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]
.3 ISO 13007-2010, Ceramic tiles, Grout and adhesives

.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 filed 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^3, medium density stone weighs 2160 to 2560 kg/m^3 and high density stone weighs more than 2560 kg/m^3.

.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] [[II 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] [Large and Heavy Tile Dry-set mortar] 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] [Large and Heavy Tile Dry-set mortar] 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]

.6 RTU Grout: color consistent, no efflorescence and stain resistant acrylic based grout meeting or exceeding specific tests 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/m3 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^2/24 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