a perm rating 1.0 or less when tested with ASTM E-96 Procedure A



Continued

# TILE INSTALLED IN STEAM ROOMS 321SR-2012-2014



Please refer to page 8.

## DETAIL B – FRAME CONSTRUCTION

### SUITABLE SUBSTRATES

- Wood or metal studs maximum 406 mm o.c.

### MATERIALS

- 13 mm minimum thickness cementitious backer unit (CBU).
- MORTAR BED AND BOND COAT – Single or two component liquid latex-Portland cement mortar (minimum acceptable standard ANSI A 118.4 or ISO C2S1)
- GROUT – per manufacturer’s recommendations.
- VAPOUR RETARDER – per manufacturer’s recommendations.



### APPLICATION

- If tile being installed directly: use Detail 305W-2012-2014 Detail A on walls; if tile is being set over a waterproof membrane follow manufacturer’s recommendations.

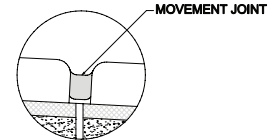
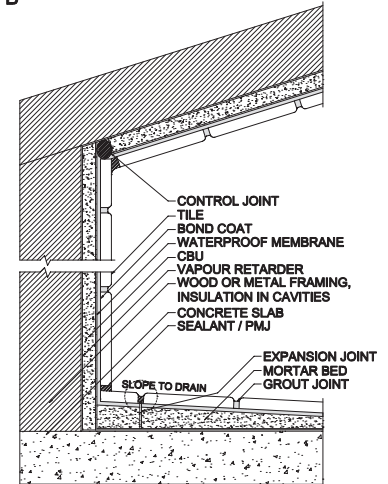
### OTHER CONSIDERATIONS

- Detail 311F-2012-2014 may be used provided that proper slope to drain is in the substrate.
- Drains should be designed to permit drainage of water at the tile surface and the surface of the waterproof membrane. A drainage layer may be incorporated over the waterproof membrane as recommended by the manufacturer. For drainage see Detail 326DR-2012-2014.
- Refer to Notes For The Professional and 301MJ-2012-2014.
- For high use showers and wet areas (hotels, gang showers, sports facilities etc.) a waterproof membrane shall be used.\*
- All openings and cuts must be treated to ensure waterproof integrity.
- Refer to Detail 319SR-2012-2014 Detail B for drain.
- Waterproof membrane if required must be specified. (ANSI A 118.10) Follow manufacturer’s recommendations.
- If waterproof membrane is not specified a slurry bond coat must be applied to concrete slab.
- If required, an insulation layer should be used made of rigid polystyrene. Consult with manufacturer.
- Slope ceilings 150 mm per 1000 mm and floors 20 mm per 1000 mm.



\* For continuous steamrooms if the waterproof membrane is acting as both the waterproofing membrane and the vapor retarder the waterproof membrane must have a perm rating of .5 or less using ASTM E-96 Procedure E with 90 % humidity. If the waterproof membrane has a perm rating higher then .5 then a vapor retarder should be used that has a perm rating 1.0 or less when tested with ASTM E-96 Procedure A

B



# TILE INSTALLED ON COUNTERTOPS

## 322C-2012-2014

### SUITABLE SUBSTRATES

- 19 mm exterior grade plywood

### MATERIALS

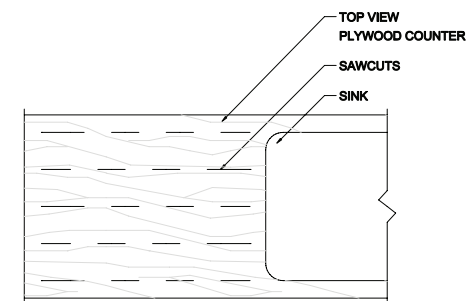
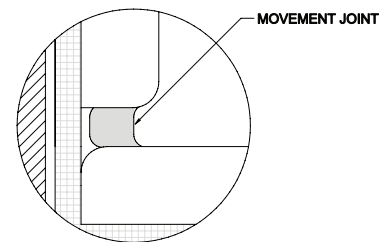
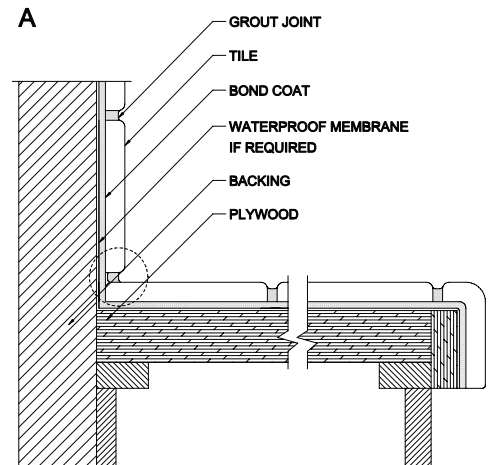
- Extra heavy duty glazed tile, unglazed porcelain tile, natural stone tile.
- Cleavage membrane – minimum 6 mils polyethylene film (Detail C).
- METAL LATH – 1.4 kg/m<sup>2</sup> (Detail C) (ASTM C847).
- Scratch coat (see Tile Guide Specification Section Mixes 2.5.1) and 25+ mm mortar bed (see Tile Guide Specification Section Mixes 2.5.3 and 2.5.5) (Detail C).
- Cementitious backer unit (CBU) minimum 13 mm thick (ANSI A 118.9) or coated glass mat backer board (Detail B) minimum 13 mm (ASTM C1178).
- BOND COAT – Epoxy (minimum acceptable standard ANSI 118.3 or ISO R1), latex-Portland cement mortar (minimum acceptable standard ANSI A 118.4 or ISO C2S1P1) (Detail A & B). Latex-Portland cement mortar on cured mortar bed (Detail C).
- GROUT – Latex-Portland cement (minimum acceptable standard ANSI A 118.6 or ISO CG1) with a water base sealer or epoxy grout (minimum acceptable standard ANSI A 118.3 or ISO RG).

### APPLICATION

- Detail A - Gap plywood 6 mm and support joint with cross bridging. Fill gap between plywood with setting materials. Random cuts spaced approximately at 150 mm and 150 mm in length should be cut into the plywood to relieve the strains and to permit the plywood to remain relatively equal in moisture content on both sides.
- Detail B - Attach cementitious backer unit (CBU) or nominal 11 mm thick fibre-cement backer meeting ASTM C1288. For coated glass mat backer board do not use membrane and install with 30 mm galvanized or non-pull out nails. Gap cementitious backer unit (CBU) 3 mm. Tape joint with fibreglass tape set in latex-Portland cement mortar. Set tiles to achieve minimum 95% contact with bonding materials and let cure before grouting. Provide 100% contact with bonding material under bullnose tile at the apron.
- Detail C - Apply polyethylene film over lapped at least 100 mm. Nail galvanized diamond metal lath butted, not overlapped, to the plywood. Apply mortar bed to required thickness of 32 mm min. Allow mortar bed to cure. Apply bond coat to cured mortar bed. Apply tile to bond coat before bond coat skins over. Use sufficient bond coat to ensure minimum 80% contact. Contact shall be evenly distributed to give full support of the tile. On fresh mortar bed, beat tile into position. On dry-set mortar, slide tile into position. Beat mosaic tile into position. Allow bond coat to cure. Force grout into full depth of joint, remove excess grout and clean.

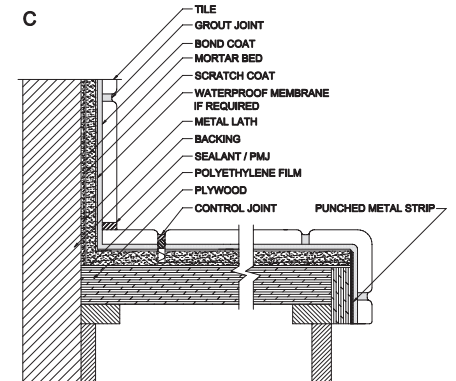
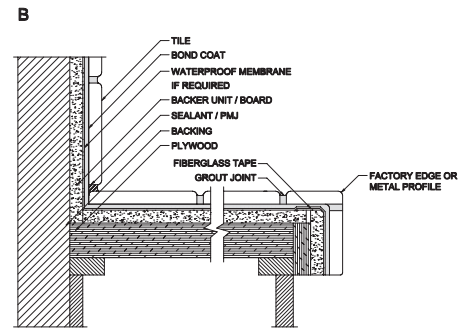
### LIMITATIONS

- Latex-Portland cement grouts are absorbent and can stain. A water based grout sealer may be recommended. Follow manufacturers recommendations.



**OTHER CONSIDERATIONS**

- Details A and B are most commonly used, particularly in residential construction. Epoxy grout is recommended for optimum stain resistance and hygienic purposes. An alternate method for finishing counter top edges is the use of prefabricated trim at the apron. Where ceramic tile is used to cover apron, full support must be provided behind tile using one of the methods shown. Where cut outs in counter tops are provided for appliances, provide cross bridging under counter tops within 51 mm of opening.
- A movement joint may be provided between the backsplash and the counter. A caulking sealant or a prefabricated movement joint may be used.
- Waterproof membrane if required must be specified. (ANSI A 118.10) Follow manufacturer's recommendations.
- Refer to Notes For The Professional.



# TILE INSTALLED OVER EXISTING TILE

## 323RW-2012-2014

### INTERIOR WALLS ONLY

#### SUITABLE SUBSTRATES

- Existing tile on frame or masonry construction where existing tile is well bonded.

#### MATERIALS

- TILE
- GALVANIZED METAL LATH – 1.4 kg/m<sup>2</sup> (ASTM C847)
- MULTI-PURPOSE PRIMER (optional) – latex-based bond promoting primer
- BOND COAT – Dry-set mortar (minimum acceptable standard ANSI A 118.1 or ISO C1), latex-Portland cement mortar (minimum acceptable standard ANSI A 118.4 or ISO C2S1), modified epoxy emulsion mortars, 100% solids epoxy mortar, epoxy adhesive (minimum acceptable standard ANSI A 118.3 or ISO R1), or organic adhesives (minimum acceptable standard ANSI A 118.3 or ISO R1).
- GROUT – Portland cement, latex-Portland cement (minimum acceptable standard A 118.6 or ISO CG1), or epoxy grouts (minimum acceptable standard ANSI A 118.3 or ISO RG).

#### PREPARATION

- Remove soap scum, sealers, dirt or other contaminants from existing tile. Mechanically abrade surfaces of existing glazed tile with a carborundum disc or by other means. Rinse abraded surface to remove dust. Apply levelling material and reinforce joint between levelling materials and existing tile with 51mm fibre mesh tape set in latex-Portland cement mortars.
- For non-glazed or textured surfaces use an appropriate stripper as recommended by manufacturer.

#### APPLICATION

- Apply tile using latex-Portland cement mortar, epoxy or organic adhesive ANSI A136.1 Type 1 only. Organic adhesives can be used for absorbent bisquet tile. Organic adhesives require complete evaporation of water in the adhesive in order to obtain cure and are not recommended for commercial use. Refer to 304W-2012-2014 for installations with organic adhesive and Detail 305W-2012-2014 for installations using latex-Portland cement mortars or dry-set mortars. Use sufficient bond coat to ensure minimum of 95% contact on wet areas.

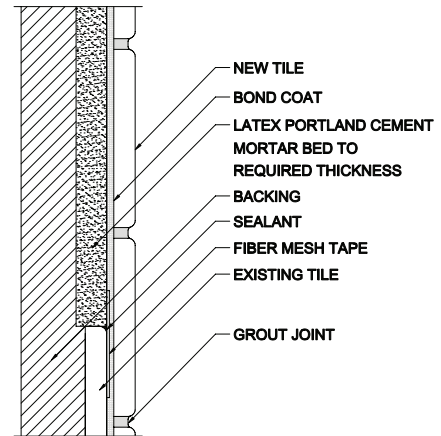
#### LIMITATIONS

- Acid washing will not remove wax, sealers and oils.
- For commercial use a cementitious bonding material may be more suitable than organic adhesives to obtain a higher impact resistance and to improve bond strength.

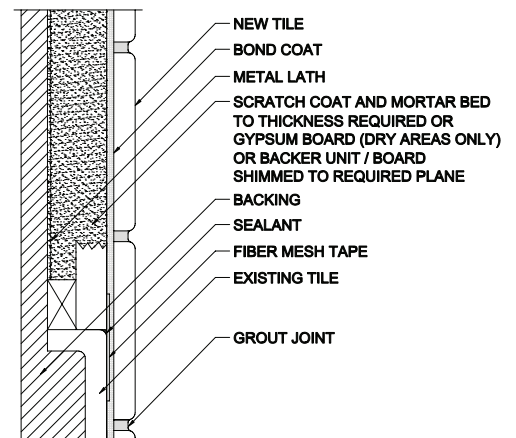
#### OTHER CONSIDERATIONS

- Install new tile so that grout joint is over transition point between levelling material and existing ceramic tile where possible.
- Refer to Notes For The Professional.
- For larger tile non sag mortars may be considered. Follow manufacturers recommendations
- Waterproof membrane if required must be specified. (ANSI A 118.10) Follow manufacturer's recommendations.

A



B



# TILE INSTALLED OVER EXISTING TILE

## 324RF-2012-2014

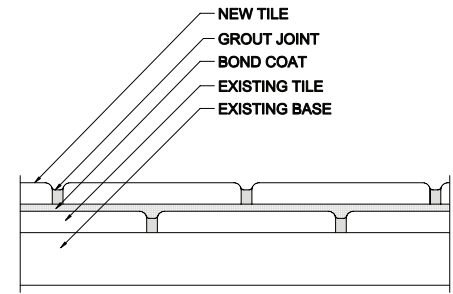
### INTERIOR FLOORS ONLY

#### SUITABLE SUBSTRATES

- Existing well bonded tile, cementitious or epoxy terrazzo, marble, granite and slate, free of cracks.

#### MATERIALS

- TILE
- MULTI-PURPOSE PRIMER (optional) – latex-based bond promoting primer.
- BOND COAT – Dry-set mortar (minimum acceptable standard ANSI A 118.1 or ISO C1), latex-Portland cement mortar (minimum acceptable standard ANSI A 118.4 or ISO C2S1), modified epoxy emulsion mortars, 100% solids epoxy mortar, epoxy adhesive (minimum acceptable standard ANSI A 118.3 or ISO R1), or organic adhesives (minimum acceptable standard ANSI A 118.3 or ISO R1).
- GROUT – Portland cement, latex-Portland cement (minimum acceptable standard A 118.6 or ISO CG1), or epoxy grouts (minimum acceptable standard ANSI A 118.3 or ISO RG).



#### PREPARATION

- Remove soap scum, sealers, dirt or other contaminants from existing tile. Mechanically abrade surfaces of existing glazed tile with a shot blast, scarifier or by other means. Rinse abraded surface to remove dust
- For non-glazed or textured surfaces use an appropriate stripper as recommended by the manufacturer.
- Prefill any voids in the existing grout joints, chipped tile and/or missing tile.

#### APPLICATION

- Apply tile using single or two component liquid latex Portland cement mortar or epoxy mortar. Refer to Detail 311F-2012-2014.

#### LIMITATIONS

- Acid washing will not remove wax, sealers and oils.

#### OTHER CONSIDERATIONS

- Existing installations must be sound, well bonded and free of structural cracks. If existing installation is not structurally sound, consider use of detail 309F-2012-2014 or the use of crack isolation membrane. See Detail 311F-2012-2014 Detail C.
- Refer to Notes For The Professional.
- Existing movement joints must be respected and carried through to new tile work.
- Increase in height may require adjustments to threshold or the use of a prefabricated reducer profile to meet adjacent floors.

# EXTERIOR DECKS

## 325ED-2012-2014



Please refer to page 8.

### SUITABLE SUBSTRATES

- Exterior concrete slab.
- Exterior grade plywood over wood joist at maximum of 406 mm o.c. Floor systems, including the framing system and subfloor panels, over which the tile will be installed shall be in conformance with the Canadian National Building Code 2010 and applicable local building codes taking into consideration anticipated live and dead loads.

### MATERIALS

- TILE
- BOND COAT – Single or two component liquid latex-Portland cement mortar (minimum acceptable standard ANSI A 118.4 or ISO C2S1).
- GROUT – Latex-Portland cement (minimum acceptable standard ANSI A 118.6 or ISO CG1).
- Waterproof membrane ANSI A 118.10.

### APPLICATION

#### DETAIL A

- Concrete slab must be sloped a minimum of 2% (approximately 6 mm per 300 mm). If not located over occupied space a waterproof membrane meeting ANSI A 118.10 may be substituted for roofing membrane.
- Finished tolerance of mortar bed not to exceed 6 mm in 3000 mm or 2 mm in 300 mm.
- Drainage layer mat is applied to the surface of the waterproofing layer but not bonded. Mortar bed thickness should be not less than 38 mm. Use of latex additive in mortar bed (see Tile Guide Specification Section Mixes 2.6.5) and bond coat is mandatory. Use sufficient bond coat to ensure minimum 95% contact. Contact shall be evenly distributed to give full support of the tile. On fresh mortar, beat tile into position. On dry-set mortar, slide tile into position. Allow bond coat to cure. Force grout into full depth of joint, remove excess grout and clean.
- Reinforcing mesh 51 mm x 51 mm x 1.6 mm installed in mortar bed over membrane.

#### DETAIL B

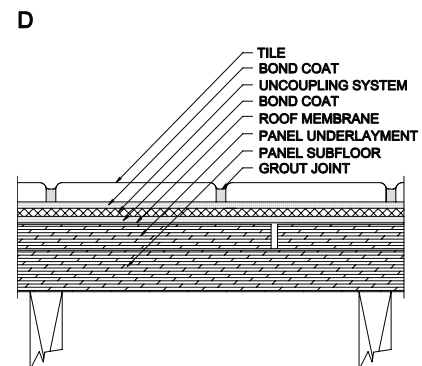
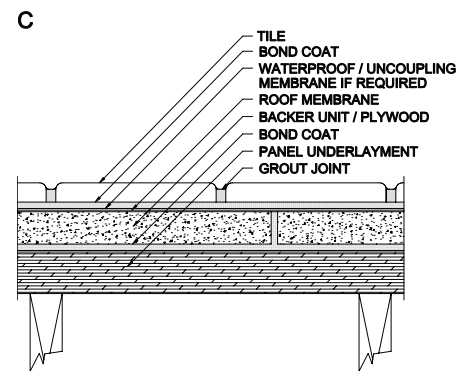
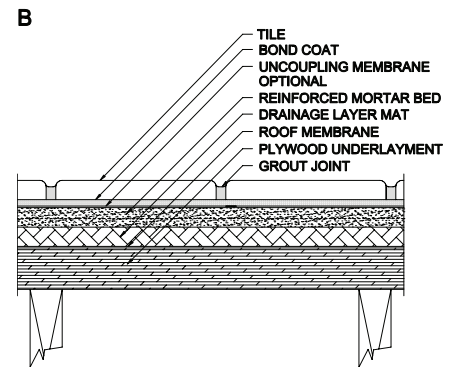
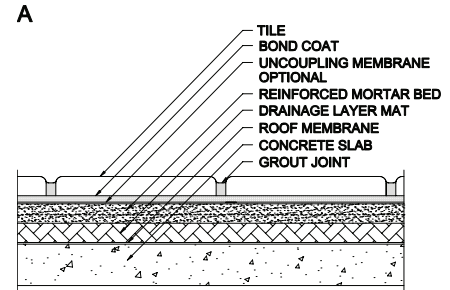
- Sub-floor – 16 mm exterior grade plywood meeting CSA 0121, sloped as per Detail A. Install roofing membrane and drainage layer in accordance to manufacturer's recommendations. Install mortar be in accordance to Detail A.

#### DETAIL C

- Sub-floor – 16 mm exterior grade plywood meeting CSA 0121, sloped as per Detail A. Backer unit 13 mm minimum and must be exterior rated. Backer unit bond coat and fasteners as recommended by manufacturer. Backbuttering is recommended to bond tile to achieve 95% mortar contact.
- Apply approved roofing membrane and primer as recommended by manufacturer.

#### DETAIL D

- Sub-floor – 16 mm exterior grade plywood meeting CSA 0121, sloped as per Detail A. Overlay of plywood and installation as in Detail 313F-2012-2014 Detail A. Overlay of plywood can be substituted with cementitious backer unit (CBU) as in Detail C. Roofing membrane is a self applied modified rubberized asphalt Styrene-Butadiene-Styrene(SBS) membrane or other membrane types as recommended by manufacturer. Uncoupling system is applied directly onto roofing membrane as per manufacturer's instructions. For definition of uncoupling system see Glossary. Backbuttering is recommended to bond tile to achieve 95% mortar contact. NOTE: This system can also be used over a concrete slab instead of plywood especially for areas over living space.



Continued

## EXTERIOR DECKS 325ED-2012-2014

### DETAIL E

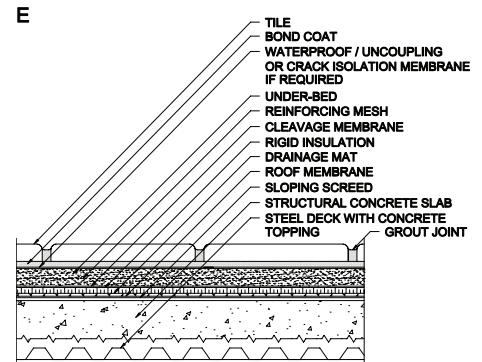
- Exterior Deck Over Occupied Space – concrete slab and finished surface to be sloped a minimum of 2% (approximately 6 mm per 300 mm). See Detail 326 DR-2012-2014 (B).
- A waterproof membrane meeting ANSI A 118.10 may be under the tile. A roofing membrane must be installed over the structural slab.
- Drainage layer mat must be applied to the roofing membrane but not bonded.
- Mortar bed thickness should not be less than 38 mm.
- Heavy or extra heavy duty tile to be used.
- Finished tolerance of mortar bed not to exceed 6 mm in 3000 mm or 2 mm in 300 mm.
- Rigid insulation must be Type 4 polystyrene.

### LIMITATIONS

- DETAILS B & C – are effective methods of installation for exterior applications that can have a relatively long life span. It should however be recognized that plywood by its own nature will age and be affected by the elements. Consequently, some maintenance and/or repair may be required over time. Examine each manufacturers system and be advised of the expected life span and guarantee so that the best system for the installation in question can be chosen. i.e. regions under extreme freeze/thaw or high rainfall conditions.
- Detail C – Verify with roofing membrane manufacturer if tile or stone can be direct bonded to membrane.

### OTHER CONSIDERATIONS

- As of 2005/2006 changes to the Canadian National Building Code require exterior decks, (regardless of over living space or not), are deemed to be roofs and require an approved roofing material Section 9.26 Roofing and Section 9.26.4.1 and 9.27.3.8. ) if they are not flow-through.
- It is essential that movement joints be incorporated into the tiled surface as per Detail 301MJ-2012-2014.
- Water must not be added to latex and Portland cement bonding material.
- Care must be taken in flashing the waterproofing against all perpendicular surfaces, 150 mm minimum.
- Finishing around the outer edges of the deck should be considered for esthetical appearance.
- For Detail A and B the thin-set method is recommended in areas subject to freeze/thaw conditions. Mortar bed may be subject to failure under these conditions.
- For Detail B, C and D a vapour retarder may be applied underneath wood sub-floor. Consultant to specify location.
- Refer to Notes For The Professional.
- Drains should be designed to permit drainage of water at the tile surface and the surface of the waterproof membrane. For drainage see Detail 326DR-2012-2014. Latex-Portland cement mortars may require 14 – 60 days cure before exposure to water. Verify with the manufacturer the correct cure time required. Alternatively, to reduce the curing time required, a rapid set mortar may be more suitable.
- Waterproof membrane if required must be specified. (ANSI A 118.10) Follow manufacturers' recommendations.
- Some Uncoupling membrane manufacturers may require a non-modified mortar or C1E or C2E to be used for bond-coat.



# DRAINAGE SYSTEMS INTERIOR/EXTERIOR

## 326DR-2012-2014

### SUITABLE SUBSTRATES

- Concrete or masonry
- Exterior grade plywood
- Shower pan or waterproof membrane over structural base
- Exterior deck over steel pan or suspended slab
- Wall constructed in accordance with Details 302W-2021/2013, 303W-2012-2014, 304W-2012-2014, 305W-2012-2014 A or B, 307W-2012-2014, 308W-2012-2014.

### MATERIALS

- TILE
- Waterproof membrane ANSI A 118.10
- MORTAR BED minimum 20 mm to 51 mm sloped to drain. See Tile Guide Specification Section mixes 2.5.3 and 2.5.5
- BACKING – Minimum 13 mm, Gypsum Board (ASTM C36), Cementitious Backer Unit (CBU) (ANSI A 118.9), Coated Glass Mat Backer Board (ASTM C1178) or nominal 11 mm Fibre Cement Backer Board (ASTM C1288)
- BOND COAT – Dry set mortar or latex Portland cement mortar over mortar bed cured minimum of 24 hours.
- GROUT – Portland cement or Latex Portland cement
- TAPE – 51 mm wide fibre mesh tape
- Drain – With integrated bonding flange complying with CSA B-79-94 or double weep drain complying with equivalent CSA standard.

### APPLICATION

- Slope mortar bed a minimum of 2% (approximately 6 mm per 300 mm). Mortar bed thickness should not be less than 20 mm in thickness. Waterproof membrane must turn up wall at least 150 mm for exterior applications and up the wall to shower head level for interior applications. Waterproof membrane must completely cover integrated bonding flange. Drain grate to be set flush with the surface of the tile.

### LIMITATIONS

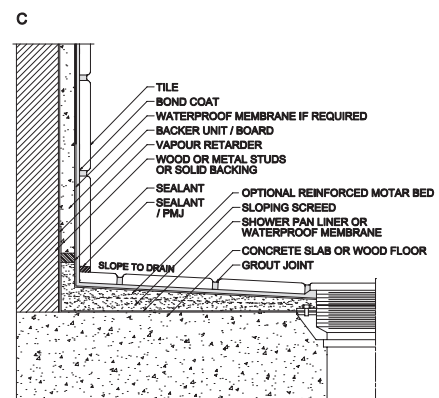
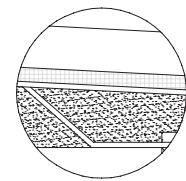
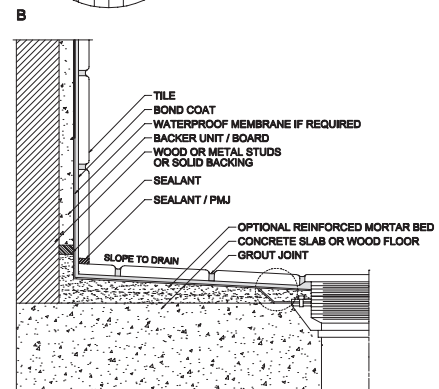
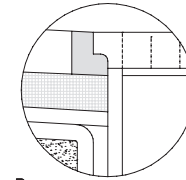
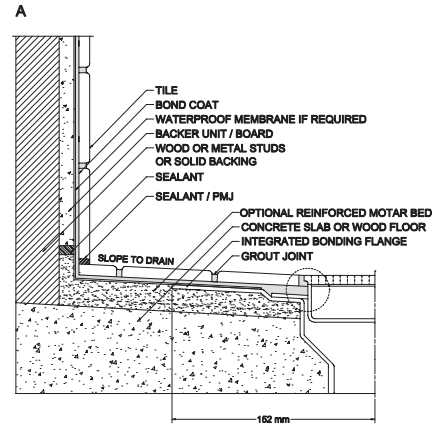
- Requires integrated bonding flange for bonded waterproof membranes
- Interior applications waterproof membrane must be used to the anticipated level of moisture exposure.
- Detail 304W-2012-2014 and 305W-2012-2014 (B) are not for exterior use
- Detail 304W-2012-2014 must have waterproof membrane installed on surface (ANSI A 118.10)

### LIMITATIONS

- Requires integrated bonding flange for bonded waterproof membranes
- Interior applications waterproof membrane must be used to the anticipated level of moisture exposure.
- Detail 304W-2012-2014 and 305W-2012-2014 (B) are not for exterior use
- Detail 304W-2012-2014 must have waterproof membrane installed on surface (ANSI A 118.10)

### LIMITATIONS

- For high use showers and wet areas (hotels, gang showers, sports facilities etc. a waterproof membrane to be used.
- All openings and cuts must be treated to ensure waterproof integrity.
- For Detail B a drainage layer may be incorporated over the waterproof membrane as recommended by manufacturer.
- Tile should be moisture resistant.
- Refer to Notes For The Professional.



# LARGE FORMAT (FUSED) GLASS TILE ON INTERIOR FLOORS

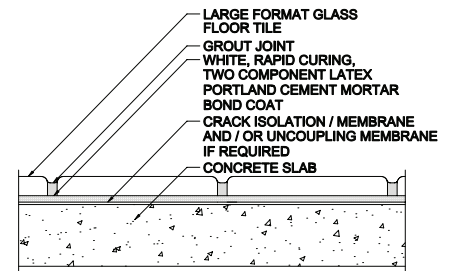
## 327GTF-2012-2014



Please refer to page 8.

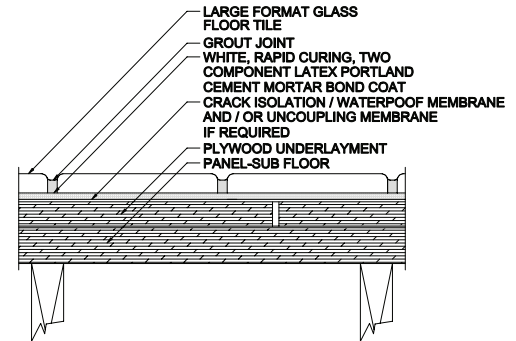
### SUITABLE SUBSTRATES

- For use on stable substrates such as cured concrete, double layer of plywood, 12.5 mm CBU suitably installed on plywood subfloor, mortar bed suitably installed on plywood subfloor or other rigid subfloor systems
- Dry interiors only, unless provided with a suitable waterproofed structure and sloped to drain.
- Provide a suitable rigid subfloor that is designed to support the maximum loading anticipated for the area to be tiled. Floor systems, including the framing system and subfloor panels, over which the tile will be installed shall be in conformance with the Canadian National Building Code 2005 and applicable local building codes taking into consideration anticipated live and dead loads.



### MATERIALS

- TILE\*
- CRACK ISOLATION MEMBRANE – ANSI A 118.12 (follow membrane manufacturer's instructions for use on vertical surfaces)
- UNCOUPLING MEMBRANE – following manufacturer's recommendations
- BOND COAT – White, rapid curing, two component latex-Portland cement mortar (minimum acceptable standard ANSI A 118.4 or ISO C2S1)
- GROUT – Polymer modified tile grout per manufacturer's recommendation



### APPLICATION

- Apply crack isolation membrane (ANSI A108.17) or uncoupling membrane following manufacturer's recommendations to provide complete coverage of the substrate in the area on which the large format glass tile is to be installed. Since many large format glass tiles are somewhat translucent it is very important that complete coverage be achieved by back buttering each piece of tile with white thin-set mortar immediately prior to setting the tile to ensure that no voids or bubbles are visible against the back of the glass tile. Install tile in accordance with ANSI A 108.5 – use the minimum thickness of thin-set mortar that is recommended by the thin-set manufacturer – the maximum mortar thickness between the tile and C.I.M. is to be no greater than 3 mm after the tile has been beaten into place. An adequate thickness of thin-set mortar can generally be applied with a 5 mm V-notched trowel.

### LIMITATIONS

- This method is suitable only for large format glass floor tiles which are manufactured by fully fusing the colors / glazes / finishes with the glass body at temperatures above 550°C.
- Cutting of glass tile - any cuts, other than those that are hidden in inside corners, should be performed using a diamond blade designed for cutting glass on a wet saw – glass tile should be cut with the rotation of the saw blade into the glazed (back) side of the tile – on most saws this is face down.
- Do not use epoxy bond coat or grout unless recommended by manufacturer.

### OTHER CONSIDERATIONS

- Movement Joint ( architect must specify type of joint and show location and details on drawings )
- Movement joints - mandatory according to Detail 301MJ-2012-2014.
- There is a new standard for glass tile called ANSI A137.2 which should be consulted for types, size and performance which includes large format glass tile.

- \* Large format tiles are considered to be thicker than 5.5 mm. Ceramic tile panels are 5.5 mm or less and have no performance standards established by ANSI or ISO. These products are very questionable on floor applications see notes on Ceramic Tile Panels page 12.

# LARGE FORMAT (FUSED) GLASS TILE ON INTERIOR WALLS

## 328GTW-2012-2014



Please refer to page 8.

### SUITABLE SUBSTRATES

- For installation on the following stable substrates: Gypsum Board, CBU, Fiber Cement Underlayment, Coated Glass Mat Water Resistant Gypsum Boards or Cured Mortar Bed
- Gypsum Board for dry interiors only
- Over dry, well-braced wood studs or furring
- Over well-braced metal studs

### MATERIALS

- Gypsum board – ASTM C36 or C630
- CBU – ANSI 118.9, installed in accordance with ANSI A108.9
- Fibre Cement Underlayment – ASTM C1288
- Cured mortar bed, lath and membrane – ANSI A108.1B
- Crack Isolation Membrane – ANSI A 118.12 (follow membrane manufacturer's instructions for use on vertical surfaces).
- Waterproof Membrane – ANSI A 118.10. Follow manufacturer's recommendations.
- Vapor/moisture barrier membrane (when required) to be 15 lb. roofing felt or minimum 4-mil polyethylene film.
- TILE\*
- BOND COAT – White, rapid curing, two component latex-Portland cement mortar (minimum acceptable standard ANSI A 118.4 or ISO C2S1)
- GROUT – Polymer modified tile grout per manufacturer's recommendation



### APPLICATION

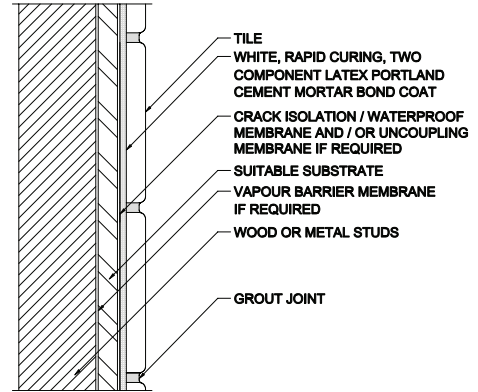
- Crack Isolation Membrane – ANSI A108.17 or follow the CIM manufacturer's recommendations – to provide complete coverage of the substrate in the area on which the large format glass tile is to be installed.
- Waterproof membrane – ANSI A108.3 or follow the CIM manufacturer's recommendations.
- Since many large format glass tiles are somewhat translucent it is very important that complete coverage be achieved by back buttering each piece of tile with white thin-set mortar immediately prior to setting the tile to ensure that no voids or bubbles are visible against the back of the glass tile.
- Install tile in accordance with ANSI A 108.5 – use the minimum thickness of thin-set mortar that is recommended by the thin-set manufacturer – the maximum mortar thickness between the tile and C.I.M. is to be no greater than 3 mm after the tile has been beaten into place. An adequate thickness of thin-set mortar can generally be applied with a 5 mm V-notched trowel.
- Cutting of glass tile for any cuts other than those that are hidden in inside corners should be performed using a diamond blade designed for cutting glass on a wet saw – glass tile should be cut with the rotation of the saw blade into the glazed (back) side of the tile – on most saws this is face down.

### LIMITATIONS

- This method is suitable only for large format glass tiles which are manufactured by fully fusing the colors/glazes/finishes with the glass body at temperatures above 550°C
- Do not use regular gypsum board in wet areas such as tub & shower enclosures.
- Do not use in areas where gypsum board is exposed to temperatures above 52°C

### OTHER CONSIDERATIONS

- Maximum stud spacing – 406 mm o.c.
- Minimum recommended metal stud depth 92 mm
- Metal studs – 20 gauge or heavier.
- Movement Joint ( architect must specify type of joint and show location and details on drawings )
- Movement joints – mandatory, according to Detail 301MJ-2012-2014.
- There is a new standard for glass tile called ANSI A137.2 which should be consulted for types, size and performance which includes large format glass tile.



# LARGE FORMAT TILE ON INTERIOR FLOORS

## 329 LFT -2012-2014

### SUITABLE SUBSTRATES

- For use on stable substrates such as cured concrete, double layer of plywood, 12.5 mm CBU suitably installed on plywood subfloor, mortar bed suitably installed on plywood subfloor or other rigid subfloor systems (Drawings refer to 311F-A, 313F-A,B,D)
- Dry interiors only, unless provided with a suitable waterproofed structure and sloped to drain.
- Provide a suitable rigid subfloor that is designed to support the maximum loading anticipated for the area to be tiled. Floor systems, including the framing system and subfloor panels, over which the tile will be installed shall be in conformance with the Canadian National Building Code 2005 and applicable local building codes taking into consideration anticipated live and dead loads.

### MATERIALS

- TILE\*
- SELF-LEVELLING UNDERLAYMENT – Cement-based, quick-setting, self-levelling, self-drying underlayment for engineer-approved floors, very fluid once mixed, installation from featheredge 6 mm to at least 138 mm in a single application.
- CRACK ISOLATION MEMBRANE – ANSI A 118.12 (follow membrane manufacturer's instructions for use on vertical surfaces).
- UNCOUPLING MEMBRANE – Follow manufacturer's recommendations.
- BOND COAT – Full coverage medium-bed mortars, latex-Portland cement mortar (minimum acceptable standard ANSI A 118.4 or ISO C2S1), modified epoxy emulsion mortars or 100% solids epoxy mortar (minimum acceptable standard ANSI A 118.3 or ISO R1).
- GROUT – Polymer-modified sanded tile grout (minimum acceptable standard ANSI A 118.7 or ISO CG2).

### APPLICATION

- Measure deflections on the floor or wall using a 10ft straight-edge prior to commencing any installation.
- Apply crack isolation membrane (ANSI A108.17) or uncoupling membrane following manufacturer's recommendations to provide complete coverage of the substrate in the area on which the large format tile is to be installed. Use recommended notch trowel for setting larger format tiles. Apply mortar into substrate with fl at side of trowel. This ensures complete contact to the pores of the substrate. It is very important that complete coverage be achieved by back buttering each piece of tile with thin-set mortar immediately prior to setting the tile to ensure that no voids are present against the back of the tile. Install tile in accordance with ANSI A 108.5.
- Periodically check coverage and bond by picking up freshly installed tile and inspecting. Be sure to remove contaminants on the back of tile so as ensure proper adhesion of tile to thin-set.
- Apply tile to bond coat before bond coat skins over. Use sufficient bond coat to ensure minimum 95% contact. Contact shall be evenly distributed to give full support of the tile. Slide tile firmly into position. Allow bond coat to cure. Force grout into full depth of joint, remove excess grout and clean.

### LIMITATIONS

- Manufacturer's recommendations must be followed.
- Surface variation should not exceed 3 mm in 3000 m.
- Provide positive drainage below exterior slabs; use latex-Portland cement mortars on exterior slabs. Use of epoxy mortars and grouts is recommended for interior surfaces only or where improved chemical resistance is required.
- Use method 309F-2012-2014 or crack isolation/uncoupling membrane if recommended by the manufacturer for precast floor systems, post tensioned concrete floor systems and other floors subject to movement or deflection.

### OTHER CONSIDERATIONS

- For exterior installations, use a suitable latex-Portland cement mortar or manufacturer's recommendations. Backbuttering of the tile is required to achieve 95% contact.
- Tile used in exterior applications must be frost resistant.
- Refer to Notes For The Professional and 301MJ-2012-2014.
- Waterproof membrane if required must be specified. (ANSI A 118.10) Follow manufacturer's recommendations
- For exterior use concrete slab must be sloped to provide positive surface drainage and adequate drainage below slab must be provided.
- Movement Joint (architect must specify type of joint and show location and details on drawings)
- There is a new standard for glass tile called ANSI A137.2 which should be consulted for types, size and performance which includes large format glass tile.

\* Large format tiles are considered to be thicker than 5.5 mm. Ceramic tile panels are 5.5 mm or less and have no performance standards established by ASNI or ISO. These products are very questionable on floor applications see notes on Ceramic Tile Panels page 12.

# LARGE FORMAT TILE ON INTERIOR WALLS

## 330LFTW -2012-2014

### SUITABLE SUBSTRATES

- For installation on the following stable substrates: Gypsum Board, CBU, Fiber Cement Underlayment, Coated Glass Mat Water Resistant Gypsum Boards or Cured Mortar Bed.
- Gypsum Board for dry interiors only
- Over dry, well-braced wood studs or furring
- Over well-braced metal studs (For drawings refer to 304W,305W-A,B,307W) NOTE: The maximum loading recommended for Gypsum Board is 5lbs/ sf including setting and grouting materials.

### MATERIALS

- TILE\*
- Gypsum Board – ASTM C36 or C630
- CBU – ANSI A 118.9, installed in accordance with ANSI A108.9
- Fibre Cement Underlayment – ASTM C1288
- Cured mortar bed, lath and membrane – ANSI A108.1B
- Crack Isolation Membrane – ANSI A 118.12 (follow manufacturer's instructions for use on vertical surfaces)
- Waterproof membrane – ANSI A 118.10. Follow manufacturer's recommendations
- Vapor/moisture barrier membrane (when required) to be 15 lb. roofing felt or minimum 4-mil polyethylene film.
- LEVELLING COMPOUND – Cementitious patching compound as per manufacturer's recommendations.
- BOND COAT – Latex-Portland cement mortar (minimum acceptable standard ANSI A 118.4 or ISO C2S1), modified epoxy emulsion mortars or 100% solids epoxy mortar (minimum acceptable standard ANSI A 118.3 or ISO R1).
- GROUT – Polymer-modified sanded tile grout (minimum acceptable standard ANSI A 118.7 or ISO CG2).

### APPLICATION

- Measure deflections on the floor or wall using a 10ft straight-edge prior to commencing any installation.
- Crack Isolation Membrane – ANSI A108.17 or follow the CIM manufacturer's recommendations – to provide complete coverage of the substrate in the area on which the large format tile is to be installed.
- Waterproof membrane – ANSI A108.3 or follow the CIM manufacturer's recommendations. Use recommended notch trowel for setting larger format tiles. Apply mortar into substrate with fl at side of trowel. This ensures complete contact to the pores of the substrate. It is very important that complete coverage be achieved by back buttering each piece of tile with thin-set mortar immediately prior to setting the tile to ensure that no voids are present against the back of the tile. Install tile in accordance with ANSI A 108.5.
- Periodically check coverage and bond by picking up freshly installed tile and inspecting. Be sure to remove contaminants on the back of tile so as ensure proper adhesion of tile to thin-set.
- Apply tile to bond coat before bond coat skins over. Use sufficient bond coat to ensure minimum 95% contact. Contact shall be evenly distributed to give full support of the tile. Slide tile firmly into position. Allow bond coat to cure. Force grout into full depth of joint, remove excess grout and clean.

### LIMITATIONS

- Do not use regular gypsum board in wet areas such as tub & shower enclosures.
- Do not use in areas where gypsum board is exposed to temperatures above 52°C
- Maximum variation of slab should not exceed 6 mm in 3000 mm or 2 mm in 300 mm.
- Surface variation should not exceed 3 mm in 3000 m

### OTHER CONSIDERATIONS

- Maximum stud spacing – 406 mm o.c.
- Minimum recommended metal stud depth 92 mm
- Metal studs – 20 gauge or heavier.
- Movement Joint (architect must specify type of joint and show location and details on drawings)
- Movement joints – mandatory, according to Detail 301MJ-2012-2014.
- For exterior installations, use a suitable latex-Portland cement mortar. Backbuttering of the tile is required to achieve 95%contact.
- Tile used in exterior applications must be frost resistant.
- Refer to Notes For The Professional and 301MJ-2012-2014.
- Waterproof membrane if required must be specified. (ANSI A 118.10) Follow manufacturer's recommendations.
- There is a new standard for glass tile called ANSI A137.2 which should be consulted for types, size and performance which includes large format glass tile.

# SOUND CONTROL SYSTEMS ON INTERIOR FLOORS

## 331F-SC-2012-2014

### DETAIL A – THIN SYSTEM OVER PLYWOOD

#### SUITABLE SUBSTRATES

- Provide a suitable rigid subfloor that is designed to support the maximum loading anticipated for the area to be tiled. Floor systems, including the framing system and subfloor panels, over which the tile will be installed shall be in conformance with the Canadian National Building Code 2010 and applicable local building codes taking into consideration anticipated live and dead loads.

#### MATERIALS

- SOUND REDUCTION MEMBRANE – meets ANSI A 118.13 standard for Bonded Sound Reduction Membranes for Thin-set Ceramic Tile and Dimension Stone Installation. This standard applies to trowel applied, liquid and flexible sheet membranes.
- BOND COAT – Latex-Portland cement mortar (minimum acceptable standard ANSI A 118.4 or ISO C2), modified epoxy emulsion mortars or 100% solids epoxy mortar (minimum acceptable standard ANSI A 118.3 or ISO R1).
- GROUT – Portland cement, latex-Portland cement (minimum acceptable standard ANSI A 118.6 or ISC CG1) or epoxy (minimum acceptable standard ANSI A 118.3 or ISO RG).
- GYPSUM BOARD – ASTM C36 Type X 15 mm thick
- RESILIENT CHANNELS – 1 or 2 legged
- SOUND ABSORBENT BATT – Fibreglass batt, natural cotton fibre or other
- ACCOUNSTICAL SEALANT – ASTM C919.

#### APPLICATION

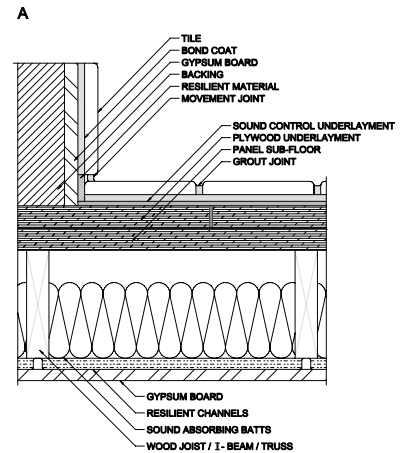
- Apply sound reduction membrane following manufacturer's recommendations to provide complete coverage of the substrate in the area on which the tile is to be installed. Install tile in accordance with ANSI A 108.5 Use sufficient bond-coat to ensure a minimum 95% contact.
- All perimeters must be recessed away from the walls and acoustic sealant or prefabricated movement joints must be applied Slide tile firmly into position while bond coat is wet and tacky. Force grout into full depth of tile joint. Remove excess grout and clean.

#### LIMITATIONS

- Some systems may require epoxy grout and/or epoxy bond-coat.
- Some products/systems cannot be used in commercial applications where heavy loads and carts will be used. A "Light Commercial" to "Heavy Commercial" rating utilizing ASTM C627 should be required.

#### OTHER CONSIDERATIONS

- Sound reduction membranes are intended to minimize the transfer of sound from one room to the room below, it is however only part of the overall system. Substrates, flooring material, dropped ceiling assemblies, perimeter joints, etc., will all affect the overall values.
- Movement Joint ( architect must specify type of joint and show location and details on drawings )
- Movement joints - mandatory according to Detail 301MJ-2012-2014.
- All systems must meet or exceed a "Residential Rating" with ASTM C627
- Some systems require 2 layers of 15 mm type X Gypsum Ceiling
- Refer to notes on "Sound Control Underlayment"
- Ratings may vary from 46 IIC to approximately 54 IIC using ASTM E-492 depending on product and other components in the system.
- This floor assembly has little or no effect on STC rating, normally this floor assembly will have an STC of 50 or more, when the appropriate sound rated wall detail is used.



Continued

# SOUND CONTROL SYSTEMS ON INTERIOR FLOORS

## 331F-SC-2012-2014

### DETAIL B – THICK SYSTEM OVER PLYWOOD

#### SUITABLE SUBSTRATES

- Provide a suitable rigid subfloor that is designed to support the maximum loading anticipated for the area to be tiled. Floor systems, including the framing system and subfloor panels, over which the tile will be installed shall be in conformance with the Canadian National Building Code 2010 and applicable local building codes taking into consideration anticipated live and dead loads.

#### MATERIALS

- SOUND REDUCTION MEMBRANE – as per manufacturer's recommendations. A wide range of resilient material can be used including crumbled rubber, cork, foam and other resilient materials.
- BOND COAT – Dry-set mortar (minimum acceptable standard ANSI A 118.1 or ISO C1), latex-Portland cement mortar (minimum acceptable standard ANSI A 118.4 or ISC C2), modified epoxy emulsion mortars or 100% solids epoxy mortar (minimum acceptable standard ANSI A 118.3 or ISO R1).
- GROUT – Portland cement, latex-Portland cement (minimum acceptable standard ANSI A 118.6 or ISC CG1) or epoxy (minimum acceptable standard ANSI A 118.3 or ISO RG).
- GYPSUM BOARD – ASTM C36 Type X 15 mm thick
- RESILIENT CHANNELS – 1 or 2 legged
- SOUND ABSORBENT BATT – fibreglass batt, natural cotton fibre or other
- ACCOUSTICAL SEALANT – ASTM C919

#### APPLICATION

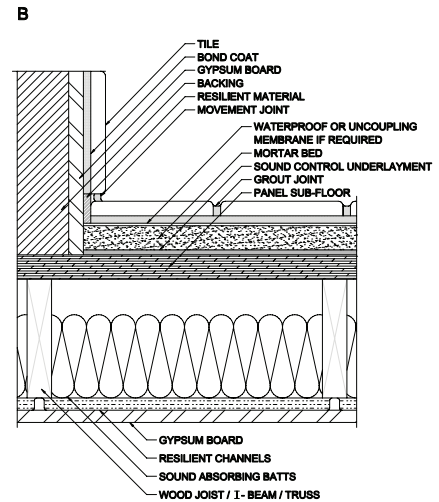
- Apply sound reduction membrane following manufacturer's recommendations to provide complete coverage of the substrate
- Apply mortar bed (see Tile Guide Specification Section Mixes 2.5.5) to required thickness over fresh slurry bond coat (see Tile Guide Specification Section Mixes 2.5.2). Finished tolerance of mortar bed not to exceed 6 mm in 3000 mm or 2 mm in 300 mm
- Install tile in accordance with ANSI A 108.5 Use sufficient bond-coat to ensure a minimum 95% contact.
- All perimeters must be recessed away from the walls and acoustic sealant or prefabricated movement joints must be applied. Slide tile firmly into position while bond coat is wet and tacky. Force grout into full depth of tile joint. Remove excess grout and clean.

#### LIMITATIONS

- Some products/systems cannot be used in commercial applications where heavy loads and carts will be used. A "Light Commercial" to "Heavy Commercial" rating utilizing ASTM C-627 should be required.
- This assembly will normally raise the floor from anywhere from 30 mm to 62.5 mm in height. Height restrictions should be evaluated.

#### OTHER CONSIDERATIONS

- Sound reduction membranes are intended to minimize the transfer of sound from one room to the room below, it is however only part of the overall system. Substrates, flooring material, dropped ceiling assemblies, perimeter joints, etc., will all affect the overall values.
- Movement Joint (architect must specify type of joint and show location and details on drawings).
- Movement joints - mandatory according to Detail 301MJ-2012-2014.
- All systems must meet or exceed a "Residential Rating" with ASTM C-627.
- Some systems require 2 layers of 15 mm type X Gypsum Ceiling
- Refer to notes on "Sound Control Underlayment".
- Ratings may vary from 48 IIC to approximately 58 IIC using ASTM E-492 depending on product and other components in the system. This floor assembly has little or no effect on STC rating, normally this floor assembly will have an STC of 50 or more, when the appropriate sound rated wall detail is used.
- Detail 314F-C2 Modular Screed System Over Plywood can be used as alternative to a monolithic mortar bed.



# SOUND CONTROL SYSTEMS ON INTERIOR FLOORS

## 331F-SC-2012-2014

### DETAIL C – THIN SYSTEM ON CONCRETE WITH DROPPED CEILING

#### MATERIALS

- SOUND REDUCTION MEMBRANE – meets ANSI A 118.13 standard for Bonded Sound Reduction Membranes for Thin-set Ceramic Tile and Dimension Stone Installation. This standard applies to trowel applied, liquid and flexible sheet membranes.
- BOND COAT – Dry-set mortar (minimum acceptable standard ANSI A 118.1 or ISO C1), latex-Portland cement mortar (minimum acceptable standard ANSI A 118.4 or ISC C2), modified epoxy emulsion mortars or 100% solids epoxy mortar (minimum acceptable standard ANSI A 118.3 or ISO R1).
- GROUT – Portland cement, latex-Portland cement (minimum acceptable standard ANSI A 118.6 or ISC CG1) or epoxy (minimum acceptable standard ANSI A 118.3 or ISO RG).
- GYPSUM BOARD – ASTM C36 Type X 15 mm thick
- RESILIENT CHANNELS – 1 or 2 legged
- SOUND ABSORBANT BATT – Fibreglass batt, natural cotton fibre or other
- ACCOUSTICAL SEALANT – ASTM C919.

#### APPLICATION

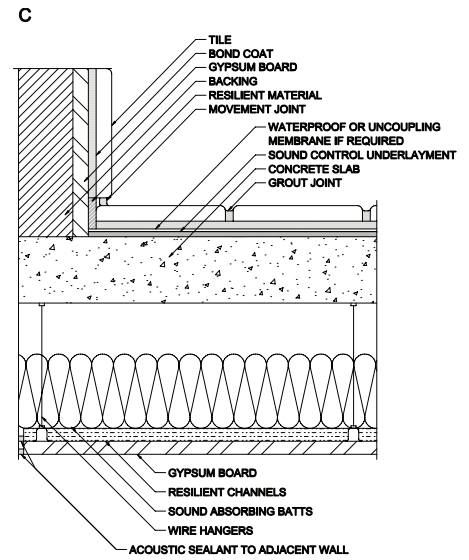
- Apply sound reduction membrane following manufacturer's recommendations to provide complete coverage of the substrate in the area on which the tile is to be installed. Install tile in accordance with ANSI A 108.5 Use sufficient bond-coat to ensure a minimum 95% contact.
- All perimeters must be recessed away from the walls and acoustic sealant or prefabricated movement joints must be applied Slide tile firmly into position while bond coat is wet and tacky. Force grout into full depth of tile joint. Remove excess grout and clean.

#### LIMITATIONS

- Some systems may require epoxy grout and/or epoxy bond-coat.
- Some products/systems cannot be used in commercial applications where heavy loads and carts will be used. A "Light Commercial" to "Heavy Commercial" rating utilizing ASTM C-627 should be required.

#### OTHER CONSIDERATIONS

- Sound reduction membranes are intended to minimize the transfer of sound from one room to the room below, it is however only part of the overall system. Substrates, flooring material, dropped ceiling assemblies, perimeter joints, etc., will all affect the overall values.
- Movement Joint ( architect must specify type of joint and show location and details on drawings).
- Movement joints - mandatory according to Detail 301MJ-2012-2014.
- All systems must meet or exceed a "Residential Rating" with ASTM C627.
- Some systems require 2 layers of 15 mm type X Gypsum Ceiling.
- Refer to notes on "Sound Control Underlayment" Boards.
- Ratings may vary from 64 IIC to approximately 68 IIC using ASTM E492 depending on product and other components in the system.
- This floor assembly has little or no effect on STC rating, normally this floor assembly will have an STC of 50 or more, when the appropriate sound rated wall detail is used.
- Request for test results for ASTM E-2179-03 from manufacturer to determine contribution on a concrete slab. Product specified should have a contribution ( $\Delta$ ) IIC rating of 10 or greater.



Continued

# SOUND CONTROL SYSTEMS ON INTERIOR FLOORS

## 331F-SC-2012-2014

### DETAIL D – THICK SYSTEM ON CONCRETE WITH DROPPED CEILING

#### SUITABLE SUBSTRATES

- Interior concrete slabs. Floor systems over which the tile is installed shall be in conformance with the Canadian National Building Code 2010 and applicable local building codes taking into consideration anticipated live and dead loads.

#### MATERIALS

- SOUND REDUCTION MEMBRANE – as per manufacturer’s recommendations. A wide range of resilient material can be used including crumbled rubber, cork, foam and other resilient materials.
- BOND COAT – Dry-set mortar (minimum acceptable standard ANSI A 118.1 or ISO C1), latex-Portland cement mortar (minimum acceptable standard ANSI A 118.4 or ISC C2), modified epoxy emulsion mortars or 100% solids epoxy mortar (minimum acceptable standard ANSI A 118.3 or ISO R1).
- GROUT – Portland cement, latex-Portland cement (minimum acceptable standard ANSI A 118.6 or ISC CG1) or epoxy (minimum acceptable standard ANSI A 118.3 or ISO RG).
- GYPSUM BOARD – ASTM C36 Type X 15 mm thick
- RESILIENT CHANNELS – 1 or 2 legged
- SOUND ABSORBANT BATT – Fibreglass batt, natural cotton fibre or other
- ACCOUSTIC SEALANT – ASTM C919

#### APPLICATION

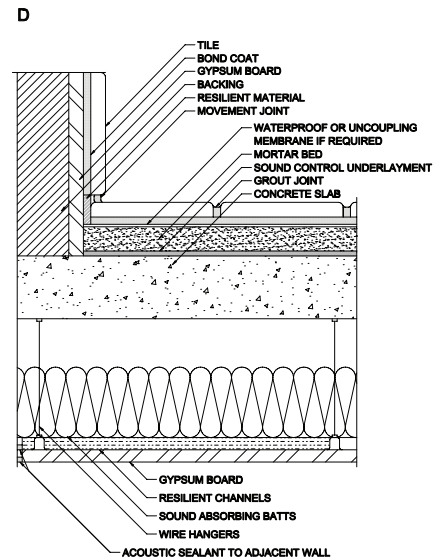
- Apply sound reduction membrane following manufacturer’s recommendations to provide complete coverage of the substrate
- Apply mortar bed (see Tile Guide Specification Section Mixes 2.5.5) to required thickness over fresh slurry bond coat (see Tile Guide Specification Section Mixes 2.5.2). Finished tolerance of mortar bed not to exceed 6 mm in 3000 mm or 2 mm in 300 mm
- Install tile in accordance with ANSI A 108.5 Use sufficient bond-coat to ensure a minimum 95% contact.
- All perimeters must be recessed away from the walls and acoustic sealant or prefabricated movement joints must be applied Slide tile firmly into position while bond coat is wet and tacky. Force grout into full depth of tile joint. Remove excess grout and clean.

#### LIMITATIONS

- Some products/systems cannot be used in commercial applications where heavy loads and carts will be used. A “Light Commercial” to “Heavy Commercial” rating utilizing ASTM C627 should be required.
- This assembly will normally raise the floor from anywhere from 30 mm to 62.5 mm in height. Height restrictions should be evaluated.

#### OTHER CONSIDERATIONS

- Sound reduction membranes are intended to minimize the transfer of sound from one room to the room below, it is however only part of the overall system. Substrates, flooring material, dropped ceiling assemblies, perimeter joints, etc., will all affect the overall values.
- Movement Joint (architect must specify type of joint and show location and details on drawings)
- Movement joints - mandatory according to Detail 301MJ-2012-2014.
- All systems must meet or exceed a “Residential Rating” with ASTM C627
- Some systems require 2 layers of 15 mm type X Gypsum Ceiling
- Refer to notes on “Sound Control Underlayment” Boards
- Ratings may vary from 65 IIC to approximately 70 IIC using ASTM E-492
- This floor assembly has little or no effect on STC rating, normally this floor assembly will have an STC of 50 or more, when the appropriate sound rated wall detail is used.
- Request for test results for ASTM E-2179-03 from manufacturer to determine contribution on a concrete slab. Product specified should have a contribution ( $\Delta$ ) IIC rating of 10 or greater
- Detail 314F-G Modular Screed System on concrete can be used as alternative to a monolithic mortar bed



Continued

# SOUND CONTROL SYSTEMS ON INTERIOR FLOORS

## 331F-SC-2012-2014

### DETAIL E – THIN SYSTEM ON CONCRETE NO DROPPED CEILING

#### MATERIALS

- SOUND REDUCTION MEMBRANE – meets ANSI A 118.13 standard for Bonded Sound Reduction Membranes for Thin-set Ceramic Tile and Dimension Stone Installation. This standard applies to trowel applied, liquid and flexible sheet membranes.
- BOND COAT – Dry-set mortar (minimum acceptable standard ANSI A 118.1 or ISO C1), latex-Portland cement mortar (minimum acceptable standard ANSI A 118.4 or ISC C2), modified epoxy emulsion mortars or 100% solids epoxy mortar (minimum acceptable standard ANSI A 118.3 or ISO R1).
- GROUT – Portland cement, latex-Portland cement (minimum acceptable standard ANSI A 118.6 or ISC CG1) or epoxy (minimum acceptable standard ANSI A 118.3 or ISO RG).

#### APPLICATION

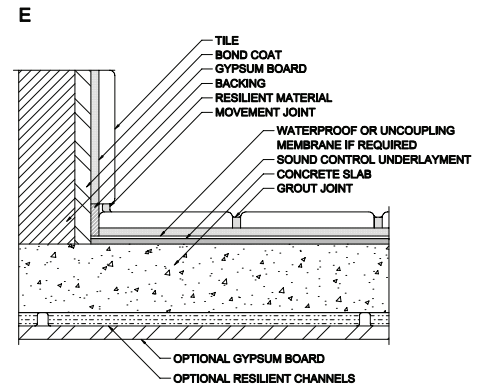
- Apply sound reduction membrane following manufacturer’s recommendations to provide complete coverage of the substrate in the area on which the tile is to be installed. Install tile in accordance with ANSI A 108.5 Use sufficient bond-coat to ensure a minimum 95% contact.
- All perimeters must be recessed away from the walls and acoustic sealant or prefabricated movement joints must be applied Slide tile firmly into position while bond coat is wet and tacky. Force grout into full depth of tile joint. Remove excess grout and clean.

#### LIMITATIONS

- Some systems may require epoxy grout and/or epoxy bond-coat.
- Some products/systems cannot be used in commercial applications where heavy loads and carts will be used. A “Light Commercial” to “Heavy Commercial” rating utilizing ASTM C627 should be required.

#### OTHER CONSIDERATIONS

- Sound reduction membranes are intended to minimize the transfer of sound from one room to the room below, it is however only part of the overall system. Substrates, flooring material, dropped ceiling assemblies, perimeter joints, etc., will all affect the overall values.
- Movement Joint ( architect must specify type of joint and show location and details on drawings )
- Movement joints - mandatory according to Detail 301MJ-2012-2014.
- All systems must meet or exceed a “Residential Rating” with ASTM C-627-99
- Some systems require 2 layers of 15 mm type X Gypsum Ceiling
- Refer to notes on “Sound Control Underlayment” Boards
- Ratings may vary from 35 IIC to approximately 52 IIC using ASTM E-492 depending on product and other components in the system.
- This floor assembly has little or no effect on STC rating, normally this floor assembly will have an STC of 50 or more, when the appropriate sound rated wall detail is used.
- Request for test results for ASTM E-2179-03 from manufacturer to determine contribution on a concrete slab. Product specified should have a contribution (Δ) IIC rating of 20 or greater. A bare concrete slab 150 mm thick with no ceiling panels will have approximately an IIC of 28. Alternatively, a concrete slab 200 mm thick with no ceiling panels will have approximately an IIC of 32.



Continued

# SOUND CONTROL SYSTEMS ON INTERIOR FLOORS

## 331F-SC-2012-2014

### DETAIL F – THICK SYSTEM ON CONCRETE NO DROPPED CEILING

#### SUITABLE SUBSTRATES

- Interior concrete slabs. Floor systems over which the tile is installed shall be in conformance with the Canadian National Building Code 2010 and applicable local building codes taking into consideration anticipated live and dead loads.

#### MATERIALS

- SOUND REDUCTION MEMBRANE – as per manufacturer’s recommendations. A wide range of resilient material can be used including crumbled rubber, cork, foam and other resilient materials.
- BOND COAT - Dry-set mortar (minimum acceptable standard ANSI A 118.1 or ISO C1), latex-Portland cement mortar (minimum acceptable standard ANSI A 118.4 or ISO C2), modified epoxy emulsion mortars or 100% solids epoxy mortar (minimum acceptable standard ANSI A 118.3 or ISO R1).
- GROUT – Portland cement, latex-Portland cement (minimum acceptable standard ANSI A 118.6 or ISC CG1) or epoxy (minimum acceptable standard ANSI A 118.3 or ISO RG).

#### APPLICATION

- Apply sound reduction membrane following manufacturer’s recommendations to provide complete coverage of the substrate in the area on which the tile is to be installed. Install tile in accordance with ANSI A 108.5 Use sufficient bond-coat to ensure a minimum 95% contact.
- All perimeters must be recessed away from the walls and acoustic sealant or prefabricated movement joints must be applied. Slide tile firmly into position while bond coat is wet and tacky. Force grout into full depth of tile joint. Remove excess grout and clean.

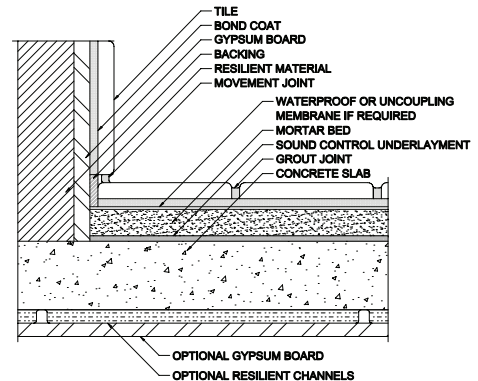
#### LIMITATIONS

- Some products/systems cannot be used in commercial applications where heavy loads and carts will be used. A “Light Commercial” to “Heavy Commercial” rating utilizing ASTM C627 should be required.
- This assembly will normally raise the floor from anywhere from 30 mm to 62.5 mm in height. Height restrictions should be evaluated..

#### OTHER CONSIDERATIONS

- Sound reduction membranes are intended to minimize the transfer of sound from one room to the room below, it is however only part of the overall system. Substrates, flooring material, dropped ceiling assemblies, perimeter joints, etc., will all affect the overall values.
- Movement Joint (architect must specify type of joint and show location and details on drawings)
- Movement joints - mandatory according to Detail 301MJ-2012-2014.
- All systems must meet or exceed a “Residential Rating” with ASTM C627
- Some systems require 2 layers of 15 mm type X Gypsum Ceiling
- Refer to notes on “Sound Control Underlayment”.
- Ratings may vary from 40 IIC to approximately 60 IIC using ASTM E492 depending on product and other components in the system.
- This floor assembly has little or no effect on STC rating, normally this floor assembly will have an STC of 50 or more, when the appropriate sound rated wall detail is used.
- Request for test results for ASTM E2179 from manufacturer to determine contribution on a concrete slab. Product specified should have a contribution ( $\Delta$ ) IIC rating of 20 or greater. A bare concrete slab 150 mm thick with no ceiling panels will have approximately an IIC of 28. Alternatively, a concrete slab 200 mm thick with no ceiling panels will have approximately an IIC of 32.
- Detail 314F-G Modular Screed System on concrete can be used as alternative to a monolithic mortar bed.

F



Continued

## Part 1 General

### 1.1 SUMMARY

- .1 This section includes requirements for supply and installation of [ceramic] [and] [stone] tiling and bonding systems in [floor] [wall] [and] [ceiling] configurations and includes for the following:
- .1 Cleavage membranes for thick set materials
  - .2 [Crack isolation] [and] [uncoupling] membranes for [large format tiles] [suspended slabs]
  - .3 Waterproof membrane for thin set tile installations
  - .4 Cementitious [and] [plywood] backer board[s]
  - .5 Tile bonding accessories including edge strips and bases [, transition strips] [, control strips] [, movement joints] [, stair treads and nosings] and other accessories required for a complete and finished installation

### 1.2 RELATED REQUIREMENTS

*SPEC NOTE: Edit following listings to reflect sections that are directly affecting or affected by work of this section. Related requirements can be used to coordinate closely related components of Work Results described in this section.*

- .1 Section 03 31 00 – Structural Concrete

*SPEC NOTE: It is highly recommended that floor flatness be specified in concrete or concrete finishing sections and to coordinate flatness tolerances required by this section prior to placement of any permanent concrete slabs.*

- .2 Section 03 35 00 – Concrete Finishing
- .3 Section 05 51 00 – Metal Stairs
- .4 Section 06 10 00 – Rough Carpentry
- .5 Section 07 92 00 – Joint Sealers
- .6 Section 09 21 16 – Gypsum Board Assemblies

*SPEC NOTE: Concrete Floor Contractors Association of Canada indicates that applied finish manufacturers often employ straightedge tolerances for slab flatness that has proven not to be practical for concrete floor construction; with typical installations for slabs on grade having an FF25 or less, and most suspended slabs having an FF20 or less. Tile installations require a floor flatness in excess of FF25 to 35; listed in CSA A23.1 as a Class B Finish with increasingly flatter surfaces for larger format tile materials.*

*Since the surface flatness tolerance required to meet the straightedge requirements of most flooring materials cannot be predetermined, it is strongly advisable to include a Cash Allowance or a Unit Price Adjustment Rate to adjust quantities of floor levelling materials based on a unit prices provided by the tiling subcontractor that can be applied to the work after acceptance of the cured concrete.*

*Specifier should determine appropriate wording and pricing procedure to meet their specification requirements, and adjust the following article to suit project requirements and contract delivery methodology.*

### 1.3 PRICE AND PAYMENT PROCEDURES

- .1 [Allowances: Floor levelling materials specified in this Section form a part of a supply and installation cash allowance as specified in Section 01 21 00 – Allowances, and will be used to adjust material quantities where floor flatness does not meet specified requirements.]
- .2 [Unit Prices: Floor levelling materials specified in this Section form a part of a Unit Price Adjustment required by Section 00 43 [13] [23] – Procurement Submittal Form [D]; complete unit price request and submit with Bids.]

*SPEC NOTE: Edit following listings of standards to suit project requirements, delete standards that do not apply to the Project and that are not listed in the specification after final edits.*

**1.4 REFERENCE STANDARDS****.1 American National Standards Institute (ANSI):**

- .1 ANSI/CTI A108.1 2012, Specification for the Installation of Ceramic Tile: Collection of 21 ANSI/CTI A108, A 118 and A136 Series of Standards on Tile Installation

*SPEC NOTE: The ANSI A137.1 or ISO 10545 Ceramic Tile Standards are used to describe materials distributed in North America; the existing CAN/CGSB 75.1-M88 standard has been withdrawn by the Standards Council of Canada (SCC). TTMAC supports ISO Tile Standards in the first instance and recognizes ANSI Tile Standards where ISO is not used.*

- .2 ANSI A137.1-2012, Specification for Ceramic Tile
- .3 ANSI A137.2-2012, Specification for Glass Tile

**.2 American Society for Testing and Materials (ASTM):**

- .1 ASTM A82/A82M-07, Standard Specification for Steel Wire, Plain for Concrete Reinforcing
- .2 ASTM C97/C97M-09, Standard Test Methods for Absorption and Bulk Specific Gravity of Dimension Stone
- .3 ASTM A185/A185M-07, Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete
- .4 ASTM C119-11, Standard Terminology Relating to Dimension Stone
- .5 ASTM C144-11, Standard Specification for Aggregate for Masonry Mortar
- .6 ASTM C207 06 (2011), Standard Specification for Hydrated Lime for Masonry Purposes
- .7 ASTM C241/C241M-09, Standard Test Method for Abrasion Resistance of Stone Subjected to Foot Traffic
- .8 ASTM C373-88 (2006), Standard Test Method for Water Absorption, Bulk Density, Apparent Porosity, and Apparent Specific Gravity of Fired Whiteware Products
- .9 ASTM C503/C503M-10, Standard Specification for Marble Dimension Stone
- .10 ASTM C568/C568M 10, Standard Specification for Limestone Dimension Stone
- .11 ASTM C615/C615M 11, Standard Specification for Granite Dimension Stone
- .12 ASTM C616/C616M-10, Standard Specification for Quartz-Based Dimension Stone
- .13 ASTM C627 10, Standard Test Method for Evaluating Ceramic Floor Tile Installation Systems Using the Robinson Type Floor Tester
- .14 ASTM C629/C629M-10, Standard Specification for Slate Dimension Stone
- .15 ASTM A641/A641M-03, Standard Specification for Zinc Coated (Galvanized) Carbon Steel Wire
- .16 ASTM C648-04 (2009), Standard Test Method for Breaking Strength of Ceramic Tile
- .17 ASTM C847 12, Standard Specification for Metal Lath

*SPEC NOTE: The ASTM C10128 test for Static Coefficient of Friction (SCOF) is being replaced by the ANSI 137.1 test for Dynamic Coefficient of Friction (DCOF); as described in the TTMAC Tile Installation Manual, using the BOT-3000 Digital Tribometer and is considered a more accurate and repeatable measure of slip resistance*  
*SPEC NOTE: Another reference standard that could be used for DCOF is the DIN 51130, often colloquially referenced as the "German Ramp Test" as listed below. This standard is applicable to ramped and non-ramped surfaces and is listed under the Deutsches Institut für Normung below.*

- .18 [ASTM C1028-07e1, Standard Test Method for Determining Static Coefficient of Friction of Ceramic Tile and other Like Surfaces by Horizontal Dynamometer Pull Meter Method]
- .19 ASTM C1178/C1178M 11, Standard Specification for Glass Mat Water Resistant Gypsum Backing Panel
- .20 ASTM C1353-09, Standard Test Method for Abrasion Resistance of Dimension Stone Subjected to Foot Traffic Using a Rotary Platform, Double-Head Abraser
- .21 ASTM C1526-08, Standard Specification for Serpentine Dimension Stone
- .22 ASTM C1527/C1527M-11 Standard Specification for Travertine Dimension Stone
- .23 ASTM C1528-10, Guide for Selection of Dimension Stone

**.3 Canadian Standards Association (CSA):**

- .1 CSA A3000 08, Cementitious Materials Compendium
- .2 CSA A123.3-05 (R2010), Asphalt Saturated Organic Roofing Felt
- .3 CSA O121-08, Douglas Fir Plywood

- .4 Canadian General Standards Board (CGSB):
  - .1 CAN/CGSB 25.20-95, Surface Sealer for Floors
  - .2 CAN/CGSB 51.34-M86: Vapour Retarder, Polyethylene Film for Use in Building Construction

*SPEC NOTE: CGSB 75.1-M88 has been withdrawn by the Standards Council of Canada (SCC), most ceramic tile offered in Canada are listed under the ANSI A137.1 or ISO 10545 Standards for Ceramic Tile. Ceramic tiles should be described by manufacturer's using the ISO or ANSI designations; however, older product data may still list their products using the CGSB standard.*

- .3 [CAN/CGSB 75.1-M88 Tile Ceramic]
- .5 [Deutsches Institut für Normung (DIN):
  - .1 DIN 51130:2004-06, Testing of Floorcoverings, Determination of Slip Properties, Ramp Method]
- .6 [International Standards Organization (ISO):
  - .1 ISO 10545-Series, Ceramic Tiles, Standards for Testing
  - .2 ISO 13006-2012, Ceramic Tiles, Definitions, Classifications, Characteristics and Marking]
- .7 Terrazzo, Tile and Marble Association of Canada (TTMAC):
  - .1 TTMAC 2012-2014 Specification Guide 09 30 00, Tile Installation Manual
  - .2 TTMAC Dimensional Stone Guide
  - .3 TTMAC Hard Surface Maintenance Guide

## 1.5 ADMINISTRATIVE REQUIREMENTS

- .1 Preconstruction Meeting: Arrange a preconstruction meeting in accordance with Section [01 31 19 – Project Meetings] attended by [Constructor], Consultant, tile installer and tile supplier, mortar and grout representative [, and [[waterproof] [crack isolation] [uncoupling] [sound dampening]] membrane representative] to discuss the following:
  - .1 Substrate and backing surfaces flatness requirements
  - .2 Installation techniques associated with specified materials
  - .3 Compatibility between specified materials and between adjacent materials
  - .4 Concerns arising from site conditions
  - .5 Concerns of the installer or supplier arising from as-constructed conditions

*SPEC NOTE: Coordinate structural concrete drawings and design requirements for slab depressions accounting for mortar bed, bond coat and tile thicknesses and weights where finished tile floors are installed flush with adjacent floors. Coordination with the documents used for communicating construction requirements is a key success requirement to show slab depressions at drawing locations where they are most easily coordinated by the first installing subcontractor.*

- .2 Coordination: Coordinate requirements for floor recesses and provide depth of required slab depressions to Section 03 31 00 before placement of concrete accounting for mortar bed, bond coat and tile thickness where finished tile surfaces are indicated as being installed flush with adjacent floor finishes.

## 1.6 SUBMITTALS

- .1 Provide required information in accordance with Section [01 33 00 – Submittal Procedures].
- .2 Action Submittals: Provide the following submittals before starting any work of this Section:
  - .1 Product Data: Submit manufacturer's product data for each type of product specified; indicate compliance with specification and installation recommendations of manufacturer of products being used.

*SPEC NOTE: Shop Drawings are required only for projects where extensive or complex tile Work or unusual conditions such as may be required for swimming pools, detailed mosaics or other installations requiring special attention to details. Edit list to suit project requirements.*

- .2 Shop Drawings: Submit shop drawings indicating the following:
  - .1 Special tile patterns or conditions affecting installation
  - .2 Locations transitions and intersections between differing materials
  - .3 Widths, details, and locations of [expansion and contraction joints], and [control and isolation joints] in tile substrates and finished tile surfaces
  - .4 [Indicate swim lane lines and other pool markings and special patterns]
  - .5 [Indicate locations and configuration of inserts and edging details]
- .3 [Samples for Initial Selection: Submit samples for initial selection by Consultant:
  - .1 Tile: Manufacturer's colour charts consisting of actual tiles or sections of tiles showing the full range of colours, textures, and patterns available for each type and composition of tile indicated. Include Samples of accessories involving colour selection.
  - .2 Grout: Manufacturer's colour charts consisting of actual sections of grout showing the full range of colours available for each type of grout indicated.]

*SPEC NOTE: Specify quantity and size of samples required and whether they are mounted on panels with specified grout, or submitted as individual samples.*

- .4 Samples for Verification: Submit samples for verification to Consultant including sample sets showing full range of variations expected where products involve normal colour and texture variations:
  - .1 Trims: Submit full size units of each type of trim and accessory in each colour required for installation; minimum 150 mm lengths].
  - .2 Tiles: Submit [one (1)] [two (2)] [four (4)] pieces of each tile [specified] [selected].

— OR —

*SPEC NOTE: Adjust panel sizes for sample submittals based on size of tiles specified; large format tiles will require larger sample panel sizes.*

- .3 Panels: Submit [300 mm x 300 mm] [900 mm x 900 mm] [600 mm x 600 mm] sized panel using [specified] [selected] material [including coloured grout] mounted on 19 mm thick plywood backer [; include sample installation of perimeter accessories, control or movement joints, and trims where applicable].
- .5 Informational Submittals: Provide the following submittals during the course of the work:
  - .1 Certificates: Submit written statements from manufacturers indicating compatibility with respect to other manufacturer's materials where more than one manufacturer's products form a part of a single tile assembly.

*SPEC NOTE: Modify project sustainable design submittals to reflect actual credits being sought for the project. Choices indicated related to New Construction, always confirm credit listing based on LEED® rating system used for the Project.*

*SPEC NOTE: Confirm that specified materials qualify for sustainable design requirements before specifying them; asking for submittals for products that do not or cannot meet sustainable requirements may cause delays or additional administration to the project.*

- .6 [Sustainable Design Submittals: Coordinate project sustainable design requirements with Section [01 35 31 – LEED® Special Project Procedures]; in addition, provide information for following specific requirements of this Section:]
  - .1 [MR Credit 4 – Recycled Content:
    - .1 Content: Total value of building materials must contain a minimum weighted average of [10%] [20%] of post consumer + ½ pre-consumer recycled content; preference will be given to materials that provide a positive contribution towards the total recycle content for the project over materials that provide less of a contribution.
    - .2 Compliance Requirement: Submit product cut sheet indicating post consumer and post industrial recycled content contained in products proposed for this project meeting or exceeding requirements of ISO 14021 – Environmental Labels and Declarations, Self Declared Claims (Type II Environmental Labelling).]

- .2 [MR Credit 5 – Regional Materials:
  - .1 Content: Total value of building materials must contain a minimum of [20%] [30%] of building materials extracted, processed, and manufactured within the region in support of the use of indigenous resources and reducing environmental impacts resulting from transportation.
  - .2 Compliance Requirement: Submit information confirming that materials were extracted, harvested, recovered and processed within 800 km from manufacturer and as follows:
    - .1 Submit information confirming that final manufacturing site is within 800 km of the project site.
    - .2 Include any allowances for fractions of products used to achieve Credit.
    - .3 The 800 km range can be increased to 2400 km where bills of lading are submitted indicating that materials were delivered by rail or marine transportation.]
- .3 [IEQ Credit 4.1 – Low Emitting Materials-Sealants and Coatings:
  - .1 Content: Use sealants and primers that meet or are less than VOC Limits established by South Coast Air Quality Management District Rule 1168 and amendments.
  - .2 Compliance Requirements: Provide information for each site applied adhesive or surface sealer used within the building envelope (interior side of weatherproofing system) indicating VOC Limit in grams per litre (g/L) meeting or less than limits listed for application of materials specified in this Section.]

## 1.7 PROJECT CLOSEOUT SUBMITTALS

- .1 Operations and Maintenance Data: Submit [two (2)] [four (4)] copies of TTMAC Maintenance Guide in accordance with Section [01 78 23 – Operations and Maintenance Data], and additional information as follows:
  - .1 Provide specific warning of any maintenance practice or materials that may damage or disfigure the finished Work.
  - .2 Provide manufacturer's maintenance data sheets for floor sealers and other non tile maintenance materials and accessories.
- .2 Maintenance Materials: Provide additional materials supplied to the installation in accordance with Section [01 78 43 – Spare Parts] as follows:
  - .1 Tile Maintenance Materials: Deliver 2% of total for each tile material used for the project, packaged neatly in original containers to prevent damage, from the same lot or batch with a minimum of [1 (one) box] [[8 (eight)] pieces] of each colour and type use for the project; clearly marked to identify the following:
    - .1 Manufacturer [, stone quarry] and distributor's name.
    - .2 Material series name and stocking number
    - .3 Material description, including colour and pattern

## 1.8 QUALITY ASSURANCE

- .1 Quality Assurance Program: Communicate requirements for submission of specifications and material compatibility submissions to TTMAC as required for Verispec Program; tile installation Subcontractor shall include costs for Verispec Program as a part of submitted Bid.
- .2 Qualifications: Provide proof of qualifications when requested by Consultant:
  - .1 Project Quality Standard: Tile Installation Manual published by the TTMAC, together with authorized additions and amendments will be used as a reference standard and forms part of this project specification.
  - .2 Installer: Execute Work of this Section using a company employing qualified personnel skilled in ceramic tile installation, that is a member in good standing of TTMAC at time of Bidding, having a minimum of [two (2)] [five (5)] years proven experience and having completed tile installations similar in material, design, and extent to that indicated for this Project.

- .3 Supplier: Obtain each specified material from one source with resources to provide products from the same production run for each contiguous area consistent in quality, appearance and physical properties.

## 1.9 MOCK-UPS

*SPEC NOTE: Sample installations and mock-ups are an excellent resource for communicating design intent and confirming material layouts. Dry laid sample installations are quick and easy to set up and can typically communicate design intent in an effective manner. Mock-ups are more time consuming and have a higher cost impact to the construction, but are extremely effective at confirming complex design intent and tight tolerances where there is a higher degree of expectations for the project.*

- .1 Provide required [Mock-up[s]] [Sample Installation[s]] in accordance with Section [01 45 00 – Quality Control] and as follows:
  - .1 [Dry lay sample installation] [Construct mock-ups] for each form of construction and finish required to verify selections made under Sample submittals and to demonstrate aesthetic effects and qualities of materials and execution.

*SPEC NOTE: Include the following where a small scale dry laid sample of representative installation may not be sufficient to confirm full aesthetic considerations or technical installation requirements.*

- .2 Mock-up one (1) typical [washroom] [shower room] [\_\_\_\_] indicating tile pattern, grout colour and accessories indicated:
  - .1 Mock-up will be used to coordinate placement of miscellaneous specialties and other related components as well as clearances to adjacent appurtenances (electrical and mechanical fixtures) and finishes.
  - .2 Consultant will require modifications pertaining to aesthetics and placement of components that interfere with other materials or fixtures.
  - .3 When identified modifications to the mock-up are completed, reviewed, and accepted by the Consultant, they will form the standard of acceptance for the remainder of the Work.
- .3 Locate mock-ups in the location and of the size indicated or, if not indicated, as directed by Consultant.
- .4 Notify Consultant seven (7) days in advance of the dates and times when mock-ups will be constructed.
- .5 Obtain Consultant's acceptance of mock-ups before proceeding with final unit of Work.
- .6 [Maintain mock-ups during construction in an undisturbed condition as a standard for judging the completed Work; demolish and remove mock-ups from Project site when directed by Consultant.] [Accepted mock-ups in an undisturbed condition at the time of Substantial Performance may become part of the completed Work.]

## 1.10 DELIVERY, STORAGE, AND HANDLING

- .1 Packaging Requirements: Packaging is required to list the following:
  - .1 Markings: Manufacturer's mark or trademark, product name and country of origin; also include on edge or back side of tile.
  - .2 Quality: Indication of First Quality.
  - .3 Type of Tile: Indicate tile type as described by relevant reference standard.
  - .4 Dimensions: Tile sizing indicating nominal dimensions and working size, and whether sizing is modular or non-modular.
  - .5 Surface: Indicating glazed or unglazed surface finish.
  - .6 Additional Preparation: Indication of whether tiles require any site preparation or surface treatments.
  - .7 Weight: Total dry weight that tile and packaging is not to exceed.
- .2 Delivery and Acceptance Requirements: Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use in accordance with ANSI A108.1 for labelling sealed tile packages.
- .3 Storage and Handling Requirements: Store materials to prevent damage or contamination to materials by water, freezing, foreign matter, and other causes; store cementitious materials in a dry area, and blocked off floor and ground surfaces.

**1.11 SITE CONDITIONS**

- .1 Ambient Conditions: Apply tile after completion of work by other Sections is complete; to surfaces sufficiently dry, clean, firm, level, plumb and free from oil or wax or any other material harmful to tile adhesion and as follows:

*SPEC NOTE: TTMAC recommended installation temperatures for various materials are listed; always confirm with manufacturer's requirements for any variations to recommended minimum and maximums.*

- .1 Temperature: Maintain tile materials and substrate temperature between TTMAC recommended minimum and maximum temperature range; unless indicated otherwise by manufacturer, as follows:
- .1 Tile and Cementitious Materials: Install tiles between [12 degrees C] and [38 degrees C], meeting installation material manufacturer's written recommendations.
- .2 Epoxy Materials: Install epoxy mortar and grouts between [18 degrees C] and [35 degrees C], meeting installation material manufacturer's written recommendations.
- .3 Curing Time: Maintain temperature range for 48 hours before and during installation and maintain temperature range until materials are fully set and cured in accordance with manufacturer's recommendations, and as follows:
- .1 Provide additional heat when there is a risk that surface temperatures may drop below minimum recommended temperatures.
- .2 Provide cooling or wait until temperature range is below maximum recommended temperatures; do not install materials when temperature is at or above maximum recommended temperature.
- .2 Ventilation: Maintain adequate ventilation where Work of this Section generates toxic gases or where there is a risk of raising relative humidity to levels that could damage building finishes and assemblies.

**Part 2 Products****2.1 MANUFACTURERS**

*SPEC NOTE: Consider the merits of Basis-of-Design Materials (single sourced materials) or Acceptable Materials (multiple sources) has on project delivery and control of aesthetic requirements. Tile finishes are more apt to be single sourced whereas accessories and setting materials can be obtained from multiple sources. Modify the content of this article as required to reflect the choices being made within the technical selection components.*

- .1 Basis-of-Design Materials: Products named [in this Section] [on Drawings] [in Finishes Legend] form the basis-of-design materials for the project.
- .1 Substitutions: [Substitutions will be considered for single listed materials when submitted in accordance with Instructions to Bidders a minimum of [ten (10) days] before closing of Bids.] [Substitutions will not be considered for single listed materials during the Bid Period].
- .2 Acceptable Materials: Use any product listed where multiple products are provided in the specifications in accordance with Section [01 62 00 – Product Options] [; requests for substitutions are not required where products are available from the following:]
- .1 Acceptable Tile Manufacturers: Distributors providing [ceramic] [and] [stone] materials from the following listed manufacturers are considered acceptable for use in this project:
- .1 [List ceramic tile manufacturer by name]
- .2 [List stone tile manufacturer by name]
- .3 [List specific product information such as name of material, colour and product number in the form of a materials legend or schedule]
- .2 Acceptable Mortar and Grout Manufacturers: Distributors providing tile mortar and grout materials from the following listed manufacturers are considered acceptable for use in this project:
- .1 [List mortar and grout manufacturer by name]
- .2 [List specific product information such as name of material, colour and application locations as a part of the product listings for the bonding materials]
- .3 [\_\_\_\_\_]
- .3 Additional manufacturers offering similar products may be incorporated into the work of this Section provided they meet the performance requirements established by the named products and provided

they submit requests for substitution in accordance with Section [01 25 00 – Substitutions] a minimum of [ten (10) days] in advance of Bid Closing.

## 2.2 PERFORMANCE REQUIREMENTS

- .1 Provide tile products manufactured and tested in accordance with ANSI A108.1 [or] [,] [ANSI A137.1] [or] ISO 10545] as appropriate to the Basis-of-Design Materials listed [in this Section] [on the Drawings] [in Finishes Legend].

*SPEC NOTE: There is no accurate transitional guide between the old ASTM C1028 Static Coefficient of Friction (SCOF) referenced in older versions of Americans with Disabilities references, ANSI A137.1 and CGSB 75.1 and the updated Dynamic Coefficient of Friction (DCOF) measurements required by the latest version of ANSI A137.1 and DIN 51130. There was no minimum acceptable SCOF indicated under previous testing standards; the new versions of ANSI and DIN provide minimum acceptable DCOF using easily repeatable testing methods based on slip-fall criteria.*

*SPEC NOTE: These standards are specific to ceramic tile materials; select stone materials that have a honed texture for interior foot traffic; and heavy texture for exterior locations, wet locations, or areas subject to accumulations of dirt and other locations where enhanced slip resistance is required such as in public transit areas, ramps, food processing plants, swimming pools and shower rooms, and similar installations.*

*SPEC NOTE: Select ANSI A137.1 for minimum slip resistance values or DIN 51130 where more stressful environments are encountered. Coordinate with tile distributors and manufacturers to determine which products meet the new minimum slip resistance requirements or are suitable for the intended application.*

*SPEC NOTE: Many European manufacturers provide DIN Class Slip Resistance ratings for different installation conditions ranging from R9 to R13; refer to TTMAC Tile Installation Manual for additional information on the "German Ramp Method".*

- .2 Slip Resistance: Provide materials having a minimum Dynamic Coefficient of Friction (DCOF) of [0.42 [dry] [wet] in accordance with ANSI A137.1 when tested using the BOT 3000 Digital Tribometer] [0.45 [dry] [wet] in accordance with DIN 51130 with [R9] [R10] [R11] [R12] [R13] Class Slip Resistance].

*SPEC NOTE: Heavy Commercial Traffic porcelain tile installations should always be specified with a minimum "Extra Heavy" load rating, and will require a good quality latex modified portland cement mortar unless a membrane manufacturer requires a different mortar composition such as non-modified cementitious or epoxy.*

*SPEC NOTE: Adjust listing to reflect actual floor traffic expectations for the project; indicate on drawings where multiple load bearing performance ratings are required. Refer to TTMAC Tile Installation Manual for additional guidance for determining floor traffic requirements.*

- .3 Floor Traffic Load Bearing Performance: Provide installations rated for the following load bearing performance in accordance with ASTM C627 for ceramic tile installed on walkway surfaces:
- |    |              |                            |
|----|--------------|----------------------------|
| .1 | Extra Heavy: | Passes cycles 1 through 14 |
| .2 | Heavy:       | Passes cycles 1 through 12 |
| .3 | Moderate:    | Passes cycles 1 through 10 |
| .4 | Light:       | Passes cycles 1 through 6  |
| .5 | Residential: | Passes cycles 1 through 3  |

*SPEC NOTE: ISO 10545-12 defines any tile that has 0.5% water absorption when measured using the ISO 10545-3 test as being Frost Resistant. The higher the amount of water absorption the greater the likelihood of damage caused by stress generated by freeze-thaw action.*

*Some manufacturers publish data indicating tiles having 3.0% as being frost resistant; this is not always accurate particularly for stone and quarry tile materials, always obtain proof of freeze-thaw stability for tiles having water absorption greater than 0.5%.*

*SPEC NOTE: Indicate locations of frost resistant tiles on drawings where applications of frost resistant materials are limited to defined areas.*

- .4 Frost Resistance: Provide exterior tiles having a maximum water absorption rating of 0.5% or less when measured in accordance with [ASTM C373 for ceramic materials] [and] [ASTM C97 for dimensional stone] [or ISO 10545-3]; submit proof of freeze-thaw stability for tile materials having water absorption higher than 0.5%.

*SPEC NOTE: Floor flatness tolerances for large format tiles are not optional – they should be considered a mandatory preparation requirement specified in this Section. Specify starting flatness requirements in Section 03 35 00; this section will have to provide additional levelling at additional cost to the contract where the starting tolerances are not achieved, and administered as a change to the contract.*

*SPEC NOTE: Concrete Floor Contractors Association of Canada (CFCA) indicates that floor flatness in the range of FF25 slabs on grade and FF20 for suspended slabs are achievable and are suitable for installation of tiles less than 400 mm x 400 mm; include modified flatness requirements for tile materials 400 mm x 400 mm and larger and where tile manufacturers indicate a higher degree of flatness.*

*SPEC NOTE: Inform structural engineer whether an entire floor areas require the tighter flatness tolerance so that they can account for additional loads and clearances required for overlayment materials. Typically where a complete overlayment is required it is better to specify a two-course slab placement and transfer responsibility to Section 03 35 00 to achieve the floor level tolerances.*

*SPEC NOTE: The Constructor needs to communicate responsibilities where differences occur between the expected flatness specified in Division 03 and final flatness in Division 09 responsibilities. There are occasions where site conditions beyond the control of the concrete placement contractor can cause curling or unevenness beyond the stated tolerances and should be treated as a change to contract arising from unknown site conditions.*

- .5 Substrate and Backing Surface Flatness Tolerances: Section 03 35 00 establishes a flatness requirement for [FF25 for slabs on grade] [and] [FF20 for suspended slabs] for in place concrete and is considered as the starting flatness for work of this Section; final measurement for flatness and level using mortar bed or self levelling screed materials provided by this Section will be measured in same manner as specified in Section 03 35 00 to achieve the following:
- .1 Small Format Floor Tile: Tiles having dimensions less than 100 mm x 100 mm require floor flatness as specified in Section 03 35 00.
  - .2 Standard Format Floor Tile: Tiles having dimensions from 100 mm x 100 mm and less than 400 mm x 400 mm require floor flatness measured to a minimum FF35; equivalent to 5 mm with no more than 2 gaps under a 3000 mm straightedge measurement.
  - .3 Large Format Floor Tile: Tiles having dimensions 400 mm x 400 mm and larger require floor flatness measured to a minimum of FF50; equivalent to 3 mm with no more than 2 gaps under 3000 mm straightedge measurement.
  - .4 Wall Tiles: Provide wall levelling similar to that specified for floors for tiles having similar sizes listed above.

*SPEC NOTE: Preselect and name exact tile, stair treads and trim required wherever possible and list the manufacturer or quarry location, or both manufacturer and quarry location (if applicable); and possibly the tile distributor as Basis-of-Design Materials for the project. Alternatively it is possible to specify tile by reference standard and performance requirements based on type of manufacturing or stone, class, water absorption group, size, colour, finish, edge detail and pattern as listed in tile descriptions listed below.*

*SPEC NOTE: Following descriptions include possible criteria from representative reference standards that manufacturers and suppliers could use to describe their products based on country of origin; edit paragraphs and provide descriptive criteria, limitations and reference standards to establish a minimum level of quality that manufacturers' and tile installers will be evaluated for compliance with requirements of the project.*

## 2.3 CERAMIC MATERIALS

- .1 Floor Tile - Type [FT1]: Provide materials meeting requirements of [ISO 13006] [ANSI A137.1] [CAN/CGSB 75.1] as follows:
- .1 Description:
    - .1 Dimensions: Nominal [ ] mm x [ ] mm x [ ] mm thickness
    - .2 Country of Origin: [List Origin]
    - .3 Appearance: [Plain] [Granular] [Mottled] [Solid] [Abrasive] [Polished] [ ]
    - .4 Pattern: [[Non-] Textured [slate] [stone] [random] [swirl]
    - .5 Colour: [ ] [Selected from tile manufacturer's full range of [[12] [24] [36] [ ] colours.] [As indicated [on Drawings] [in Finishes Legend]]
    - .6 Glaze: [Unglazed] [Bright] [Clear] [Crystalline] [Fritted] [Mat] [Opaque] [Raw] [Semi-mat] [Speckled] [ ]

- .2 Composition: [Describe Tile Body] [Examples could include the following:]
  - .1 [Porcelain [with abrasive admixture]]
  - .2 [Impervious natural clay [with abrasive admixture]]
  - .3 [Non-Porous Glass]
  - .4 [Vitreous natural clay [with abrasive admixture]]
  - .5 [Conductive]
- .3 Forming Method: [Pressed] [Natural Extruded] [Precision Extruded]
- .4 Water Absorption Class: [Less than 0.5%] [0.5% to 3.0%] [3.0% to 6.0%] [6.0% to 10.0%] [Greater than 10%] in accordance with [ASTM [C97] [C373]] [ISO 13006] [CGSB 75.1 MR [1] [2] [3] [4]]
- .5 Chemical Resistance: [Pass Rating [for specified application] in accordance with ISO 10545 13] [CR [1] [2] in accordance with CGSB 75.1]
- .6 Frost Resistance: [Required] [Not Required]
- .7 Slip Resistance: [Required] [Not Required]
- .8 Abrasion [and Tread Wear] Resistance: Class [5 Heavy Commercial] [4 Commercial] [3 Heavy Residential] [2 Residential] [1 Light Residential] [0 Wall Tile Only] in accordance with [ISO 10545-7] [ASTM C1027]
- .9 Stain Resistance: Class [5 Stain Removed with Hot Water] [4 Stain Removed with Weak Cleaner] [3 Stain Removed with Strong Cleaner] [2 Stain Removed with Specific Solvents] [1 Stain not removed] in accordance with ISO 10545-14

*SPEC NOTE: Higher scratch resistance and surface abrasion resistance is denoted by higher numbers. MOH 5 or PEI 1 are not recommended for floors, and MOH 7 or PEI 5 is more suitable for high pedestrian traffic locations. Obtain advice from a knowledgeable product representative who is familiar with typical abrasion and scratch characteristics of their product line and the area of installation.*

- .10 Scratch Resistance: [[5] [6] [7] MOH] [PEI Rating [1] [2] [3] [4] [5] in accordance with ISO 10545-7]
- .11 Break Strength: [\_\_\_] MPa in accordance with ISO 10545-4
- .12 Basis-of-Design Materials: [List Manufacturer and Supplier, Material Name and other distinguishing characteristics] [As indicated [on Drawings] [in Finishes Legend]]

- .2 [Mosaic Tile - Type [MT1]: Provide materials meeting requirements of [ISO 13006] [ANSI A137.1] [CAN/CGSB 75.1] as follows:

*SPEC NOTE: Specify pre-spaced tile adhered to paper, open weave fabric or silicone dot mounted for areas not subjected to moisture, heavy traffic or freezing. Specify fabric or paper face mounted by means of a water soluble adhesive for heavy traffic, freezing or other stressful environments.*

- .1 Description: Provide pre-spaced tile adhered to paper or open weave fabric by means of a water soluble adhesive; materials with paper or fabric (synthetic or organic) adhered to back of tiles will be rejected, and as follows:
  - .1 Dimensions: Nominal [25] mm x [25] mm x [\_\_\_] mm thickness
  - .2 Country of Origin: [List Origin]
  - .3 Appearance: [Plain] [Granular] [Mottled] [Solid] [Abrasive] [Polished] [\_\_\_]
  - .4 Pattern: [[Non-] Textured [slate] [stone] [random] [swirl]
  - .5 Colour: [\_\_\_] [Selected from tile manufacturer's full range of [[12] [24] [36] [ ] ] colours.] [As indicated [on Drawings] [in Finishes Legend]]
  - .6 Glaze: [Unglazed] [Bright] [Clear] [Crystalline] [Fritted] [Mat] [Opaque] [Raw] [Semi-mat] [Speckled] [\_\_\_]
- .2 Composition: [Describe Tile Body] [Examples could include the following:]
  - .1 [Porcelain [with abrasive admixture]]
  - .2 [Impervious natural clay [with abrasive admixture]]

- .3 [Non-Porous Glass]
- .4 [Vitreous natural clay [with abrasive admixture]]
- .3 Water Absorption Class: [Less than 0.5%] [0.5% to 3.0%] [3.0% to 6.0%] [6.0% to 10.0%] [Greater than 10%] in accordance with [ASTM [C97] [C373]] [ISO 13006] [CGSB 75.1 MR [1] [2] [3] [4]]
- .4 Chemical Resistance: [Pass Rating [for specified application] in accordance with ISO 10545 13] [CR [1] [2] in accordance with CGSB 75.1]
- .5 Frost Resistance: [Required] [Not Required]
- .6 Slip Resistance: [Required] [Not Required]
- .7 Abrasion [and Tread Wear] Resistance: Class [5 Heavy Commercial] [4 Commercial] [3 Heavy Residential] [2 Residential] [1 Light Residential] [0 Wall Tile Only] in accordance with [ASTM C1027] [ISO 10545-7]
- .8 [Stain Resistance: Class [5 Stain Removed with Hot Water] [4 Stain Removed with Weak Cleaner] [3 Stain Removed with Strong Cleaner] [2 Stain Removed with Specific Solvents] [1 Stain not removed] in accordance with ISO 10545-14]

*SPEC NOTE: Higher scratch resistance and surface abrasion resistance is denoted by higher numbers. MOH 5 or PEI 1 are not recommended for floors, and MOH 7 or PEI 5 is more suitable for high pedestrian traffic locations. Obtain advice from a knowledgeable product representative who is familiar with typical abrasion and scratch characteristics of their product line and the area of installation.*

- .9 Scratch Resistance: [[5] [6] [7] MOH] [PEI Rating [1] [2] [3] [4] [5] in accordance with ISO 10545-7]
- .10 [Break Strength: [ ] MPa in accordance with ISO 10545-4]
- .11 Basis-of-Design Materials: [List Manufacturer and Supplier, Material Name and other distinguishing characteristics] [As indicated [on Drawings] [in Finishes Legend]]
- .3 Wall Tile - Type [WT1]: Provide materials meeting requirements of [ISO 13006] [ANSI A137.1] [CAN/CGSB 75.1] as follows:
  - .1 Description:
    - .1 Dimensions: Nominal [ ] mm x [ ] mm x [ ] mm thickness
    - .2 Country of Origin: [List Origin]
    - .3 Appearance: [Plain] [Granular] [Mottled] [Solid] [Abrasive] [Polished] [ ]
    - .4 Pattern: [[Non-] Textured [slate] [stone] [random] [swirl]
    - .5 Colour: [ ] [Selected from tile manufacturer's full range of [[12] [24] [36] [ ] colours.] [As indicated [on Drawings] [in Finishes Legend]]
    - .6 Glaze: [Unglazed] [Bright] [Clear] [Crystalline] [Fritted] [Mat] [Opaque] [Raw] [Semi-mat] [Speckled] [ ]
  - .2 Composition: [Describe Tile Body] [Examples could include the following:]
    - .1 [Porcelain]
    - .2 [Impervious natural clay]
    - .3 [Non-Porous Glass]
    - .4 [Vitreous natural clay]
  - .3 Chemical Resistance: [Pass Rating [for specified application] in accordance with ISO 10545 13] [CR [1] [2] in accordance with CGSB 75.1]
  - .4 Frost Resistance: [Required] [Not Required]
  - .5 [Stain Resistance: Class [5 Stain Removed with Hot Water] [4 Stain Removed with Weak Cleaner] [3 Stain Removed with Strong Cleaner] [2 Stain Removed with Specific Solvents] [1 Stain not removed] in accordance with ISO 10545-14]

*SPEC NOTE: Higher scratch resistance and surface abrasion resistance is denoted by higher numbers. MOH 5 or PEI 1 are not recommended for floors, and MOH 7 or PEI 5 is more suitable for high pedestrian traffic locations. Obtain advice from a knowledgeable product representative who is familiar with typical abrasion and scratch characteristics of their product line and the area of installation.*

- .6 Scratch Resistance: [[5] [6] [7] MOH] [PEI Rating [1] [2] [3] [4] [5] in accordance with ISO 10545-7]
- .7 [Break Strength: [ ] MPa in accordance with ISO 10545-4]
- .8 Basis-of-Design Materials: [List Manufacturer and Supplier, Material Name and other distinguishing characteristics] [As indicated [on Drawings] [in Finishes Legend]]

*SPEC NOTE: The term quarry tile is often used colloquially as a substitute term for Porcelain or Paver Tile; quarry tile is a separate and distinct material that may require additional preparation to the surface and sealing for future maintenance. Coordinate closely with tile manufacturer and supplier.*

- .4 [Quarry Tile] [Brick Plate] - Type [FT1]: [Unglazed] [Glazed] quarry tile, [slip resistant], [square] [cushioned] [natural] [rectified] edge, conforming to referenced standards and the following:
  - .1 Description: [Precoat with temporary protective coating for [epoxy] [furan] grouted quarry tile and as follows:]
    - .1 Dimensions: Nominal [ ] mm x [ ] mm x [ ] mm thickness
    - .2 Country of Origin: [List Origin]
    - .3 Face: [Plain] [Pattern]
    - .4 Colour: [ ] [Selected from tile manufacturer's full range of [[12] [24] [36] [ ] colours.] [As indicated [on Drawings] [in Finishes Legend]]
    - .5 Glaze: [Unglazed] [Bright] [Clear] [Crystalline] [Fritted] [Mat] [Opaque] [Raw] [Semi-mat] [Speckled] [ ].
  - .2 Wearing Surface: [Nonabrasive] [Abrasive aggregate embedded in surface]
  - .3 Chemical Resistance: [Pass Rating [for specified application] in accordance with ISO 10545 13]
  - .4 Slip Resistance: [Required] [Not Required]
  - .5 Abrasion [and Tread Wear] Resistance: Class [5 Heavy Commercial] [4 Commercial] [3 Heavy Residential] [2 Residential] [1 Light Residential] [0 Wall Tile Only] in accordance with ISO 10545-7
  - .6 [Stain Resistance: Class [5 Stain Removed with Hot Water] [4 Stain Removed with Weak Cleaner] [3 Stain Removed with Strong Cleaner] [2 Stain Removed with Specific Solvents] [1 Stain not removed] in accordance with ISO 10545-14]
  - .7 Scratch Resistance: [ ] MOH
  - .8 [Break Strength: [ ] MPa in accordance with ISO 10545-4]
  - .9 Basis-of-Design Materials: [List Manufacturer and Supplier, Material Name and other distinguishing characteristics] [As indicated [on Drawings] [in Finishes Legend]]

*SPEC NOTE: Include floor stone tiles tested in accordance with ASTM C241, minimum abrasive values are provided for each of the stones listed. Use caution when interpreting the hardness value, ASTM notes that the abrasive used for the test has changed (more aggressive) resulting in lower hardness values than indicated below – discuss values with a knowledgeable product representative.*

*Abrasion Resistance Test Method C1353 will eventually replace Test Method C241. It is not necessary to perform both tests. Availability of the proper equipment and materials by the testing laboratory may determine which test is performed.*

- .5 Glass Tile - Type [GT1]: Provide materials meeting requirements of ANSI A137.2 as follows:
  - .1 Description: Glass [mosaic] tile as follows:
    - .1 Dimensions: Nominal [ ] mm x [ ] mm x [ ] mm thickness
    - .2 Country of Origin: [List Origin]
    - .3 Face: [Plain] [Pattern]
    - .4 Colour: [ ] [Selected from tile manufacturer's full range of [[12] [24] [36] [ ] colours.] [As indicated [on Drawings] [in Finishes Legend]]
    - .5 Glaze: [Unglazed] [Bright] [Clear] [Crystalline] [Fritted] [Mat] [Opaque] [Raw] [Semi-mat] [Speckled] [ ].

- .2 Chemical Resistance: [Pass Rating [for specified application] in accordance with ISO 10545 13]
- .3 Slip Resistance: [Required] [Not Required]
- .4 Scratch Resistance: [5] MOH
- .5 Basis-of-Design Materials: [List Manufacturer and Supplier, Material Name and other distinguishing characteristics] [As indicated [on Drawings] [in Finishes Legend]]

*SPEC NOTE: Include floor stone tiles tested in accordance with ASTM C241, minimum abrasive values are provided for each of the stones listed. Use caution when interpreting the hardness value, ASTM notes that the abrasive used for the test has changed (more aggressive) resulting in lower hardness values than indicated below – discuss values with a knowledgeable product representative.*

*Abrasion Resistance Test Method C1353 will eventually replace Test Method C241. It is not necessary to perform both tests. Availability of the proper equipment and materials by the testing laboratory may determine which test is performed.*

## 2.4 STONE MATERIALS

- .1 Granite: Provide materials meeting or exceeding requirements of ASTM C615, selected for architectural finishing [in sizes, colours and finish as indicated [on Drawings] [in Finishes Legend] and as follows:
  - .1 Abrasive Hardness Value: [25.0] in accordance with ASTM C241
  - .2 Size: [\_\_\_ mm] x [\_\_\_ mm] x [\_\_\_ mm] thickness
  - .3 Finish: [Flamed] [Honed] [Satin Polished] [Gloss Polished]
  - .4 Colour: [\_\_\_\_\_]
  - .5 Basis-of-Design Materials: [List Quarry and Supplier, Material Name and other distinguishing characteristics]

*SPEC NOTE: Classification I is a less dense marble type and may be more prone to staining than Classification II marble. Class II marble is a better choice for areas that are subject to walk off and higher amount of maintenance.*

*Some Group A marbles can be used in exterior and interior applications, use with caution for exterior applications and only where recommended by a knowledgeable product representative. Grade B and C marbles can be used for medium to light duty walking surfaces and other interior applications and other interior applications. Grade D marbles are generally used for vertical interior applications and can be used for medium to light duty walking surfaces.*

*Abrasive Hardness for Marbles: 8.0 is minimum for wall stone tiles; 10.0 is suitable for light foot traffic; 12.0 and higher is suitable for commercial or institutional stairways, floor and platforms subject to heavy foot traffic.*

- .2 Marble: Provide materials meeting or exceeding requirements of TTMAC and ASTM C503, selected for architectural finish [in sizes, colours and finish as indicated [on Drawings] [in Finishes Legend] and as follows:
  - .1 Abrasive Hardness Value: [8.0] [10.0] [12.0] in accordance with ASTM C241
  - .2 Classification: [I Calcite] [II Dolomite]
  - .3 Soundness Group [A Sound, free from spalls cracks, open seams, pits or other defects impairing structural integrity] [[B Natural Faults] [C Geological Faults] [D Maximum Faults], with flaws, voids and lines filled with polyester wax or epoxy cement]
  - .4 Size: [\_\_\_ mm] x [\_\_\_ mm] x [\_\_\_ mm] thickness
  - .5 Finish: [Honed] [Satin Polished] [Gloss Polished]
  - .6 Colour: [\_\_\_\_\_]
  - .7 Basis-of-Design Materials: [List Quarry and Supplier, Material Name and other distinguishing characteristics]

*SPEC NOTE: Percentage of voids decreases with lowering density of the stone: low density stone weighs 1760 to 2160 kg/m<sup>3</sup>, medium density stone weighs 2160 to 2560 kg/m<sup>3</sup> and high density stone weighs more than 2560 kg/m<sup>3</sup>.*

- .3 Travertine: Provide materials meeting or exceeding requirements of ASTM C568, selected for architectural finish [in sizes, colours and finish as indicated [on Drawings] [in Finishes Legend] and as follows:
  - .1 Abrasive Hardness Value: [10.0] in accordance with ASTM C241
  - .2 Classification: I Low Density
  - .3 Size: [\_\_\_ mm] x [\_\_\_ mm] x [\_\_\_ mm] thickness
  - .4 Finish: [Honed] [Satin Polished] [Gloss Polished]
  - .5 Colour: [\_\_\_\_\_]
  - .6 Basis-of-Design Materials: [List Quarry and Supplier, Material Name and other distinguishing characteristics]

- .4 Limestone: Provide materials meeting or exceeding requirements of ASTM C568, selected for architectural finish [in sizes, colours and finish as indicated [on Drawings] [in Finishes Legend] and as follows:
- .1 Abrasive Hardness Value: [10.0] in accordance with ASTM C241
  - .2 Classification: [I Low Density] [II Medium Density] [III High Density]
  - .3 Size: [\_\_ mm] x [\_\_ mm] x [\_\_ mm] thickness
  - .4 Finish: [Honed] [Satin Polished] [Gloss Polished]
  - .5 Colour: [\_\_\_\_\_]
  - .6 Basis-of-Design Materials: [List Quarry and Supplier, Material Name and other distinguishing characteristics]
- .5 Slate: Provide materials meeting or exceeding requirements of ASTM C629; selected for architectural finish [in sizes, colours and finish as indicated [on Drawings] [in Finishes Legend] and as follows:
- .1 Abrasive Hardness Value: [8.0] in accordance with ASTM C241
  - .2 Classification: [I Exterior] [and] [III Interior]
  - .3 Size: [\_\_ mm] x [\_\_ mm] x [\_\_ mm] thickness
  - .4 Colour: [\_\_\_\_\_]
  - .5 Finish: [Honed] [Natural Cleft]
  - .6 Basis-of-Design Materials: [List Quarry and Supplier, Material Name and other distinguishing characteristics]

## 2.5 TRIMS AND EDGING

- .1 Trims: Provide tile trim shapes and profiles to match colour and finish of adjoining [site] [accent] tile, and as follows:
- .1 Size: Coordinated with sizes and coursing of adjoining flat tile where applicable.
  - .2 Shapes: [Bead]; [[Cove] [Universal] base]; [[surface] [double] bull nose]; [window sill]; [counter trim]; [[internal] [external] corners] [wainscot cap] [tapered transitions].
  - .3 Stair Nosings: Slip resistant, textured nosings.
  - .4 Basis-of-Design Materials: [List Manufacturer, Material Name and other distinguishing characteristics]
- .2 Straight Edge [and Transition] Strips: [Extruded [mill finished] [clear satin anodized] aluminum] [Roll formed stainless steel] [Solid brass] edge strips, [profile description]; height as required to suit tile installation; with integral perforated anchoring leg for setting the strip into the setting material and as follows:
- .1 Basis-of-Design Materials: [List Manufacturer, Material Name and other distinguishing characteristics]
- .3 Thresholds: [\_\_\_\_\_] marble, [\_\_\_\_\_] mm thick, [rounded edges] [bevelled [one side] [two sides]], honed finish on exposed surfaces, size to suit door opening and frame width and as follows:
- .1 Basis-of-Design Materials: [List Manufacturer, Material Name and other distinguishing characteristics]
- .4 Reducer Strips: purpose made metal extrusion; [stainless steel] [brass] [zinc] [anodized aluminium] type; maximum slope of 1:2 and as follows:
- .1 Basis-of-Design Materials: [List Manufacturer, Material Name and other distinguishing characteristics]
- .5 Prefabricated Movement Joints: purpose made, having a Shore A Hardness of 35 or greater and elasticity of plus or minus 25% when used in accordance to TTMAC Detail 301MJ-2012-2014 and as follows:
- .1 Basis-of-Design Materials: [List Manufacturer, Material Name and other distinguishing characteristics]

*SPEC NOTE: Whenever possible, it is recommended the following materials are supplied by a single source manufacturer. List only materials required for the project, coordinate with setting and bonding materials manufacturers where specific installation requirements need additional detail or decision making criteria.*

*SPEC NOTE: There are additional variations to setting and grouting materials including latex additives to dry set mortars that replace water, mortars intended for installation of tile over existing tile, for rapid setting mortars, and for high humidity or shower room types of installations. It is highly recommended that the specifier confirms with manufacturer the types of materials or combinations of materials required to meet project conditions. Refer to TTMAC Tile Installation Manual for additional guidance for determining setting materials requirements based on types of installations.*

## 2.6 MORTAR, ADHESIVE AND GROUT MATERIALS

- .1 Primer: Low VOC, low viscosity primer as recommended by manufacturer to suit substrate and site conditions; provide proof of bonding ability of setting system where manufacturer recommends that a primer is not necessary to installation.
- .2 Surface Preparation Materials: Provide following underlayment materials:
  - .1 Portland Cement Mortar: [Scratch [and Bond] Coat] [Levelling Bed] containing the following:
    - .1 Portland Cement: Meeting or exceeding requirements of CSA A3000, Type GU
    - .2 Hydrated Lime: Meeting or exceeding requirements of ASTM C207, Type [N] [NA] [S] [SA]
    - .3 Sand: Meeting or exceeding requirements of ASTM C144, passing 16 mesh
    - .4 Water: Potable
  - .2 Self Levelling and Smoothing Underlayment: Cementitious self levelling smoothing underlayment meeting or exceeding requirements of ANSI A108.1, Type 2 and as follows:
    - .1 [Acceptable Materials: List manufacturer and product name]
- .3 Wall Tile Systems: Provide the following setting materials:
  - .1 Thin Set Interior Installation: Dry set mortar meeting or exceeding requirements of ANSI A 118.1 formulated for thin set applications, factory sanded mortar consisting of portland cement, sand and additives requiring only addition of potable water for installation [complete with bond enhancing latex additive] and as follows:
    - .1 [Acceptable Materials: List manufacturer and product name, and additional latex additive if required]
  - .2 Thin Set Exterior Installation: Frost resistant, dry set mortar meeting or exceeding requirements of ANSI A 118.1 formulated for thin set applications with bond enhancing latex additive and as follows:
    - .1 [Acceptable Materials: List manufacturer and product name, and additional latex additive if required]
  - .3 Exterior Grade Plywood (EGP) Latex-Portland Cement Mortar: Factory blended, bond enhanced latex modified portland cement meeting or exceeding requirements of ANSI A 118.11 and as follows:
    - .1 [Acceptable Materials: List manufacturer and product name]

*SPEC NOTE: Specify medium set installation systems for large format tiles or tiles with irregular thickness or back surface profiles. Include reference to A 118.1 for conventional ceramic materials, include reference to A 118.4 for bond enhanced mortar required for porcelain materials.*

- .4 Floor Tile Systems: Provide the following setting materials:
  - .1 [Thin] [Medium] Set Interior Installation: Latex-portland cement mortar meeting or exceeding requirements of ANSI A 118.1, rated for floor traffic load bearing performance indicated above and as follows:
    - .1 [Acceptable Materials: List manufacturer and product name]
  - .2 [Thin] [Medium] Set Exterior Installation: Frost resistant mortar setting bed exceeding the requirements of ASTM C627 for Extra Heavy installation using latex modified, portland cement mortar meeting or exceeding requirements of ANSI A 118.4 and as follows:
    - .1 [Acceptable Materials: List manufacturer and product name]

*SPEC NOTE: Do not use adhesives for exterior or shower tile installations. Epoxy adhesives can be used for heavy duty chemical resistant applications such as commercial kitchens, food processing areas and restaurants. Organic adhesive are intended strictly for light duty or residential applications, such as kitchen backsplashes, tile borders and decorative inlays.*

## .5 Adhesive Systems: Provide the following materials:

- .1 Epoxy Adhesive: Thin set adhesive system using 100% solids epoxy resin and epoxy hardener meeting or exceeding the requirements for ANSI A108.1; stain proof, chemical resistant and having high temperature resistance and water cleanable, and as follows:
  - .1 [Acceptable Materials: List manufacturer and product name]
- .2 Organic Adhesive: Thin set wall tile adhesive system using non-flammable, water resistant, latex adhesives for interior use meeting or exceeding requirements for ANSI A108.1, Type 1 and as follows:
  - .1 [Acceptable Materials: List manufacturer and product name]

*SPEC NOTE: Obtain grout manufacturers' recommendations when specifying Modified Epoxy Emulsion Mortar meeting or exceeding requirements of ANSI A 118.8 or Furan Mortars and Grout meeting or exceeding requirements of ANSI A 118.5.*

## .6 Tile Grout Systems: Provide the following materials:

- .1 Colours: [Match colours listed named [in this Section] [on Drawings] [in Finishes Legend]] [Colours will be selected from manufacturer's [standard] [extended] range].
- .2 Unsanded Portland Cement Grout: Factory blended latex-portland cement grout meeting or exceeding requirements of ANSI A 118.6, specifically formulated for joints less than or equal to 3 mm in width and as follows:
  - .1 [Acceptable Materials: List manufacturer and product name]
- .3 Sanded Portland Cement Grout: Factory blended dry-set stain resistant [latex modified] [commercial] portland cement and graded silica sand meeting or exceeding requirements of ANSI A 118.6, specifically formulated for joints greater than 3 mm in width and as follows:
  - .1 [Acceptable Materials: List manufacturer and product name]
- .4 Polymer Modified Grout: Factory blended stain resistant polymer modified portland cement meeting or exceeding requirements of ANSI A 118.7, specifically formulated for joints greater than 3 mm in width and as follows:
  - .1 [Acceptable Materials: List manufacturer and product name]
- .5 Epoxy Grout: Water cleanable, chemical resistant, factory blended modified portland cement compound with 100% epoxy additives and hardeners meeting or exceeding requirements of ANSI A 118.3 and as follows:
  - .1 [Acceptable Materials: List manufacturer and product name]

**2.7 ACCESSORIES**

- .1 [Wood Underlayment: [As specified in Section 06 10 00] [Provide plywood, Good-One-Side and having no knot fillers or adhesives detrimental to tiling products, minimum thickness 16 mm and meeting or exceeding requirements for Exterior Rated, Sheathing Grade square edged Douglas Fir plywood meeting or exceeding requirements of CSA O121.]]
- .2 Cleavage Membrane: [[0.10 mm] [4 mil] thick polyethylene film meeting or exceeding requirements of CAN/CGSB-51.34] [Asphalt saturated roofing felt, to CSA A123.3, Type 1].

*SPEC NOTE: Although membranes are similar in make up, they are governed by different standards; crack isolation membranes are governed by ANSI A 118.12; waterproofing membranes are governed by ANSI A 118.10 – make the appropriate choice based on installation requirements for project – substrate movements listed below are 2 mm is standard performance and 3 mm is high performance.*

- .3 [Crack Isolation] [Uncoupling Membrane] [Waterproofing] Membranes: Load bearing, [premanufactured self adhering] [liquid applied, lightweight fabric reinforced] membrane meeting requirements of ANSI [A 118.12] [A 118.10]; thickness as recommended by manufacturer to accommodate in-plane substrate movement of [2 mm] [3 mm] in thin set applications meeting or exceeding requirements of ANSI A108.1 and as follows:

- .1 Basis-of-Design Materials: [List Manufacturer, Material Name and other distinguishing characteristics]

*SPEC NOTE: Sound reduction membranes can be similar to crack isolation membranes, many manufacturer's provide combined products offering both crack and sound reduction properties.*

- .4 Bonded Sound attenuation Membranes: Load bearing, [premanufactured self adhering] [liquid applied, lightweight fabric reinforced] sound attenuation membrane meeting requirements of ANSI A 118.13; thickness as recommended by manufacturer to accommodate in-plane substrate movement in thin set applications meeting or exceeding requirements of ANSI A108.1 and as follows:

- .1 Basis-of-Design Materials: [List Manufacturer, Material Name and other distinguishing characteristics]

- .5 Cementitious Backer Units: Reinforced portland cement board, reinforcing mesh embedded near both faces in accordance with ASTM C1325 or ANSI A 118.9, and as follows:

- .1 Acceptable Materials: [List Acceptable Manufacturers, Material Names]

- .6 [Metal Lath: Expanded steel lath, galvanized 1.4 kg/m<sup>3</sup> meeting or exceeding requirements of ASTM C847.]

- .7 [Reinforcing Mesh: Welded wire fabric [50 x 50 mm] mesh opening, fabricated from 1.6 mm thick galvanized steel wire.]

- .8 [Latex Additive: Formulated for use in Portland cement mortars and grouts.]

- .9 Water: Potable, clean and free of chemicals and contaminants detrimental to mortar or grout mixes.

- .10 Joint Sealant: As specified in Section 07 92 00.

- .11 Sealer: Meeting or exceeding requirements of CAN/CGSB 25.20, Type [1] [2]; as recommended by tile manufacturer.

## 2.8 MIXES

- .1 Mix premanufactured mortars and grouts in accordance with referenced standards, and mortar and grout manufacturers' written instructions; mix site mixed materials as follows:

- .1 Scratch Coat (by volume): Mix 1 part Portland cement, 4 parts sand, and latex additive where required by TTMAC Detail.

*SPEC NOTE: Delete following paragraph when site mixed materials are not used for the project.*

- .2 Site mix proportioned mortar and grout materials as follows:

- .1 Scratch Coat (by volume): Mix 1 part Portland cement, 4 parts sand, and latex additive where required by TTMAC Detail.
- .2 Slurry Bond Coat: Mix Portland cement and water to a creamy paste consistency. Include latex additive where required by TTMAC Detail.
- .3 Mortar Bed for Walls (by volume): Mix 1 part Portland cement, 4 parts sand, and latex additive where required by TTMAC Detail.
- .4 Leveling Coat (by volume): Mix 1 part Portland cement, 4 parts sand, and latex additive where required by TTMAC Detail.
- .5 Mortar Bed for Floors: 1 part Portland cement, 4 parts sand, and latex additive where required by TTMAC Detail; when mixed with water the mortar bed shall be of such a consistency and workability that will allow maximum compaction during tamping of the mortar bed, and achieve a minimum compressive strength of 15 MPa after 28 days. A stronger mix can be achieved by adding latex to the water

- .3 Adjust water volume depending on moisture content of sand to obtain consistency and workability.

### Part 3 Execution

#### 3.1 EXAMINATION

- .1 Examine materials ordered for the project before delivering to the site; open boxes and confirm that materials match accepted samples, are free from defects and breakage detrimental to final appearance and installation, and as follows:
  - .1 Consultant will only accept Grade 1 Standard, materials appearing on site factory marked as seconds or discounted or that are not consistent with materials submitted for review will be rejected.
  - .2 Replace unacceptable materials at no additional cost to the Owner; order replacement materials using most expedient delivery method to minimize effect on construction schedule.
- .2 Examine substrates, areas, and conditions where tile will be installed for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile and confirm the following:
  - .1 Verify that substrates for bonding tile are firm; dry; clean; free from oil, waxy films, and curing compounds; and are within starting flatness tolerances as specified in Section 03 35 00, and are ready for application of levelling materials specified in this Section.
  - .2 Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of Work, and similar items located in or behind tile have been completed before installing tile.
  - .3 Verify that joints and cracks in tile substrates are coordinated with tile joint locations; adjust joints in consultation with Consultant where joints are not coordinated.

*SPEC NOTE: Longer curing time for concrete substrates reduces the likelihood of moisture vapour emission rates that are higher than 1.45 kg/m<sup>2</sup>/24 hours; MVER testing should always be done, but is more essential for concrete that has only been placed for 28 days.*

- .4 Verify that concrete substrates have been allowed to cure for a minimum of [90 days] [28 days] in accordance with TTMAC requirements.
- .5 Verify that tile subject to colour variations has been blended in the factory and packaged so tile units taken from one package show the same range of colours as those taken from other packages; blend tiles at site before installing if not factory blended.
- .6 Verify that back of tile is free from contamination before installation.
- .3 Notify [Constructor] in writing of any conditions that are not acceptable; do not proceed with installation until unsatisfactory conditions have been corrected.

#### 3.2 PREPARATION

- .1 Protection: Protect surrounding work from damage or disfiguration arising from work of this Section.
- .2 Surfaces: Thoroughly clean substrate surfaces receiving tile finishes to remove grease, oil or dust film, and other contaminants affecting bond of materials within bonding systems and as follows:
  - .1 Clean back of each tile before installation to remove surface contaminants and cutting residue, firing release dust and other debris detrimental to bond and final surface appearance.
- .3 [Cleavage] [Crack Suppression] [Waterproofing] Membrane: Apply [cleavage] [crack suppression] [waterproofing] membrane in accordance with TTMAC and manufacturer's instructions.
- .4 Surface Levelling: Apply [Levelling Bed Mortar] [or] [Self Levelling Mortar] to make backing surfaces flat and true to tolerances in plane listed for performance requirements with additional requirements as follows:
  - .1 Install levelling materials wherever a slight substrate irregularity exists.
  - .2 Use self levelling materials for thicknesses less than 8 mm where thin set tile methods are used.
  - .3 Use mortar bed levelling materials for thicknesses 8 mm and greater.
  - .4 [Install cleavage membrane over [structural concrete slab] [suspended slabs] ]; apply 6 mm thick sand bed under cleavage membrane when membrane is applied over a rough surface].

*SPEC NOTE: SPEC NOTE: Delete the following paragraph when wood subfloors are not used; coordinate floor stiffness requirements for materials specified in Section 06 61 00.*

- .5 Securely screw underlayment to subfloor with smooth face up; space sheets 6 mm apart to allow for expansion and contraction of subfloor materials.

### 3.3 INSTALLATION

- .1 Install tiling in accordance with requirements of TTMAC Tile Installation Manual and parts of ANSI A108 Series of tile installation standards that apply to types of bonding and grouting materials, and to methods required for complete tile installation.
- .2 Extend tile work into recesses and under or behind equipment and fixtures to form a complete covering without interruptions:
- .1 Terminate Work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
  - .2 Make cut edges smooth, even and free from chipping.
  - .3 Do not split tile.
- .3 Accurately form intersections and returns; perform cutting and drilling of tile without marring visible surfaces:
- .1 Cut, drill, and fit tile to accommodate work of other subcontractors penetrating or abutting work of this Section.
  - .2 Carefully grind cut edges of tile abutting trim, finish, or built in items for straight aligned joints.
  - .3 Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so that plates, collars, or covers overlap tile and to provide a uniform joint appearance.
- .4 Lay tile in pattern [indicated on Drawings] [and] as follows:
- .1 Align joints when adjoining tiles on floor, base, walls, and trim are the same size.
  - .2 Lay out tile Work and centre tile sites in both directions in each space or on each wall area.
  - .3 Centre tile patterns between control and movement joints; notify Consultant for further instructions where tile patterns do not align with control or movement joints.
  - .4 Cut tile accurately and without damage.
  - .5 Smooth exposed cut edges with abrasive stone, where exposed.
  - .6 Chipped or split edges are not acceptable.

*SPEC NOTE: Large format tile having more than 380 mm length on one side can be offset by 1/3 for broken joint patterns.*

- .7 Minimum tile width is [half] [one-third] unit size unless specifically indicated otherwise on Drawings.
  - .8 Adjust tile layout to minimize tile cutting.
  - .9 Provide uniform joint widths.
  - .10 [Make joints between tile sheets the same width as joints within tile sheets so joints between sheets are not apparent in finished Work.]
  - .11 [Slope floor tile towards floor drains in thick-bed mortar installations.]
  - .12 [Lay out tile wainscots to next full tile beyond dimensions indicated.]
- .5 Bonding Bed: Set tile in place while bond coat is wet and tacky and as follows:
- .1 Adjust amount of bonding materials placed on substrates based on temperature and humidity to prevent skinning over of bonding materials.
  - .2 Use sufficient bond coat to provide a minimum 80% contact for tiles smaller than 300 mm x 300 mm and areas having Residential or Light Load Bearing Performance requirements with bonding material evenly dispersed and pressed into back of tile; refer to back buttering requirements for larger materials and installations having Moderate or higher Load Bearing Performance requirements.
  - .3 Notch bond coat in horizontal straight lines and set on freshly placed bonding material while moving (sliding) tile back and forth at 90° to notches.
  - .4 Verify that corner and edges are fully supported by bonding material.
  - .5 Set tiles to prevent lippage greater than 1 mm over a 3 mm grout joint.
  - .6 Keep two-thirds of grout joint depth free of bonding materials.
  - .7 Clean excess bonding materials from tile surface prior to final set.
  - .8 Sound tiles after bonding materials have cured and replace hollow sounding tile before grouting.

- .6 Back Buttering: Obtain 100% mortar coverage in accordance with applicable requirements for back buttering of tile in referenced TTMAC and ANSI A108 series of tile installation standards for the following applications:
- .1 Glass tile
  - .2 Exterior tile
  - .3 [Tile in wet areas:
    - .1 Showers
    - .2 Saunas
    - .3 Tub Enclosures
    - .4 Laundries
    - .5 Swimming pools]
  - .4 Tile installed with chemical resistant mortars and grouts
  - .5 Tile having tiles 300 mm or larger in any direction
  - .6 Tile having tiles with raised or textured backs
  - .7 Tile having tile installation rated for Heavy or Extra Heavy Duty.
  - .8 All porcelain tiles with more than 20% of the tile backs covered with firing release dust back buttered so that 100% of the back is covered with adhesive mortar rated for C627, Extra Heavy Duty rating.
- .7 Install prefabricated edge strips and control at locations indicated or where exposed edge of floor tile meets different flooring materials and exposed substrates.
- .8 Protect exposed edges of floor tile with properly sized transition strips, use sloped reducer strips where uneven transitions between 6 mm and 13 mm occur.

*SPEC NOTE: Verify that locations of expansion, control, cold or seismic joints are indicated on the drawings. Use the following table to determine placement of control and expansion joints on the drawings. If not included on drawings, consider including table as part of specification.*

Environment	Minimum	Maximum	Joint Width
Interior/Shaded	4800 mm	6100 mm	6 mm minimum
Interior/Sunlight	2400 mm	3700 mm	6 mm minimum
Exterior/Normal	2400 mm	3700 mm	10 mm minimum
Exterior/Excessive	2400 mm	3000 mm	13 mm minimum

- .9 Control and Movement Joints: Install control joints and expansion joints in tile work in accordance with TTMAC Detail 301MJ-2012-2014; keep control and expansion joints free of bonding materials and as follows:
- .1 Cut tiles to establish line of joints; sawn joints after installation of tiles will not be acceptable to Consultant.
  - .2 Locate joints in tile surfaces directly above joints in concrete substrates.
  - .3 Provide floor control joints over structural control joints.
  - .4 Install prefabricated joint profiles in accordance with manufacturer's written instructions, set with top surface of joint profile slightly below top surface of tile.
  - .5 Prepare joints and apply sealants in accordance with requirements of Section 07 92 00.
  - .6 Keep control and movement joints free from setting materials.
  - .7 Form an open joint for sealant in tile wherever a change in backing material occurs, at all vertical interior corners, around penetrating pipes and fixtures, and where tile abuts other materials or fixtures.

*SPEC NOTE: Epoxy grout must be installed in a dust free environment and protected for 7 days.*

- .10 Grouting: Install grout in accordance with manufacturer's written instructions, the requirements of TTMAC, and as follows:
- .1 Allow proper setting time before application of grout.
  - .2 Pre-seal or wax tiles requiring protection from grout staining.
  - .3 Force grout into joints to a smooth, dense finish.
  - .4 Remove excess grout in accordance with manufacturer's written instructions and polish tile with clean cloths.

**3.4 SITE QUALITY CONTROL**

- .1 Inspections: Owner will pay cost of inspection of installed Work [from the cash allowance in accordance with Section [01 21 00 – Allowances]]; Subcontractor is expected to cooperate with Owner's inspector and correct deficiencies identified; inspection will consist of the following as a minimum review:
- .1 Arrange for mortar and grout manufacturer's representative to review delivered materials and confirm in writing that materials and mixes specified for the project are in accordance with manufacturer's requirements.
  - .2 Confirm that tile is set flush and level with adjacent tiles.
  - .3 Identify broken, cracked, hollow sounding or damaged tiles.
  - .4 Confirm that accessories are installed correctly.
  - .5 Confirm that flexible grouting and joint sealants have been installed correctly.
  - .6 Confirm that installation is complete and in accordance with the requirements of the TTMAC.

**3.5 CLEANING AND PROTECTION**

- .1 Cleaning: Clean tile surfaces so they are free of foreign matter using manufacturer recommended cleaning products and methods after completion of placement and grouting and as follows:
- .1 Remove [latex-portland cement] [and] [epoxy] grout residue from tile as soon as possible.
  - .2 Unglazed tile may be cleaned with acid solutions only when permitted by tile and grout manufacturer's written instructions, but no sooner than 10 days after installation; protect metal surfaces, cast iron, and vitreous plumbing fixtures from effects of acid cleaning.
  - .3 Flush surface with clean water before and after cleaning.
  - .4 [Remove temporary protective coating by method recommended by coating manufacturer that is acceptable to brick and grout manufacturer; trap and remove coating to prevent it from clogging drains.]
- .2 Protection: Leave finished installation clean and free of cracked, chipped, broken, unbonded, or other tile deficiencies as follows:

*SPEC NOTE: Protection times listed below account for rapid setting and standard setting mortars and grouts; adjust times to reflect materials used.*

- .1 Protect finished areas from traffic until setting materials have sufficiently cured in accordance with TTMAC requirements.
- .2 Protect floor areas from traffic after grouting is completed in accordance with manufacturer's written instructions.
- .3 Prevent foot and wheel traffic from floors for a minimum of [24] [72] hours after completion of grouting.
- .4 Use stepping boards where access is required for light foot traffic only after [4] [24] hours from completion of grouting.
- .5 [Do not immerse in water] [and] [protect from freezing] for a minimum of [7] [21] days after completion of tile work.
- .6 Provide protective covering until Substantial Performance of the Work.
- .7 Protect wall tiles and bases from impact, vibration, heavy hammering on adjacent and opposite walls for a minimum of [7] [14] days after installation.

**3.6 INSTALLATION SCHEDULE**

*SPEC NOTE: Specify TTMAC detail suitable for project. If more than one method applies, list conditions applicable to each detail.*

- .1 Wall Tile: TTMAC Detail [\_\_\_\_\_].
- .2 Floor Tile: TTMAC Detail [\_\_\_\_\_].
- .3 Ceiling Tile: TTMAC Detail [\_\_\_\_\_].

**END OF SECTION**

# GLOSSARY

## A

**Abrasion Resistance** – The ability of a surface to resist being worn away by rubbing and friction. Measured as weight lost when a tile is exposed to an abrasive surface.

**Absorption** – The relationship of the weight of the water absorbed by a ceramic specimen subjected to prescribed immersion procedure, to the weight of the dry specimen, expressed in percent. (ASTM C242)

**Accessories** – Ceramic or non-ceramic fixtures such as towel bars, paper and soap holders, grab bars, etc.

**Acid** – A chemical substance usually corrosive to common metals (iron, aluminium, zinc). Acids are generally divided into two classes: a) a strong mineral inorganic acid such as sulfamic, sulphuric, phosphoric, hydrochloric or nitric, b) weak organic or natural acids such as acetic (vinegar, citric 9citrus fruit juices), oxalic and fatty acids (oleic, palmitic, stearic, etc.)

**Acid Resistance** – A tile that is not damaged by exposure to acid  
See chemical resistance.

**Acrylic** – A general class of resinous polymers used as additives for thin-set mortar and grout. See Latex-Portland Cement Mortar or Grout.

**Adhesive** – A premixed liquid that is ready to use. See Organic Adhesive

**Admixture** – A material such as acrylic or latex used as an additive to concrete or mortar immediately before or during mixing. Admixtures can enhance the technical properties of standard Portland cement mortars.

**Adobe** – Un-burnt brick dried in the sun.

**Agglomerate Marble** – A mixture of various marble chips bonded together with polyester resins.

**Air Entraining** – The capability of a material or process to develop a system of minute bubbles of air in cement, mortar or concrete during mixing.

**Alkali** – A chemical substance which effectively neutralizes acid material so as to form neutral salts. A base the opposite of acid. Examples are ammonia and caustic soda.

**Ambient Temperature** – The environment temperature surrounding the object under construction.

**ANSI** – American National Standards Institute, a non-profit national technical association which publishes standards covering definitions, test methods, recommended practices and specifications of materials.

**Anti-slip** – A tile that has a special surface designed to improve slip resistance

**Approved Equal** – Material, equipment or methods agreed to by the architect or engineer of a building project as being acceptable for an equivalent or substitute for the material, equipment or methods specified in the construction contract documents.

## B

**Backbutter** – The even disbursement of a bond coat to the back of tile just before the tile is placed. Back buttering improves adhesion to tiles with bond breakers such as dust, kiln release agents and dirt.

**Backing** - Any material used as a base over which tile is to be installed. See substrate.

**Battiscopa** – Trim tile with a manufactured rounded edge to be used along a baseboard, skirting or outside corner. See also bullnose.

**Bevel** – Where a tile edge has been mechanically cut or ground, usually to a 45 degree angle

**Bicottura Tile** – Tile that are fired twice. See double fired tile.

**Bisquit or Bisque** – The portion of the tile under the glaze or the body of the tile.

**Bond Breaker** – A material used to prevent adhesion of newly placed concrete and the substrate.

**Bond Coat** – A material used between the back of the tile and the prepared surface. Bond coats include pure Portland cement, dry-set Portland cement mortar, latex- Portland cement mortar, organic adhesive and epoxy mortar/adhesive.

**Bond Strength** – The force per unit area or length necessary to rupture a bond. Also: tensile, shear and Peel-back test.

**Box Screed** - A jig used to apply mortar onto the backside of large-sized tiles which may vary in thickness in order to achieve a uniform unit of thickness of the tile and mortar combined.

**Broom Surface** – The surface texture obtained by stroking a broom over freshly placed concrete. Also brushed surface.

**Bullnose Tile** – A trim tile featuring one rounded (convex) edge. Used for finishing wall installations, the top of a wainscot or for turning an outside corner.

**Butt Joint** – Tight grout joint where tile is placed side by side allowing no grout joint between each tile. This practice is not recommended by the industry.

## C

**Calibre** – When tiles are separated into groups based on their actual face (or back) size after production.

**Caulking** – Closing a joint by sealing with an elastic, adhesive compound

**Caulking** – A soft material used for sealing joints where normal structural movement may occur. Caulking retains its plasticity and is specified in areas where rigid cement grout may crack due to movement.

**Cement** – Usually refers to Portland cement which when mixed with sand, gravel and water forms concrete. Generally, cement is an adhesive that sets by virtue of a chemical reaction.

**Cementitious Backer Unit (CBU)** – A backer board designed for use with tile. It can be used in place of metal lath, Portland cement scratch coat and mortar bed over frame construction. Should be used in place of plywood or drywall in wet areas or for exterior use.

**Change Order** – Variation from original plans and specifications directed by the owner or architect in written form.

**Chemical Resistance** – The resistance offered by tile to physical or chemical reactions as a result of contact with or immersion in various solvents, acids, alkali's, salts, etc.

**Clay** – A natural mineral aggregate, consisting essentially of hydrous aluminium silicates; it is plastic when sufficiently wetted, rigid when dried en masse and vitrified when fired to a sufficiently high temperature.

**Cleavage Membrane** – A membrane that provides a separation and slip sheet between the mortar setting bed and the backing or base surface.

**Coated Glass Mat Backer Board** – A backer board designed for use with tile. It can also be used in non-tile applications. Should be used in place of plywood or drywall in wet areas. Not for exterior use.

**Coefficient of Friction/Slip Resistance (COF)** – The measurement of slip resistance between ceramic tile under both wet and dry conditions while utilizing various heel assemblies such as neolite, rubber, leather. See also static and dynamic.

**Cold Joint** – Any point in concrete construction where a pour was terminated and the surface lost its plasticity before work was continued.

**Commercial Portland Cement Grout** – A mixture of Portland cement with other ingredients to produce a water resistant, dense, uniformly coloured material.

**Compressive Strength** – The measured maximum resistance of a concrete or mortar specimen to axial loading; expressed as force per unit cross-sectional area; or the specified resistance used in design calculations.

**Conductive Mortar/Bond Coat** – A tile mortar to which specific electrical conductivity is imparted through the use of conductive additives.

**Construction Joint** – The surface where two successive placements of concrete meet but do not bond cementitiously.

**Contract Documents** – All written and graphic materials used for design and construction of a project, including the agreement, general conditions, construction drawings, specifications, addenda, change orders and other specific written stipulations.

**Control Joint** – A joint cut, formed or tooled into the concrete surface to control the location of cracks due to shrinkage and other dimensional changes in the concrete structure.

**Coping** – Special trim pieces that are designed to address edge details in special areas such as pools, counter-tops, knee walls etc

**Corundum** – An abrasive or grit added to a tile in order to increase the slip-resistance quality of a tile.

**Countertop Trim** – Trim tile with an upward slope that prevent spills from running down the counter face.

**Cove Base** – Trim tile with a curved bottom edge, used to return the wall to the floor tile creating an angled inside corner for easier cleaning.

**Crack Isolation Membranes** – For thin bed installations to isolate the tile from minor in-plane substrate cracks up to 3 mm wide.

**Crackle Glaze** – Special glaze effect featuring fine cracks for an antique or historic interpretation.

**Crystalline Finish** – Thick glaze usually applied to small tiles for artistic effect.

**Crazing** – The cracking, which occurs in fired glazes or other ceramic coatings due to critical tensile stresses. May also be done intentionally for decorative effect.

**CSC Format** – Division of various construction operations, materials and services into a numerical system. Developed by Construction Specifications Canada to assist architects in categorizing various building services for the purpose of specification writing.

**Curing** - Maintenance of humidity and temperature of the freshly placed mortar or grout during some definite period following the placing or finishing, to assure satisfactory hydration of Portland cement and proper hardening of the mortar or grout.

## D

**Dead Load** – A constant load that in structures is due to the mass of the members, the supported structure and permanent attachments or accessories.

**Deflection** - A variation in the position or shape of a structure due to effects from live or dead loads. Normally measured by the linear deviation from an established plane.

**Delamination** – Separation or splitting, usually due to a lack of adequate adhesion in plied materials.

**Design Load** – The combination of weight (dead load) and other applied forces (live loads) for which a building or part of a building is designed. Based on the worst possible combination of loads.

**Double Loading** – Porcelain tile that is dry pressed with a second application of powders that is repressed into the body before firing, achieving a pattern in the top layer.

**Double Weep Hole Drain** – Typically a drain that has weep holes both on top and the lower mast of the drain. Normally, there is a flange or ring located just below the secondary weep holes to secure the shower pan liner or membrane.

**Dry-Set Mortar** - A mixture of Portland cement with sand and additives to impart water retentivity, which is used as a bond coat for setting tile. Normally, when this mortar is used, neither the tile nor the walls have to be soaked during installation.

**Dust Pressed Method** – A way of making ceramic tile in which clays are ground into a liquid mud, and run through a sprayer and dried to a fine powder. This powder is pressed into tile often using pressure in excess of 950 tons. Also known as dry pressed.

**Dynamic co-efficient of friction** – The measurement of friction between a tile and a foot measured while in motion. See also co-efficient of friction and static co-efficient of friction.

## E

**Eased edge** – a slight bevel that removes the sharp edge of the tile.

**Earthenware** – A glazed or unglazed non-vitreous ceramic whiteware. Normally used for wall tile.

**Efflorescence** – The residue deposited on the surface of a material, usually the grout joint, by the crystallization of soluble salts. May appear as a whitish powder or crust and caused by moisture reacting with impurities in the mortar. It is a natural condition that occurs in most Portland Cement based products.

**Elastomer** – The name of a substance that can be stretched to at least twice its original length and after having stretched and the stress removed, returns to approximately its original length in a short time.

**Epoxy** – Can be an adhesive, grout or mortar. A two-part system consisting of epoxy resin and epoxy hardener. Used where chemical resistance or high bond strength is a consideration or for joints where impervious qualities, stain and chemical resistance are required. Epoxy can be an adhesive, grout or mortar.

**Expansion Joint** – A joint that extends through the tile, bonding material and substrate. They are designed to allow for continuous movement in the building structure caused by expansion and/or contraction due to thermal change or other influences.

**Exterior Grade Plywood (EGP) Latex-Portland Cement Mortar** – A modified Portland cement dry-set mortar to which a polymer has been incorporated in latex form or in a powder form for the bonding of ceramic tile to exterior grade plywood in interior dry or limited water exposure areas only. When added in latex form it is added as a replacement for part or all of the gauging water in accordance with the manufacturer's instructions.

## F

**Flexural Strength** – A property of a material or structural member that indicates its ability to resist failure in bending. May also be referred to as the Modulus of Rupture.

**Frost Resistance** – Tiles whose properties, including low porosity and water absorption levels, cause it to be minimally affected by freezing and thawing conditions and hence suitable for exterior conditions.

**Furring** – Striping used to build out a surface such as a studded wall where strips of suitable size are added to the studs to accommodate vent pipes or other fixtures.

## G

**Gauged & Ungauged** – Refers to a stone cleft out of blocks into tile. Gauged stone is ground or sawn to produce a more uniform thickness. Ungauged stone is naturally cleft resulting in variations of thickness within a tile and from tile to tile.

**Grade** – A predetermined degree of slope that a finished floor should have.

**Grout Joint** – The space left between tiles and filled with grout. This space may be narrow or wider depending on the required installation and its aesthetics. Normal floor joint width is 1/16" to 1/4".

**Granite** - A very hard, crystalline, igneous rock, composed of feldspar, quartz and lesser amounts of dark ferromagnesium materials. Gneiss and black "granites" are similar to "true" granites in structure and texture, but are composed of different materials and type of rock.

**Grout** – Materials that are used in the joints between tiles after installation with additives to impart specific characteristics and colours. Generally, the composition of grout is similar to that of mortar, however, non cementitious grouts are also available.

**Grout Saw** – The grout saw is a saw-toothed carbide steel blade mounted on a wooden handle. It is used to remove old grout. It also is used in patching work. Care should be used as it can easily damage adjacent tile.

## H

**Haze** – A fine or thin residue or film that may be transparent or opaque resulting in a cloudy or dull appearance. Typically associated with grout, sealers, or cleaners.

**Horizontal Broken Joints** – A style of laying tile with each course offset one-half or one-third of its length.

**Hydrate** – A chemical combination of water with another compound or an element.

## I

**Impact Resistance** – Ability of tile to resist breakage, either to the body or glazed surface resulting from a heavy blow.

**Integrated Bonding Flange** – An integrated bonding flange is designed to provide a large contact area at the top of the drain assembly, which will allow ample surface adhesion to thin, load bearing bondable waterproof membranes. Drain assemblies of this type are constructed in such a way that the waterproof membrane is bonded to the top of the load distribution layer rather than below it.

**IIC** – Impact Isolation Class; refers to the statistical measurement standards used to quantify the transmission of impact sound through a floor/ceiling assembly system.

**ISO** – International Standards organization, a worldwide federation of national standards bodies that will unify product testing and industry standards. TTMAC will adopt most of the ISO standards as have many tile manufacturers and the mortar manufacturers.

**Isolation Joint** – A built-in separation between adjoining similar or dissimilar elements of a concrete structure, usually a vertical plane. Also, see expansion joint.

## J

**Joint Filler/Backer-rod** – Compressible material used to fill a joint to prevent the infiltration of debris and to provide support for sealants.

**Joist** – Small beam that supports a part of the floor, ceiling or roof of a building.

## L

**Latex-Portland Cement Mortar** – A modified dry-set Portland

cement mortar, used as a bond coat for setting tile, to which a polymer is added in latex form. The added latex is in replacement for part or all of the water addition required.

**Limestone** – A sedimentary rock composed primarily of calcite and dolomite. The varieties of limestone used as dimensional stone are usually well consolidated and exhibit a minimum of graining or bedding direction.

**Lippage** – A condition where the edges of adjacent tiles when installed are not at the same level.

**Live Load** – The moving load or variable weight to which a building is subjected, due to the weight of the people who occupy it, the furnishings and other movable objects.

**Load** – A force provided by weight or mass (gravitational), external or environmental sources such as wind, water and temperature or other sources of energy.

## M

**Marble** – A stone composed predominately of crystalline grains of calcite, dolomite or serpentine, and capable of taking a polish.

**Mastic** – Organic tile adhesive.

**Matt Glaze** – A colourless or coloured ceramic glaze having low gloss.

**Miter** – Joint formed by two pieces of material cut to meet at an angle so they form an outside corner. See Jolly Tile.

**Modular Screed** – A high density expanded polystyrene panel that is used to create continuous screed surfaces without control joints or reinforcement and is designed and can also be used to accommodate hydronic radiant heating tubes.

**MOH's Hardness Test** – The MOH's hardness test determines hardness on a scale of 1 to 10 with 1 having the lowest scratch resistance and 10 having the highest. Typically ceramic tiles have a hardness of 4 to 8. Tiles having a minimum hardness of 6.5 to 7.5 are suitable for commercial applications.

**Moisture Expansion** – An increase in dimension or bulk volume of a ceramic article caused by reaction with water or water vapour.

**Monocottura Tile** – A term used for tile manufactured by a process, which allows the simultaneous firing of the clay with the glaze producing a finished tile with a single firing.

**Mortar** – Tile setting materials of varying composition used to bond tiles to a backing surface.

**Movement Joint** – A joint that allows for movement. See expansion, control, isolation and construction joint definitions.

**Mud** – a slang term used for mortar. A mud set requires a minimum of 3/4" thickness and is also known as thickset.

## N

**Notched Trowels** – Notched trowels are available in serrated and square-tooth design. The teeth are made in various sizes. The correct tooth size and depth must be used to apply the thickness of bonding mortar specified.

## O

**Open Time** – The period of time during which the bond coat retains its ability to adhere to the surfaces tile after being mixed and prior to being installed. See pot life.

**Organic Adhesive** – A prepared organic material, ready to use with no further addition of liquid or powder, which cures or sets by evaporation.

**Overrun** – An amount in excess of an order that may be standard procedure for a factory especially a custom run.

## P

**Parging** – Plastering of face of back up wall or back of facing material with cement mortar to fill chance voids.

**PEI** - PEI Acronym "Porcelain Enamel Institute" have developed a wear abrasion testing procedure in the 1940's that is still used today. It is wear rating specifically for glazed ceramic tile surfaces. PEI 0 being the lowest wear rating, up to PEI 5 for the highest wear rating.

**Pencil Rod** – Reinforcing rod with a diameter no greater than 6 mm.

**PH** – A simplified system of measuring acidity or alkalinity irrespective of the acid or alkali involved; in which neutrality is 7.0.

**Plumb** – Perpendicular to a true level.

**Polymer Modified Mortar** – A dry-set Portland cement mortar for the bonding of ceramic tile, to which a polymer has been added as a redispersible powder.

**Pot Life** – The period of time during which a material maintains its workable properties after it has been mixed.

**Prefabricated Movement Joint (PMJ)** – A prefabricated profile that typically is made of extruded Poly-Vinyl Chloride (PVC), Chlorinated Polyethylene (CPE), sometimes in combination with metal edging. All allow for movement within the tiled surface due to thermal changes, shrinkage and other influences.

**Profiles** – Preshaped metal or plastic profiles used to finish and protect tile edges and transitions.

**Push Box** – A box made with an adjustable blade that is normally set 3 mm above the thickness of the tile. Tiles are pushed through the box creating a 3 mm thickness of mortar applied to the back of the tile.

## R

**Release Agent** – Material used to prevent bonding to concrete to a surface.

**Rectified** – When a tile edge is ground to be a specific size and having straight edges.

**Reveal** – The exposed portion of a tile or stone between its outer face and a window or door set into an opening.

**Riser** – Vertical face of a step in a staircase.

**Rustic Finish** – Rough or uneven tile surface designed for an artistic effect.

## S

**Sandstone** – Sedimentary rock of quartz, sand and carbonates composition. Some stones are suitable for heavy floor traffic and some will even take a polish. Check data sheets for suitability and sizes.

**Scratch Coat** – A mixture of Portland cement, sand and water applied as the first coat of mortar on a wall or ceiling. Its surface usually is scratched or roughened so that subsequent coats of mortar will bond properly.

**Screed** – To level off mortar lying above the desired plane or shape

**Sealer** – A clear coating sometimes applied to unglazed tile floors or grout joints, to protect the surface from grease spills or other stains. A surface type sealer may be used to give a lustre or gloss to the floor. Breathable, penetrating sealers do not usually coat the tile however might improve cleanability, appearance or slip resistance.

**Shear** – A force that slides or ruptures one part of a body from another part of a body from attached objects.

**Shore A Hardness** – The measurement of a materials hardness on a durometer. The scale is from 0 – 100 and is rubber & plastic.

**Shower Receptor** – The floor and side walls of the shower up to and including the curb of the shower.

**Slake** - Allowing a mixture of mortar, thin-set mortar or grout to stand for a brief period of time after the ingredients have been thoroughly mixed with water or latex additive before the final mixing occurs. Slaking enables the moisture in the mix to penetrate lumps in the dry components, making it easier to complete the mixing procedure.

**Slate** – A very fine-grained metamorphic rock derived from sedimentary rock shale. Characterized by an excellent parallel cleavage entirely independent of original bedding, by which cleavage the slate may be split easily into relatively thin slabs.

**Soldier Course** – Oblong tile laid with the long side vertical and all joints in alignment.

**Spacers** – T-shaped and Y-shaped, they are used in installation to separate tile on walls and floors.

**Span** – Distance between supports, usually a beam or joist.

**Static co-efficient of friction** – The measurement of friction between a tile and a foot measured while stationary. See also co-efficient of friction and dynamic co-efficient of friction.

**STC** – Sound Transmission Class; refers to the statistical measurement standards used to quantify the transmission of airborne sound through building elements such as walls or floor systems.

**Step-tread** – A manufactured trim that has a softened or rounded edge to finish the tile at the edge of the step. The tread might also have a change in texture close to the tile edge such as raised or recessed ribs, bumps or circles.

**Prefabricated Stair-tread** – typically made out of metal or plastic. Often will have anti-slip tread surface and may be replaceable.

**Stringer** – The structure part of a stair that supports the treads and risers.

**Substrate** – The underlying support for the tile installation.

**Subfloor** – Rough or structural floor placed directly on the floor joists or beams, to which the finished floor is applied.

## T

**Terra Cotta** – Hard baked clay ware, including tile, of variable colour, averaging reddish re-yellow in hue and of high saturation. Surface may be rustic, smooth, polished or factory waxed.

**Thermal Expansion** – When materials expand and contract with changes in temperature. The Thermal Coefficient of Linear Expansion is expressed in inches, Per Inch Per Degree Fahrenheit.

**Thin-set** – A term used to describe the bonding of tile with suitable materials applied approximately 1/8" thick.

**Threshold** – Raised member at the floor within the doorjamb. Its purpose is to provide a divider between dissimilar flooring materials or serve as a thermal, sound or water barrier.

**Trim** – Pre-manufactured pieces designed to assist with tile transition (ie bullnose, covebase, step tread, caps etc)

### Tile – Types and Descriptions

- **Ceramic Mosaic Tile** – A tile formed by either the dustpressed or plastic method, usually 6 mm thick, and having a facial area of 100 cm<sup>2</sup> or less and are pre-mounted onto an assembly for easier installation. Ceramic mosaic tiles may have either porcelain or natural clay composition and they may be either plain or may have an abrasive mixture throughout. They may also be glazed or unglazed
- **Ceramic Tile** – This terminology is a general description for all tile types and classifications. Body of the tile is usually relatively thin and made from clay or a mixture of clay and other ceramic materials. May have either glazed or unglazed face and is fired above “Red Heat”. This terminology is a general description for all tile types and classifications.
- **Conductive Tile** – A tile made from special body compositions or by methods that result in specific properties of electrical conductivity while retaining other normal physical properties of ceramic tile.
- **Cushion-Edged Tile** – A tile on which the facial edges have a distinct curvature that results in a slightly recessed joint.
- **Double-Fired Tile** – Glazed tile produced by an initial firing of the shaped, raw materials to produce a hard tile body and then re-fired once the glaze or decoration has been applied.
- **Extruded Tile** – A tile or trim unit formed by the extrusion method where the plastic (wet) raw material is forced through a mould and then cut into shape prior to firing.
- **Faience Tile** – Glazed or unglazed tile, generally made by the plastic process, showing characteristic variations in the face, edges and glaze that give a handcrafted, non-mechanical, decorative effect.
- **Field Tile** – An area of tile covering a wall or floor. The field may be bordered by contrasting tile or tile trim.
- **Glazed Tile** – A tile with a fused impervious facial finish composed of ceramic materials fused to the body of the tile, which may be non-vitreous, vitreous or impervious.
- **Hand Made Tile** – A ceramic tile that is generally handmade, may be dust pressed or extruded, and may vary noticeably in colour, shape, texture and appearance from one tile to the next. Other descriptions of this tile include: Mexican Tile, Terra-Cotta Tile and Brick Plate Tile. May require the application of various types of sealers or coatings on site to provide a wear surface.

- **Impervious Tile** – A tile with water absorption of 0.5% or less.
- **Jolly Tile** – Tile mitered along one or two edges and used as a corner or counter edge installations.
- **Klinker Tile** – An extruded tile with mortar keys on the back to aid in the bonding of the mortar to the surface.
- **Mosaics** – Small tiles or bits of tile, stone or glass which are preassembled onto an approximate 30 cm x 30 cm area.
- **Natural Clay Tile** – A tile made by either the dustpressed or the extruded method, from clays that produce a dense body having a distinctive, slightly textured appearance.
- **Natural Stone Tile** – Material taken from a quarry and processed into various sizes, thicknesses and finishes.
- **Non-vitreous Tile** – A tile with water absorption of more than 7%.
- **Paver Tile** – unglazed porcelain or natural clay tile usually formed by the dust-pressed usually 16 mm or thicker, with > 390 cm<sup>2</sup> facial area.
- **Porcelain Tile** – A ceramic tile that is generally made by the dust-pressed method from a composition that results in a tile that is dense, impervious and fine grained with a sharply formed face. It will have less than .5 % water absorption. A new designation that is emerging is called “Technical Porcelain” which have .05% or less water absorption.
- **Quarry Tile** – Glazed or unglazed tile made by the extrusion or dust pressed process from natural clay or shale, usually fired in a tunnel kiln and have some absorption.
- **Semi-vitreous Tile** – A tile with water absorption of more than 3%, but not more than 7%.
- **Slip-Resistant Tile** – A tile having a higher coefficient of friction due to an abrasive admixture, abrasive particles in the surface or grooves or patterns in the surface.
- **Stone Tile** – Any natural stone product that is produced in thickness under 20mm, often on a tile line that gauges and calipers each tile.
- **Terra Cotta** – Hard baked clayware, including tile, of variable colour, averaging reddish or yellow in hue and having high saturation. Surface may be rustic, smooth, polished or factory waxed.
- **Terrazzo Tile** – A cementitious product containing graded coloured chips of marble, granite or other composition chips of various sizes. Tile or slabs are often individually cast in moulds, mechanically vibrated and hydraulically compressed during manufacture. Tile may be pre-finished or ground in place.
- **Vapor Retarder** – Typically made of polyethylene and has a perm rating of less than 1.0 determined per ASTM E96 and required by building code.
- **Vitreous Tile** – A tile with water absorption of more than 0.5%, but not more than 3%.
- **White-body Tile** – A tile composed of raw materials producing a white tile body that can be coated with a transparent glaze and takes colour easily. Normally used for wall tiles.

## U

**Uncoupling System** – A configured membrane with free space that provides a combination of functions to allow tile installation over problematic substrates. These functions include independent movement between the substrate and tile, vapour pressure equalization, waterproofing, supporting, and load distribution.

## V

**Vapor Retarder** – Typically made of polyethylene and various thicknesses but thinnest being 4 mill and more common 8 or 10 mil. Should have a perm rating of 1.0 or less using ASTM E-96.

**Veneer** – Decorative facing material which is not meant to be load-bearing.

**Verispec** – An awareness program, designed to ensure that the specification is being followed by evaluating the specification in-house generically and making sure that it meets the norms of the tile industry. Performing a site inspection may also be requested and may be done on a job by job basis.

**Vertical Broken Joint** – Style of laying tile with each vertical row of tile offset for half or some part of its length.

**VOC** – Volatile Organic Compounds, chemical compounds that can evaporate into the air at room temperatures and are considered a potential health hazard.

## W

**Water Absorption** – The ability to take up and retain water, expressed as a percent of the dry tile weight.

**Wet Areas** – Tile surfaces that are either soaked, saturated or subjected to moisture or liquids (usually water) such as gang showers, tub enclosures, showers, laundries, steam rooms, swimming pools and exterior areas.

**White-body** – Tile composed of raw materials producing a white tile body that can be coated with a transparent glaze and takes colour easily. Normally used for wall tiles.

## METRIC CONVERSION GUIDE

To convert inches to millimetres, multiply the number of inches by 25.4 to obtain millimetres. To convert feet to millimetres, multiply the number of feet by 304.88 to obtain millimetres. To convert millimetres to feet multiply the number of millimetres by .00328 to obtain feet.

For a reference only, some common (rounded nominal) industry metric conversions to the imperial equivalents follow:

1 mm = 1/32 inch	16 mm = 5/8 inch	125 mm = 5 inches	480 mm = 19 inches
2 mm = 1/16 inch	19 mm = 3/4 inch	150 mm = 6 inches	600 mm = 24 inches
3 mm = 1/8 inch	25 mm = 1 inch	180 mm = 7 inches	1000 mm = 40 inches
5 mm = 3/16 inch	30 mm = 1-1/8 inches	200 mm = 8 inches	1200 mm = 4 feet
6 mm = 1/4 inch	32 mm = 1-1/4 inches	280 mm = 11 inches	2440 mm = 8 feet
8 mm = 5/16 inch	38 mm = 1-1/2 inches	300 mm = 12 inches	3000 mm = 10 feet
10 mm = 3/8 inch	51 mm = 2 inches	356 mm = 14 inches	3600 mm = 12 feet
11 mm = 7/16 inch	75 mm = 3 inches	380 mm = 15 inches	4900 mm = 16 feet
13 mm = 1/2 inch	100 mm = 4 inches	406 mm = 16 inches	6100 mm = 20 feet



