MULTIPLEX

CONSTRUCTION HANDBOOK - TILING

Version 02

Print Copy

Disclaimer

This is a print version whereas the structure of the construction handbook may have been adapted for ease of reference.

The handbook app should take precedence in case of any ambiguity.

Multiplex Constructions Pty Limited

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CONTENTS

1. Tiling - Ceramic/ Porcelain

Key Considerations

- Joint locations
- Bonded vs unbonded screeds
- Efflorescence control
- Material selection - tiles, grout, adhesive
- Protection of drains prior to tiling
- Slip resistance

1.1 Design and Planning

The manufacturer or technical representative of the tile adhesive must:

- Attend the Trade Risk Workshop
- Develop a specification for the tiling system which includes adhesive, grout, sealants and secondary membrane (where required).
- Considerations should be given to:
    - Specific requirements of each project (the area where the tiles are installed)
    - Service conditions when in use
    - Type of substrate
    - Dimensions of the tiles
    - Selection of adhesives
    - Any installation constraints (installation schedule, installation technique, etc.).

1.2 Testing

- The slip resistance recommendations for a range of ‘wet floor locations’ is presented within Table 3B of Standards Australia handbook HB198:2014. An example of these locations and the classification recommendations is given below.

Pendulum Classification		BPN Range		Location Example for P5 to P0 classifications according to HB198:2014
AS 4586-2013	**AS/NZS 4586-2004**	**Slider 96**	**TRL**	
P5	V	> 54	>44	External ramps steeper than 1:14 Loading docks Commercial kitchens Swimming pool ramps and stairs
P4	W	45 – 54	40 - 44	External colonnade and walkway Pedestrian crossings, driveways Verandahs, Balconies Serving areas behind bars, cold stores Swimming pool surrounds Communal shower rooms
P3	X	35 - 44	35 - 39*	Shopping centre – food court, fresh food areas Entries & access areas - public buildings – WET Undercover concourse of sports stadiums Bathrooms in hospitals and aged care facilities Toilet facilities in public buildings
P2	Y	25 – 34	20-34*	Entries & access areas - public buildings – TRANSITIONAL Hotel bathrooms, ensuites and toilets Hotel kitchens and laundries Wards and Corridors in hospitals & aged care facilities
P1	Z	< 25	<20*	Entries & access areas - public buildings – DRY Supermarket aisles (except fresh food)
P0	-	<12	-	see Note 1

Note 1: note 3 of Notes to Table 3B states:
The minimum classification listed in Table 3B is P1. It is inappropriate for Table 3B to list the lower classification, P0, since there is no lower limit on Classification P0.

Notwithstanding, some smooth and polished floor surfaces, which do not achieve a Classification P1, may be considered to provide a safe walking environment for normal pedestrians walking at a moderate pace, provided the surfaces are kept clean and dry; however, should these surfaces become contaminated by either wet or dry materials, or be used by pedestrians in any other manner, then they may become unsafe. Therefore, the type of maintenance, the in-service inspection of floors, other environmental conditions and use should be taken in to account when selecting such products.

1.3 Screeds and Acoustic Underlays

What is screed?

A screed is an intermediate layer between the structural base and the tile adhesive. It is generally made from sand and cement, however can be a premixed product supplied in bags. Its purpose is to provide a true and even surface on which to apply stone or tiles.

There are two main types of screed:

- *Bonded screed is a mix that is fully bonded to the concrete substrate with a bonding agent (a slurry coating). This is the ideal type of screed for thinner applications where heavy loading is anticipated.*
- *Unbonded screed is applied over a clear polythene sheet or other non-coloured, non-staining de-bond medium (a solvent borne polyurethane membrane will suffice), laid over the concrete.*

Bonded Screeds

Bonded screeds must:

- Be a minimum of 25mm in depth and not greater than 40mm in thickness.
- Be compatible with any waterproof membrane.
- Have a mix ratio between 1:3 and 1:5 cement: sand to result in a minimum strength of 20 MPa compressive strength and 1.5MPa tensile strength
- Volume-batched using gauge boxes and thoroughly mixed using a forced action mixer.

Unbonded Screeds

Un-bonded screeds must:

- Be designed by a structural engineer where the screed exceeds 60mm in depth.
- Be a minimum of 40mm in thickness.
- Be reinforced with a welded, galvanised wire mesh complying with AS 4671 and AS 3958 that must:
    - Have bars spaced in either a square or rectangular pattern at minimum 25 x 25 mm centres, up to 50 x 50 mm centres.
    - Have bars of minimum thickness of 1.2 – 2mm in diameter.
    - Have a tensile strength of not less than 380 MPa, and
    - Be lapped at joints a minimum of 2.5 bar centres,
- Have a screed mix ratio 1 part GP Portland cement, 2 parts sand and 4 parts coarse aggregate (clean angular crushed rock 3 to 5 mm) to result in a minimum strength of 20 MPa compressive strength and 1.5MPa tensile strength
- Volume-batched using gauge boxes and thoroughly mixed.
- Have a debonding layer of any of the following:
    - Solvent borne polyurethane (without a broadcast of sand)
    - Acoustic matting
    - Slip layer, i.e. 200 µm clear polyethylene sheet

Figure 1: Bonded Screed, Training Mock-up, MPX Centre for Excellence

Figure 2: Un-bonded Screed, Training Mock-up, MPX Centre for Excellence

Acoustic Underlay

Acoustic underlay must be:

- Installed under the screed in accordance with relevant requirements of the manufacturer and acoustic consultant.
- 100% rubber when used in wet areas.
- It should be avoided if at all possible.

1.4 Control Joints

1.4.1 Floors

Perimeter expansion joints must:

- Be installed in all tile and stone applications
- Have a full depth gap of 10mm through the tile bed
- Be formed by a strip or strips of polyethylene foam, placed against the wall, column, etc. and the tile bed placed up and into contact with the strip
- Be filled with the approved sealant unless approved otherwise.

Figure 3: Full depth gap of 10mm through the tile bed, Training Mock-up, MPX Centre for Excellence

Intermediate expansion joints must:

- Be installed in all tile and stone applications
- Have a full depth gap of 6mm wide (or 10mm if aligned with a substructure joint) through the tile bed
- Be filled with the approved sealant. Note: Sealants are generally suitable for use in wall tiling, around the perimeter of floors and may also be used to fill intermediate movement joints in floors which will only be subjected to light foot traffic and in wet areas.
- Be installed with proprietary pre-formed full depth expansion joint strip (refer Figure 5)
- Be around embedded structural items, e.g. balustrade posts and hold down bolts
- Be installed around metal floor wastes with an expansion gap of 3 to 6mm wide
- Be at the maximum centres outlined in the table below

- Be aligned with the joints in the structure (refer Figure 4)
- Have full adhesion coverage (refer Figure 4)

	In Direct Sunlight	Not in Direct Sunlight
INTERNAL – Light Coloured Tiles	3.0m centres QLD (4.5m centres in)	4.5m centres
INTERNAL – Dark Coloured Tiles	3.0m centres	3.0m centres
EXTERNAL – Light Coloured Tiles	3.0m centres QLD (4.5m centres in)	4.5m centres
EXTERNAL – Dark Coloured Tiles	3.0m centres	3.0m centres

Figure 4: A PVC expansion joint which can absorb small movements in a tiled floor, Tile Devil, UK

Figure 5: The DURAFLEX TL expansion joint profile from Dural. DURAFLEX TL profiles are vulcanised of a soft EPDM insert with two parallel metal strips

Source: http://www.stoneconcept.com.au/product/details/49

1.4.2 Internal walls

Movement joints should be provided:

- Over existing and/or structural movement joints.
- Where tiling abuts other materials.
- Where tiling is continuous across junctions of different background materials.
- In large tiled areas, at internal vertical corners and at 3m to 4.5m centres horizontally and vertically (where large degrees of thermal movement or vibration are expected, the frequency of movement joints should be increased to accommodate the movement).
- Where stresses are likely to be concentrated, for example at changes of alignment.

Movement joints should be of a suitable width to permit the sealant to accommodate the expected movement (typically 6mm).

1.5 Secondary Membranes

What are secondary membranes?

Secondary membranes are required to reduce or eliminate efflorescence issues associated with tiled areas that are subject to wetting. Efflorescence is the unsightly white staining that is a common occurrence on building projects.

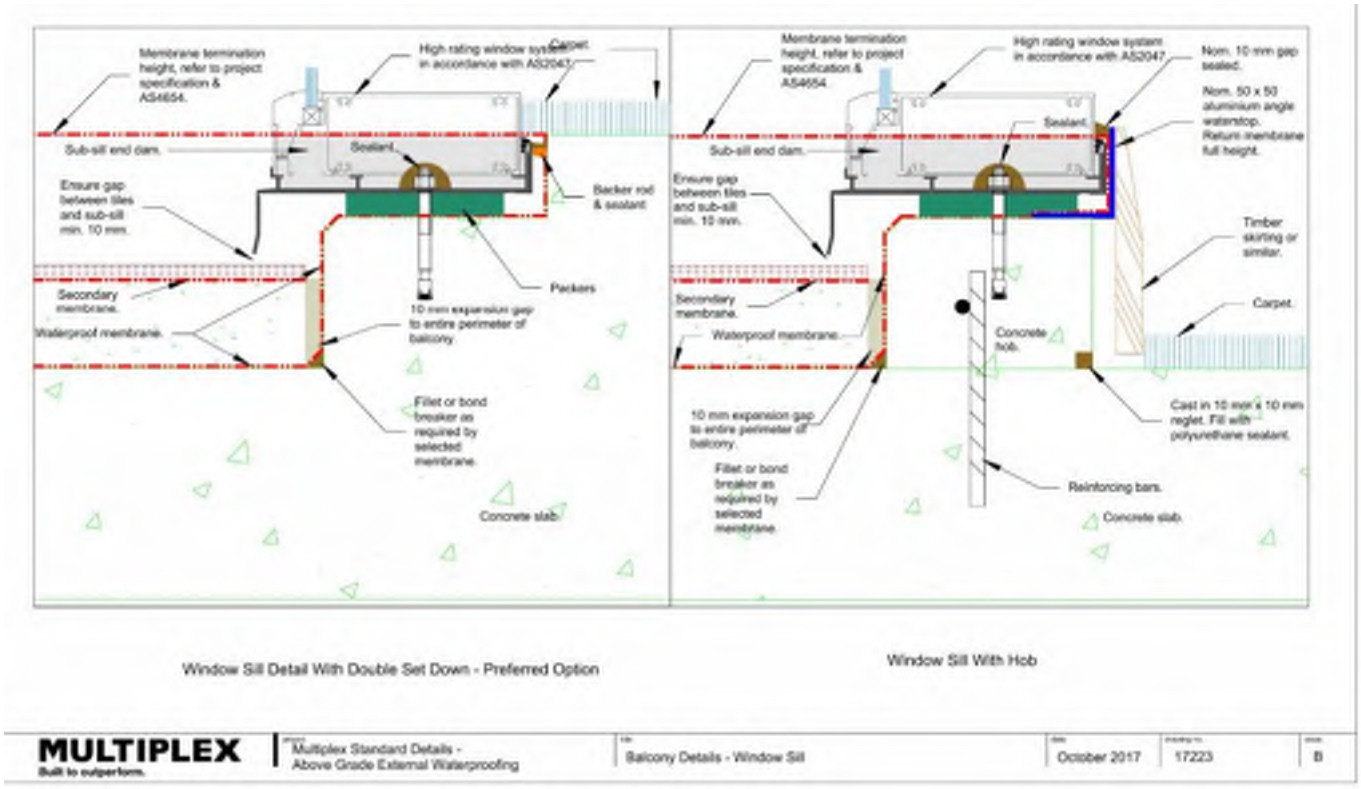
Secondary waterproof membranes as a minimum must be used to control efflorescence to tiles in:

- Every shower recess
- Every entire bathroom floor (Preferred)
- Every balcony or other exposed location

1.6 Balcony Tiles

A 10mm air gap must be maintained from the tile to the sub-sill.

Figure 6: Training Mock-up, MPX Centre for Excellence



1.7 Tile Adhesives

What are the different types of tile adhesives?

Tile adhesives have the following chemical compositions:

- *Cementitious (C), adhesives made from a mixture of hydraulic binders, aggregates and chemical additives. They may be either a one-component type, which means they need to be blended with water and/or latex*
- *Dispersion (D), a mixture of organic binders dispersed in water polymers with organic additives*
- *Reactive (R), a mixture of synthetic resins which harden through a chemical reaction (components A and B)*

Tile adhesives are made up of the following classes:

- *Class 1: Normal adhesives*
- *Class 2: Improved adhesives*
- *Class F: Fast-setting adhesives*
- *Class T: Reduced slip adhesives*
- *Class E: Adhesives with extended open time*
- *Class S1: Deformable adhesives (for cementitious adhesives only)*
- *Class S2: Highly deformable adhesives (for cementitious adhesives only)*

Adhesives must:

- Be cured for a minimum of 12 hours or as specified by the manufacturer before grouting.

1.8 Sealants

Sealants must be:

- On a backer rod (20% bigger than joint)

- Compatible with the stone and other components
- Correct ratio – width to depth
- UV tolerant, (outdoors)
- Tooled into the joint, ideally to an hourglass shape
- Installed as per MPX standard details. Refer Drw: 3001, 3002, 3003, 3004, 3006, 3007

1.9 Completion

- Run shower for ten minutes to ensure falls are correct and pipes are clear.
- Ensure temporary protection is in place prior to handover and does not abrade the tile.
- No undue ponding in finished floors in wet areas and external tiles areas.

1.10 Multiplex Standard Details

3000 - Notes & Drawing Index

3001 - Typical Plans

3002 - Detail A From 3001 - Typical Intermediate Joint

3003 - Detail B from 3001 - Handrail Post and Perimeter Joint

3004 - Sections 1 & 2 From 3003

3005 - Detail D From 3001

3006 - Joint Detailing

3007 - Floor Waste

3008 - Section 1 from 3001 - Joint over Supporting Structural Element

2. Natural Stone

Key Considerations

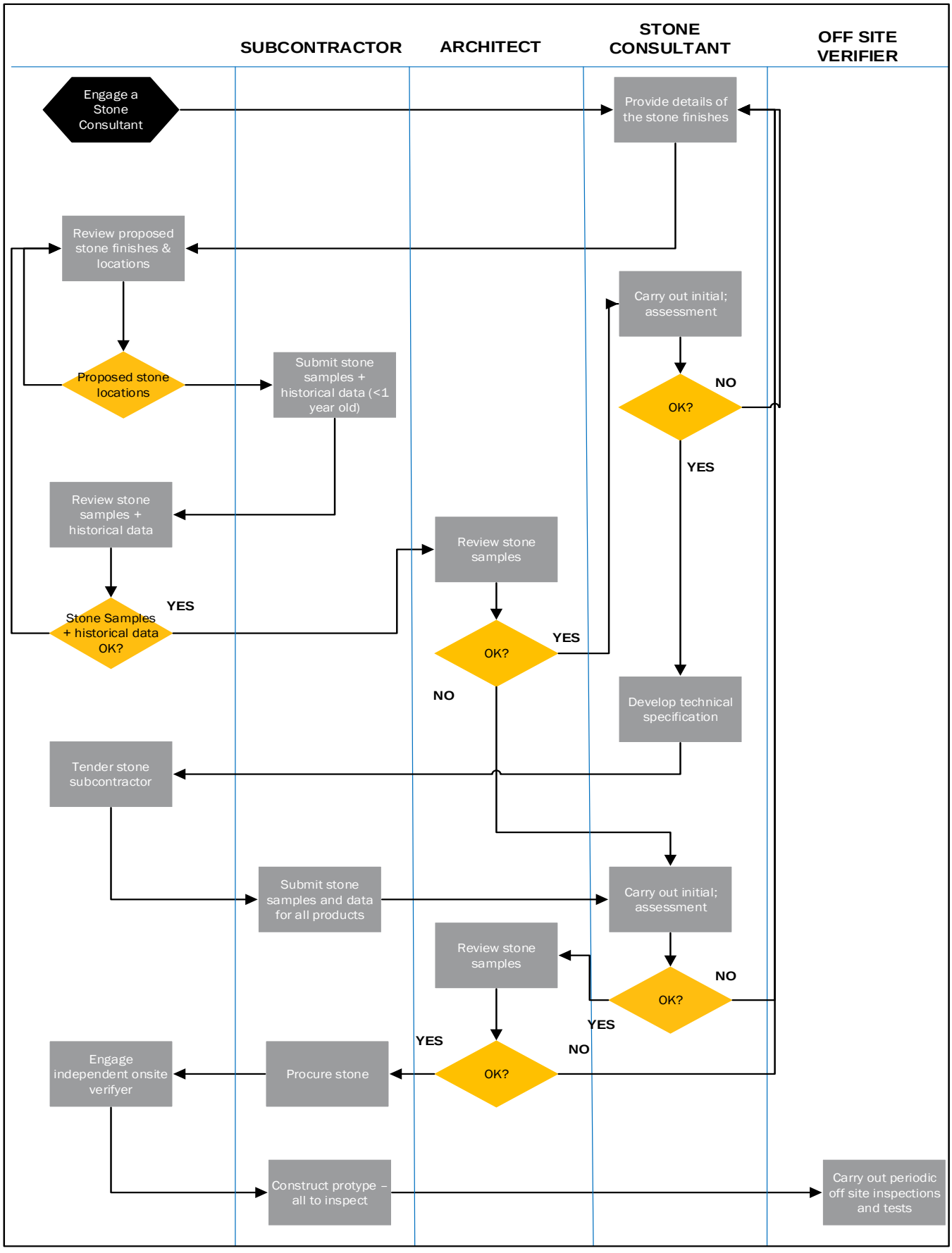
- Joint locations
- Efflorescence control
- Material selection
- Durability
- Stain resistance.
- Strength.
- Resistance to abrasion.

2.1 Design and Planning

- In all instances, except for very minor low risk use of stone, a suitable consultant (refer recommendations in table below) must be engaged by each project.
- Generally, the scope shall include the following: -
  - Review plans and specifications for the proposed stone types and uses.
  - Comment on the suitability of what is specified.
  - Offer alternatives if specified stone is unsuitable.
  - Provide a technical specification for the project.
  - Review and comment on sample submissions from Subcontractors/Suppliers.
  - Review and comment on any historical tests or data provided by the Subcontractors/Suppliers.
  - Review and comment on Subcontractor submissions, workshop drawings, etc.
  - Recommend what stone tests are required and at what frequency.
  - Testing of stone samples.
  - Actively participate in meetings and workshops as required by MPX.
  - Inspect the work during construction. Report to MPX what non-conformances or other matters for concern are observed.
  - Carry out a final inspection at complete to confirm that the work is in accordance with the technical specification.
  - Assist in compilation of Operation & Maintenance Manual

Recommended stone consultants	
Contact	**David Mahaffey**
Company	Mahaffey Associates
Mobile	0414 245 302
Email	david@mahaffey.com.au
Contact	**Jim Mann**
Company	Stone Initiatives & Materials Testing Group P/L
Mobile	0400 251 020
Email	jmann@stonemtg.com.au

The stone design and selection process must be in accordance with the flowchart below:



- **Inform the client in writing that although all due care and diligence has been used to select the stone, provide appropriate design and correctly install the stone, due to the uncontrolled nature of its constituents, the long term performance of the stone cannot be fully understood.**

Recommended Performance Characteristics		Background required	Mortar / adhesive / grout requirements	Stone / Tiles Requirements	Particular fixing requirements	Other requirements
A	Slip Resistance	Slip resistance will be reduced by degree of incline	N/A	Refer to section on 'Slip resistance'	N/A	Proper maintenance – keep clean and dry where possible
B	Abrasion Resistance	N/A	Durable proprietary grout	Appropriate stone for expected traffic and location	Avoid high points and fix to a true plane	Grit reduction and proper maintenance
C	Impact Resistance	Rigid	Rigid	Adequate thickness, density and mechanical strength	Full coverage minimum voids	N/A
D	Load Resistance	Substantial minimum deflection	Rigid	High breaking load	Flush grouted, fully bedded	Joints suitable for requirements
E	Chemical Resistance	As applicable	As applicable, special grouts	As appropriate for location	Manufacturer's instructions	Chemical resistance of movement joint materials
F	Stain Resistance	N/A	As applicable, special grouts	No failure - Refer to MPX Home Stain Tests	N/A	May require sealer. Stain resistant movement joints
G	Water Exposure Resistance	Refer to AS3740	Unaffected by moisture	Will tolerate moisture without deterioration	Full coverage minimum voids	May require sealer
H	Prolonged Wet Condition Resistance	Unaffected by moisture	Unaffected by moisture	Will tolerate moisture without deterioration	Full coverage minimum voids	May require sealer
I	Extreme Climatic Resistance	N/A	As required by situation	Frost resistant, thermal shock, salt resistant	Full coverage minimum voids. Movement joints important	N/A

Table 2 - Minimum Recommended Performance Characteristics by Classification.

Classification	Intended location	Performance characteristics (refer Table 1								
		A	B*	C	D	E	F	G	H	I
Residential	Showers	✓	2							✓
	Bathrooms,	✓	2 - 3			✓				
	toilets	✓	3			✓				
	Laundries	✓	3		✓					
	Living areas	✓	3 - 4		✓	✓				
	Kitchens									

Classification	Intended location	Performance characteristics (refer Table 1								
		A	B*	C	D	E	F	G	H	I
Residential/ Commercial (R/C)	Food & drink prep. areas	✓	4		✓	✓	✓	✓		
	Foyers	✓	3							
	(R)	✓	4							
	(C)	✓	3 - 4					✓		✓
	External	✓	4		✓	✓		✓	✓	✓
	(R)	✓	3		✓	✓		✓		✓
	(C)									
	Pool surrounds									
Commercial	Shops, arcades	✓	4	✓	✓	✓			✓	
		✓	3 - 4			✓				
	Offices	✓	3 - 4	✓		✓				
	Restaurants and public areas									

NOTE: In order to ensure that these performance characteristics can be maintained it is essential that the systems used are compatible with the anticipated intrinsic movements of the stone & tiles, its substrate and the base structure.

2.2 Testing

- All stone proposed to be used must be tested. Testing details are to be specified by the Stone Consultant or as specified in the specification for low risk use.
- Stone will typically be tested against the following standards:
    - Water Absorption - ASTM C97M-09
    - Bulk Specific Gravity - ASTM C97M-09
    - Compressive Strength – ASTM C170M-09
    - Flexural Strength - ASTM C880M-09
    - Modulus of Rupture - ASTM C99M-09
    - Resistance to Salt Attack - AS/NZS 4456.10-2003
    - Resistance to Acid Attack - Surface sensitivity, immersion...
    - Determination of Frost Resistance (Freeze/Thaw) - ISO 10545-12:1995
    - Abrasion Resistance - ASTM C1353-09
    - Dimensional Stability
    - Coefficient of Thermal Expansion
    - Home Staining (refer below)
- Test reports received for initial appraisal must be less than 12 months old.
- MPX Home Staining test must be undertaken in accordance with process below:
    - Obtain samples of material as proposed for use, i.e. same finish, sealer etc.
    - Apply two separate patches of the domestic substances listed below to the samples. Patches to be approx. 30 mm diameter. Mark tile with permanent marker to indicate each substance and its location.
    - After 1-2 minutes attempt to remove one patch of each substance using only a sponge and warm water. Record on the table below whether or not a stain remains on the stone. Take care not to contaminate adjacent samples.
    - After 12 hours attempt to remove the remaining patch of each substance using only a sponge and warm water.

- Record on the table below whether or not a stain remains on the stone.

SUBSTANCE	RESULTS			
	Cleaned after 1 – 2 minutes		Cleaned after 12 hours	
	Permanent Stain	No Stain	Permanent Stain	No Stain
Tooth paste				
Perfume				
Peanut Butter				
Butter				
Vegemite				
Red Wine				
Beetroot				
Coffee				
Orange Juice				
Tomato Juice				
Mustard				
Olive Oil				
Coca Cola				
Shampoo				
Shower gel/Body wash				
Hand/Body lotion				
Hair conditioner				
Soap				
Aftershave				
Lipstick				
Shaving foam				
Champagne				
White wine				
Nail polish remover				
Other (specify)				

2.3 Beds and Screeds

Refer to section ‘Screeds and Acoustic Underlays’

2.4 Secondary Membranes

- Secondary waterproof membranes must be used to control efflorescence whenever either natural or reconstituted stone is used irrespective of location if exposed to water, e.g. bathrooms, etc.

2.5 Control Joints

Refer to section ‘Control Joints’

3. Terrazzo

Key Considerations

- Joint locations
- Efflorescence control
- Material selection
- Durability
- Stain resistance.
- Strength.
- Resistance to abrasion

3.1 Design and Planning

- Engage a Consultant to:
    - Assist in writing a terrazzo specific specification, detailing/workshop drawings and workmanship requirements.
    - Conduct regular site inspections during the works to confirm conformity of the subcontract works to the Specification.
- Samples of the proposed terrazzo must be submitted for testing, the results to determine acceptability.
- Prototype example of the flooring installation must be constructed. It must be at least 1800 x 1800 mm and incorporate all items intended to be used in the project. The Consultant to view and sign off.
- Installation details and ongoing maintenance requirements must be provided by the manufacturer.
- Terrazzo tiles must:
    - Having a wear layer after grinding of at least 8 mm
    - Not less than 35 mm thick (cementious)
    - Not less than 20mm thick (resin)
    - Not less than 40mm thick (stair treads)
    - Not brought to site unless it is more than 28 days old after manufacture.
    - Be laid on a cured screed with adhesive (preferred) and avoid the use of the “wet lay” method
    - Be delivered with spacers placed between the layers of the tiles on the pallet and then tied down and not wrapped to reduce the risk of cracking and/or delamination.

3.2 Beds and Screeds

Refer to section ‘Screeds and Acoustic Underlays’ under Ceramic / Porcelain

3.3 Joints

- If proprietary metal expansion joints are to be used, avoid brass/bronze types where they are likely to experience wetting especially external areas.
- Provide perimeter joints to all floors.
- Floors must be subdivided into smaller bays by contraction joints at 6 metre intervals.
- On suspended slabs provide contraction joints over supporting members, e.g. beams, columns, etc.
- Joints should be grouted within two to three days after fixing.

3.4 Grouting

- Grouted floors should be left for at least three days or until grouted joints are thoroughly hardened before grinding commences and should be covered to prevent them from drying too rapidly.
- NOTE Some colours, particularly if black colour is used, require a longer curing period before grinding

3.5 Multiplex Standard Details

3009 - Terrazzo Details - Joints, Typical Locations

3010 - Terrazzo Details - Joints, Type A

3011 - Terrazzo Details - Joints, Type B Seismic Rated by Latham SGAL PAVA Series

3012 - Terrazzo Details - Joints, Type B Seismic by Unison Model Si T

3013 - Terrazzo Details - Joints, Type C

3014 - Terrazzo Details - Joints, Type D

3015 - Terrazzo Details - Joints, Type E

3016 - Terrazzo Details - Joints, Type B Light Duty

3017 - Terrazzo Details - Joints, Cracked Concrete and Temporary Movement Joints (TMJ)

4. Segmental and Flag Pavements

Key Considerations

- Material selection
- Subgrades
- Slip resistance

4.1 Design and Planning

- Design is to by a suitably qualified and experienced consultant (i.e. landscape architect or civil engineer).
- Considerations should be given to:
    - The type of traffic (pedestrian/vehicular/maintenance) likely to be carried
    - The weight of the traffic likely to traffic the area
    - The frequency or amount of traffic carried
    - Abrasive characteristics of the traffic
    - General layout of the pavement (surface grades/alignment)
    - Drainage incl, surface, sub-surface and subsoil
    - Tree root control measures
    - Any relevant site specific issue
- Samples must be submitted of all proposed segmental paving materials, including the following:
    - Sand: Provide certification of the grading and quality to AS 1141.11.1.
    - Segmental pavers: Submit the following type test results from a NATA registered laboratory:
    - Characteristic breaking load and flexural strength: To AS/NZS 4456.5.
    - Dimensional deviations: To AS/NZS 4456.3.
    - Abrasion resistance: To AS/NZS 4456.9.
    - Salt attack resistance grade: To AS/NZS 4456.10.
    - Slip resistance type test: To AS 4586 Appendix A.
    - Slip resistance site test of completed paving: To AS 4663 Appendix A,
    - Adhesive: Classification to AS ISO 13007.1.

4.2 Flexible Pavement

What is Flexible Pavement?

A pavement that does not rely on a rigid layer, such as a concrete slab, to distribute superimposed loads to the subgrade.

- Base courses must be:
    - Designed by an engineer
    - Compacted in layers.
- Bedding course must be:
    - Material that is a well-graded coarse sand.
    - Compacted in accordance with the specification
    - Tested as specified

- Paved areas must be:
    - Provided with perimeter edge restraints to prevent lateral spread of the pavers and consequent loss of interlock. These should be adequate to support the intended loads and to prevent the escape of bedding course material from beneath the paved surface.
    - Slightly above the front edge of the edge restraint

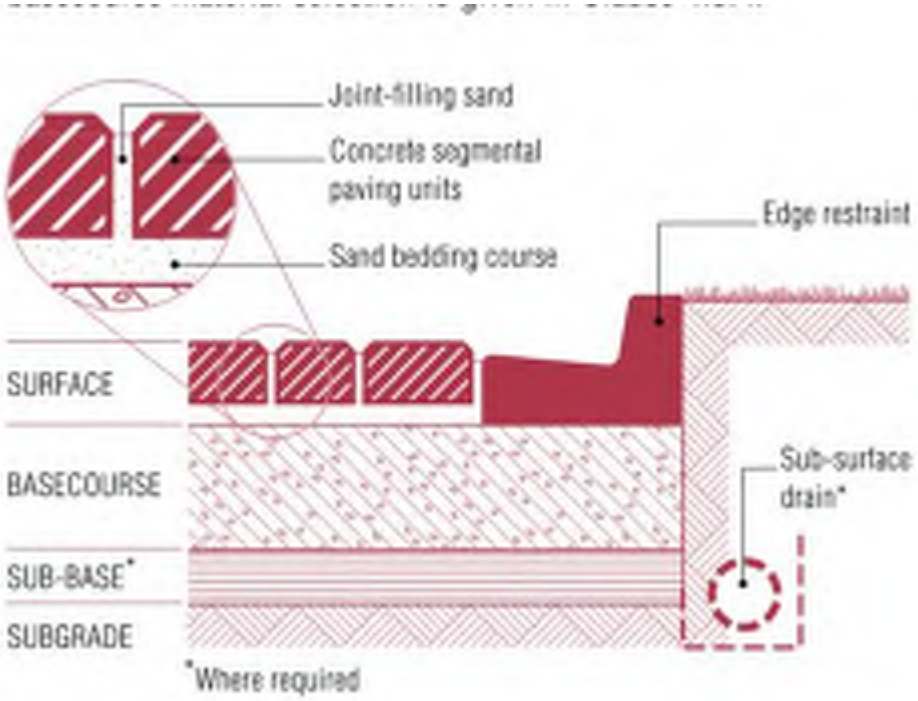


Figure 1: Segmental Pavement Structure

4.3 Rigid Pavements

What is Rigid Pavement?

A pavement that relies on a rigid layer, such as a concrete slab, to distribute superimposed loads to the subgrade.

- Subgrades must be:
    - Designed by an engineer with consideration to the following:
        - Loadbearing capacity of the subgrade
        - Subgrade drainage
- Base course must be:
    - A concrete slab having the following properties:
        - Strength to be consistent with expected traffic loading and subgrade strength
        - Thickness to satisfy predicted loading.
        - Reinforced to satisfy predicted loading.
        - Finished slab to have falls for drainage.
        - Finished to a smooth surface.
- Screeds where used must be:
    - Treated to control efflorescence
- Pavers must be:

  - Provided with perimeter edge restraints to prevent lateral spread of the pavers and consequent loss of interlock. These should be adequate to support the intended loads and to prevent the escape of bedding course material from beneath the paved surface.

- Control joints should be considered for the following locations.
  - Over structural control joints.
  - At internal corners.
  - Close to external corners in large paved areas.
  - Around the perimeter at abutments.
  - At junctions between different substrates.
  - To divide large paved areas into bays,
  - At abutments with the building structural frame and over supporting walls or beams where flexing of the substrate is anticipated.

Reference Documents

Concrete Masonry Association of Australia

- CMAA PA01 Concrete segmental pavements - Detailing guide
- CMAA PA02 Concrete segmental pavements - Design guide for residential access ways and roads
- CMAA PA03 Concrete segmental pavements - Specifying guide
- CMAA PE01 Permeable interlocking concrete pavements - Design and construction guide

Clay Brick and Paver Institute

- CBPI Manual 1 Clay paving design and construction

5. Pedestal Paving

Key Considerations

- Material Selection
- Unit strength
- Pedestal centres

5.1 Design and Planning

- Pavers or flags must:
    - Be 30mm thick or greater, and
    - Tested in accordance with the specialist consultant requirements (i.e. impact, static, porosity and modulus of rupture)
    - Porcelain
    - Have a marking to indicate floor waste location
    - Consider design for uplift
- Engage a specialist consultant who may be the Stone Consultant
- Review capacity to drain storm events via joints
- A registered structural engineer is to be engaged to review the system holistically in accordance with AS1170 to produce the following forms within the relevant state.
    - QLD – Building Act 1975, Building Regulation 2006, Form 15 Compliance Certificate for Building design or specification
    - QLD – Building Act 1975, Building Regulation 2006, Form 16 Inspection Certificate/Aspect Certificate/QBCC Licensee Aspect Certificate
    - VIC – Building Act 1993, Building Regulations 2006 Regulation 1507: Certificate of Compliance – Design
    - VIC – Building Act 1993, Building Regulation 2018 Regulation 126: Certificate of Compliance for Building Work
- Provide shop drawings. Include full plans showing paver and paver supports layout, adjacent construction and penetrations, and details of each condition of installation and attachment.
    - Include data indicating compliance with performance requirements.
    - Indicate points of supporting structure and other construction elements that must coordinate with paver installation.
- A Risk Workshop must be conducted to:
    - Review the proposed locations in which pedestals and paver system is to be used
    - Review the whole of life aspect, if the area will need to be maintained and use of machinery either during construction or in its life. For example, pedestals and paver system will not be able to be construction in areas that may need a EWP or Boom for future maintenance
- Pedestals must not be used:
    - Where heavy mobile vehicles or machines need to traverse.
    - Where emergency or maintenance vehicles (EWP's) need to access
    - In excess of 200mm in height. Where this is exceeded an additional pedestal must be installed under the centre of the paver. (VIC, QLD and NSW).
- The system shall withstand the effects of the following loads
    - Floors: Uniform load and concentrated loads.

- All Roof or Balcony Zones Uplift Pressures:

- Flags must be restrained by walls, hobs or similar on all sides.
- Stormwater outlets should be positioned wholly within the boundary of a full unit. Ensure pedestal locations do not overlap or otherwise obstruct drains.
- Overflow provision must be provided either by purpose made outlets (scuppers or spitters) or by overtopping of the surrounding structure.
    - If overtopping is the selected method, ensure the height of the weir is a minimum of 20 mm below any sill or floor level opening into the building.
    - Ensure runoff does not interfere with areas below if they are habitable spaces or publicly accessible.
- Waterproof membrane used below pedestal must have UV tolerance unless it can be shown the membrane will not be exposed to sunlight, either directly or by reflections off adjoining surfaces, and
    - Be capable of resisting the imposed loads for the service life of the installation.
    - Or, provide a load distribution system below each pedestal.

5.2 Testing

The table below outlines the suggested tests to be performed and should be reviewed in consultation with the stone consultant.

Test	**Minimum Requirement**
Slip Resistance	Refer SA HB 198: 2014
Static Load AS 4155.8	525 kg
Tile Impact EN 14158 (Modified)	4 Joules
Tile Porosity	< 0.05%
Support Compression	1.0 kN
Fire resistance	$+150^0$ C

5.3 Installation

- Provide a gap to the perimeter as specified by the manufacturer to allow for thermal expansion of the flags.
- Provide a gap to any aluminium door or window frame, sill, or sub-sill.
- Allow for movement between paving and fixtures.

5.3.1.1 Flag Layout

- The Architect is to provide details of the flag joint positions.
- Consideration is required for the following: -
    - Minimisation of cuts,
    - Penetrating items,
    - Waste locations,
    - Door openings,
    - Expansion joints in the structure,
    - Steps or changes in heights,
    - Overflow provision,
    - Hobs or other restraining features.
    - Requirement for TGSIs.

5.3.1.2 Expansion joints

- Do not locate pedestals directly over expansion joints in the substrate.

- Locate pedestals on one side or the other of any expansion joint in the substrate..

5.3.2 Pedestal installation

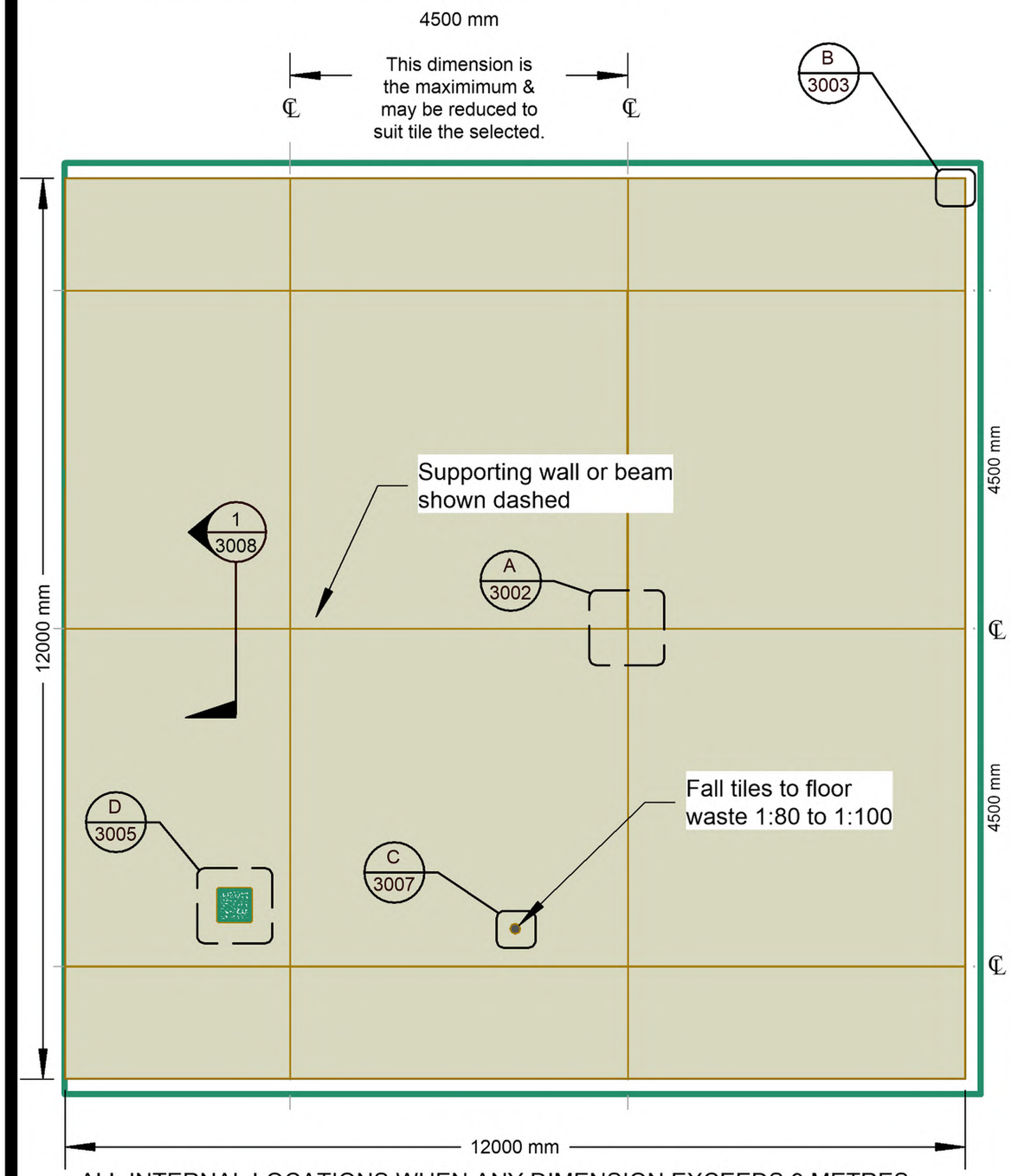
- Install pedestals to the manufacturer’s recommendations in complete rows, starting at one side of the perimeter, installing flags and adjusting to the correct level as each subsequent row of pedestals are installed.

6. Appendix 1 - Multiplex Standard Details

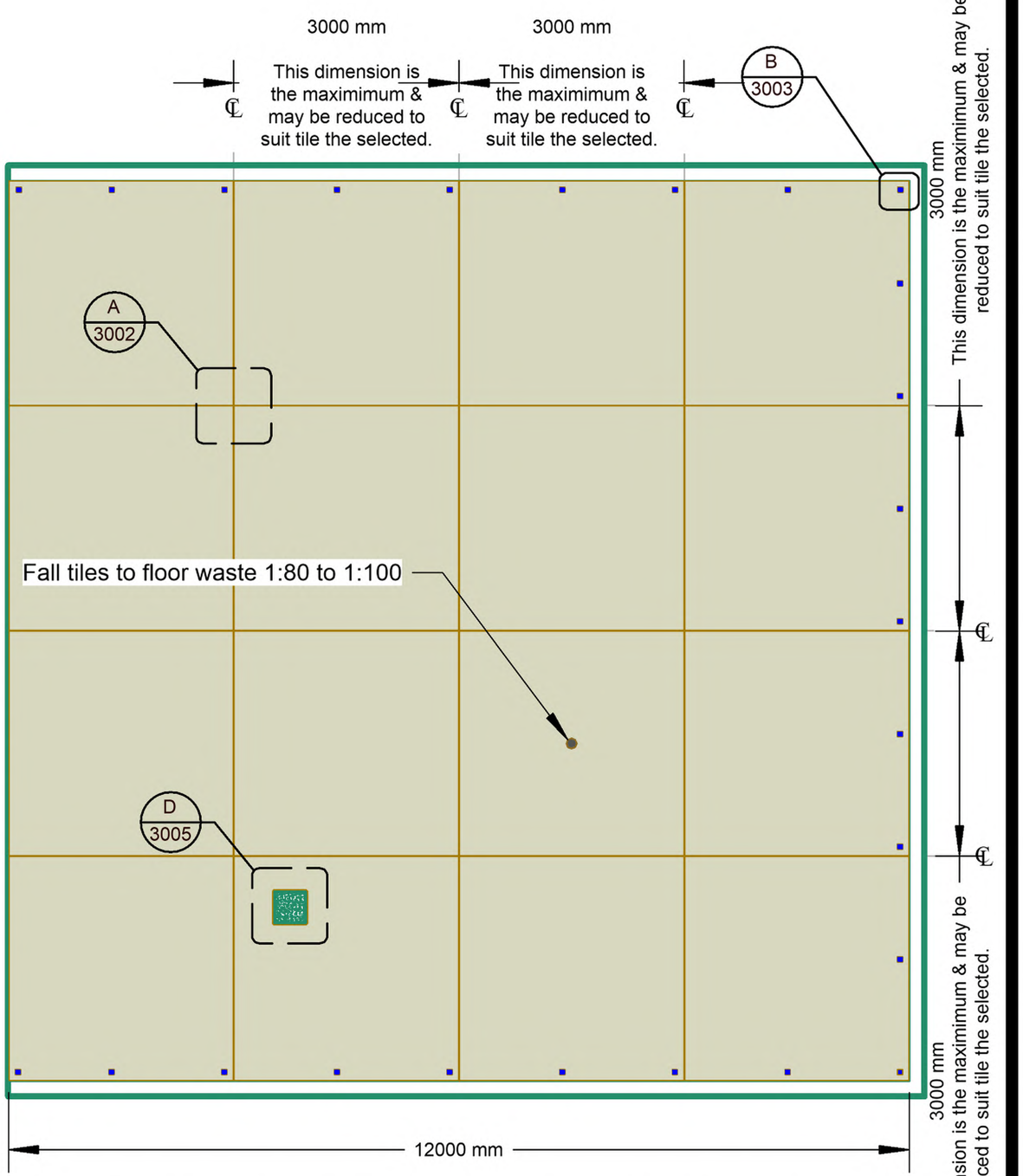
NOTES:
1. Dimension provided are nominal.
2. Some details may be shown exaggerated or exploded to provide clarity.
3. Details provided are to indicate intent. Each project is to produce site specific details.
4. The nomination in a detail of a particular product or system is not intended as an endorsement for that product, system or manufacturer and shall not be interpreted as the only products or system that may be suitable for that situation.
5. Waterproofing details are not provided in this series, refer to MPX Guide to Waterproofing.

DRAWING INDEX:

NOTE: THESE DIMENSIONS ARE APPLICABLE TO NSW ONLY



ALL INTERNAL LOCATIONS WHEN ANY DIMENSION EXCEEDS 9 METRES & NOT EXPOSED TO DIRECT SUNLIGHT AND ALL EXTERNAL TILING WHEN ANY DIMENSION EXCEEDS 4.5 METRES



ALL INTERNAL LOCATIONS EXPOSED TO DIRECT SUNLIGHT OR EXTERNAL LOCATIONS USING DARK TILES OR STONE

MULTIPLEX
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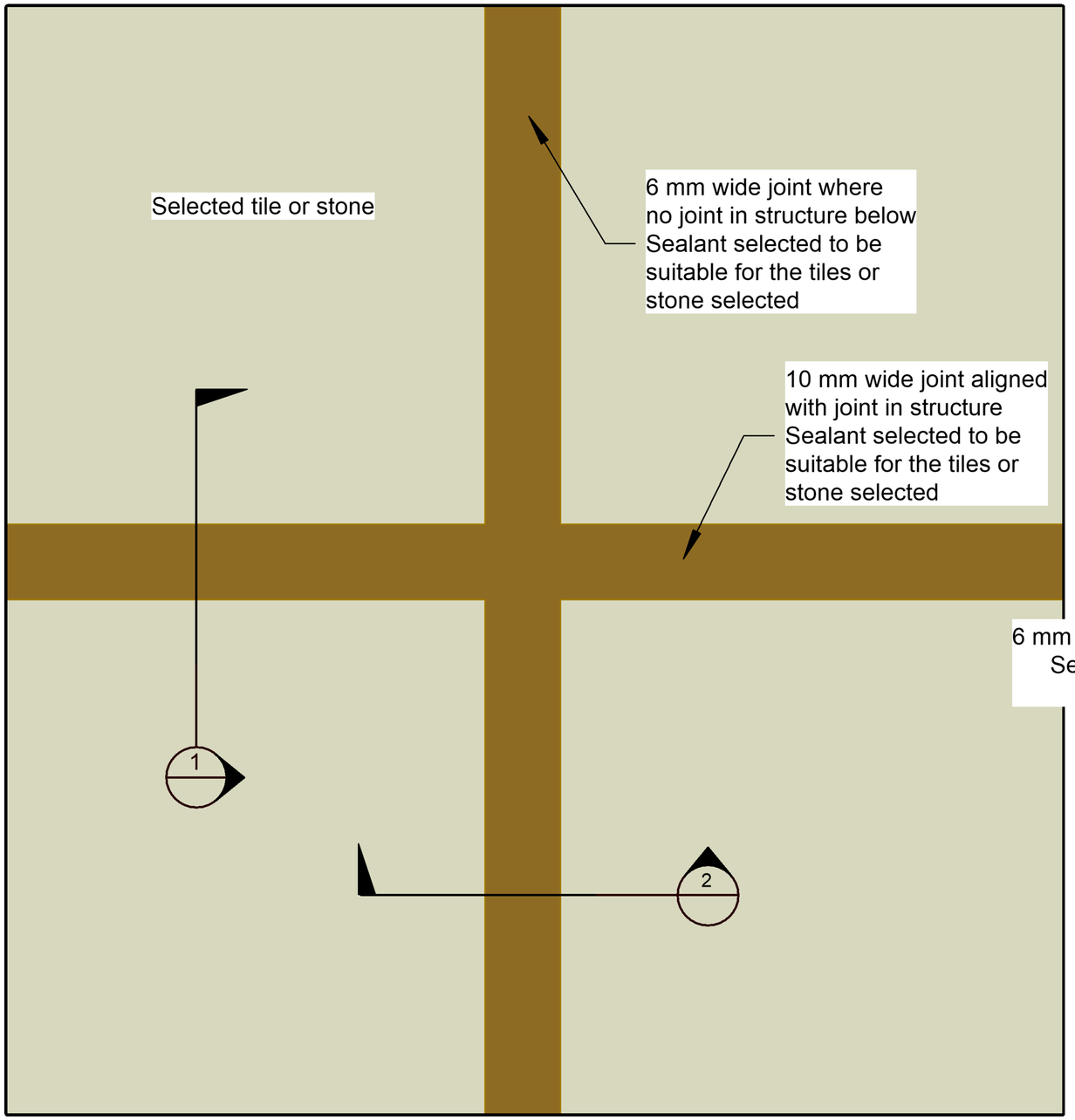
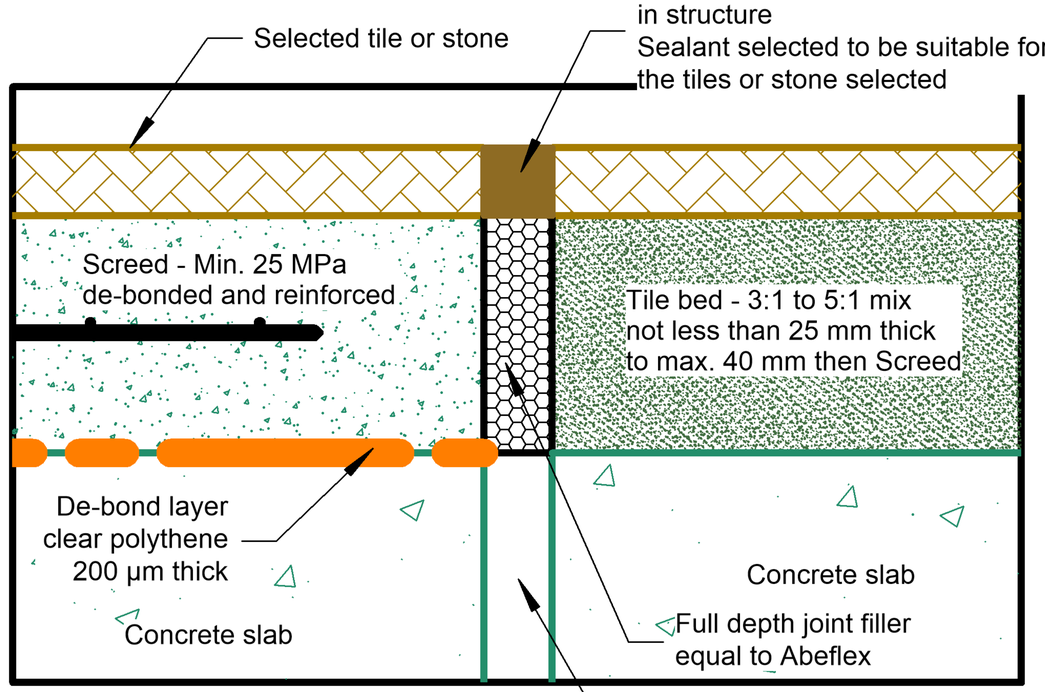
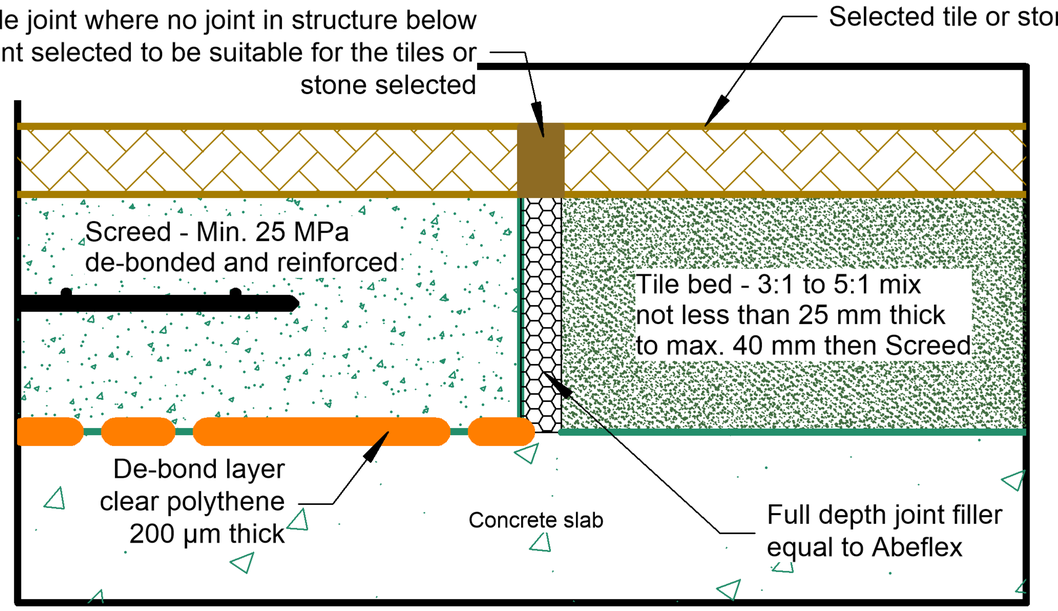
project	title	date	drawing no.	issue
Multiplex Standard Details - Hard Floor Finishes	Typical Plans	December 2018	3001	B



PLAN



SECTION 1



SECTION 2

MULTIPLEX
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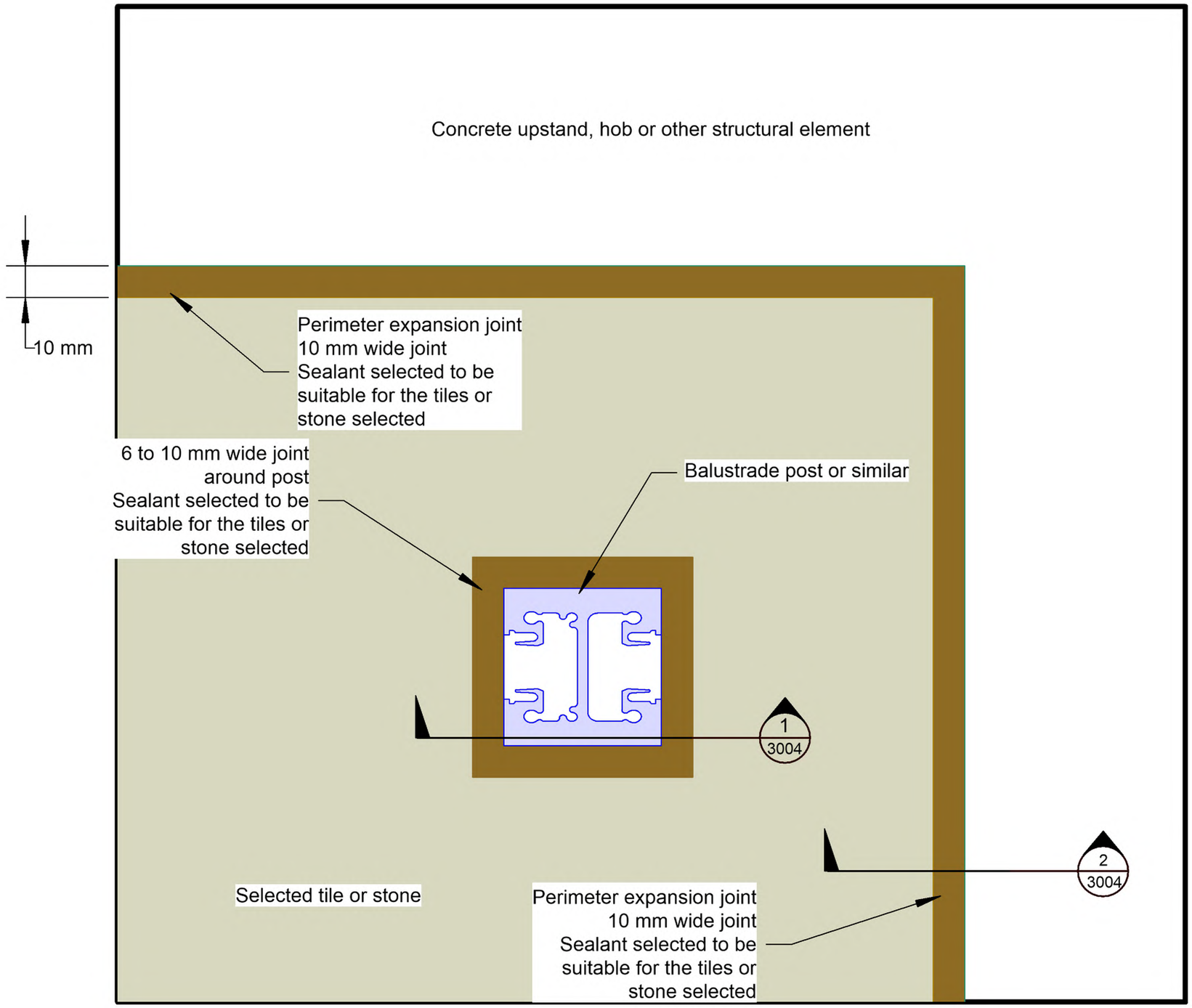
project	title	date	drawing no.	issue
Multiplex Standard Details - Hard Floor Finishes	Detail A From 3001 - Typical Intermediate Joints	December 2018	3002	C



MULTIPLEX
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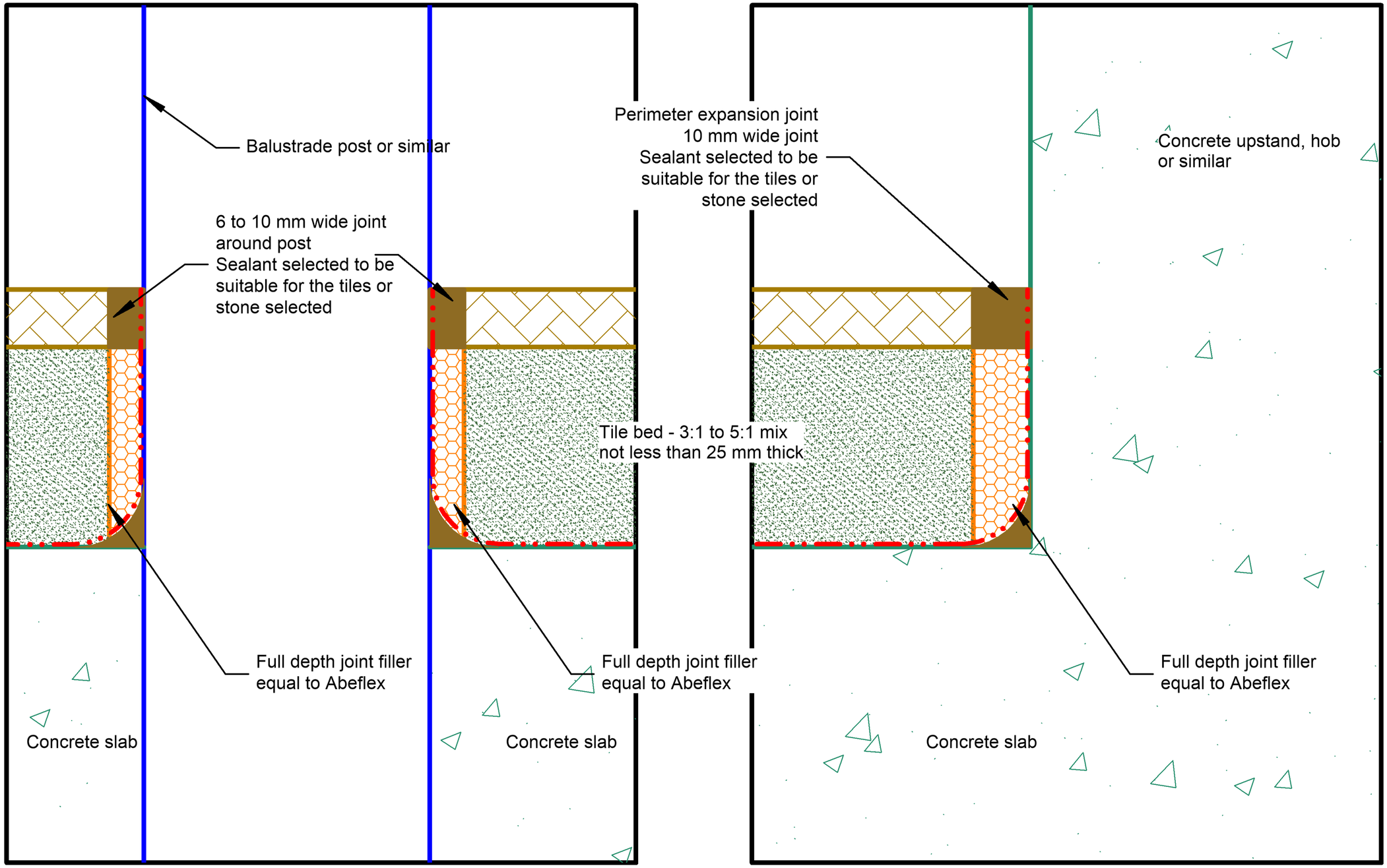
project	title	date	drawing no.	issue
Multiplex Standard Details - Hard Floor Finishes	Detail B From 3001 - Handrail Post and Perimeter Joint	December 2018	3003	B



SECTION 1

SECTION 2

MULTIPLEX
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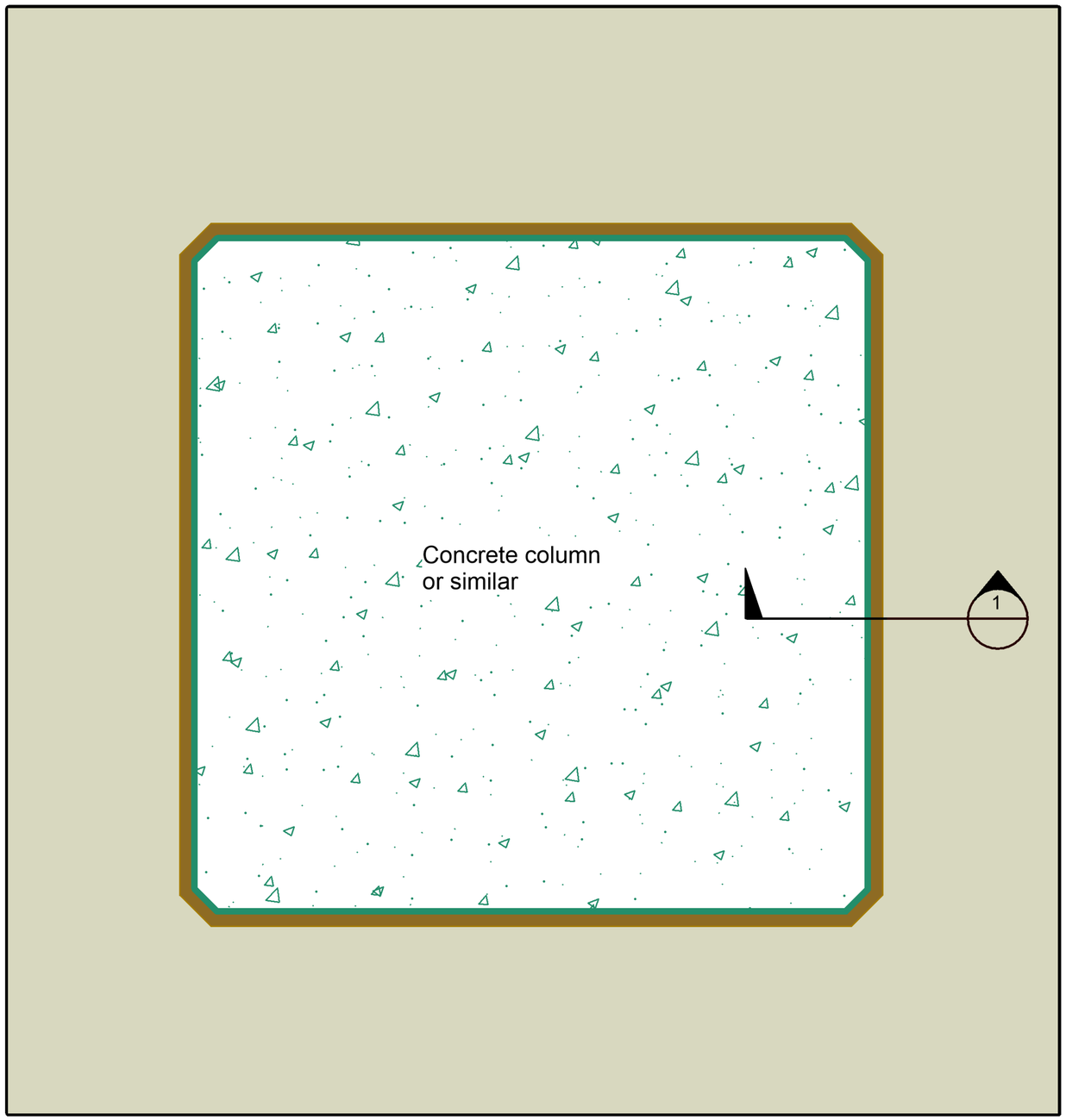
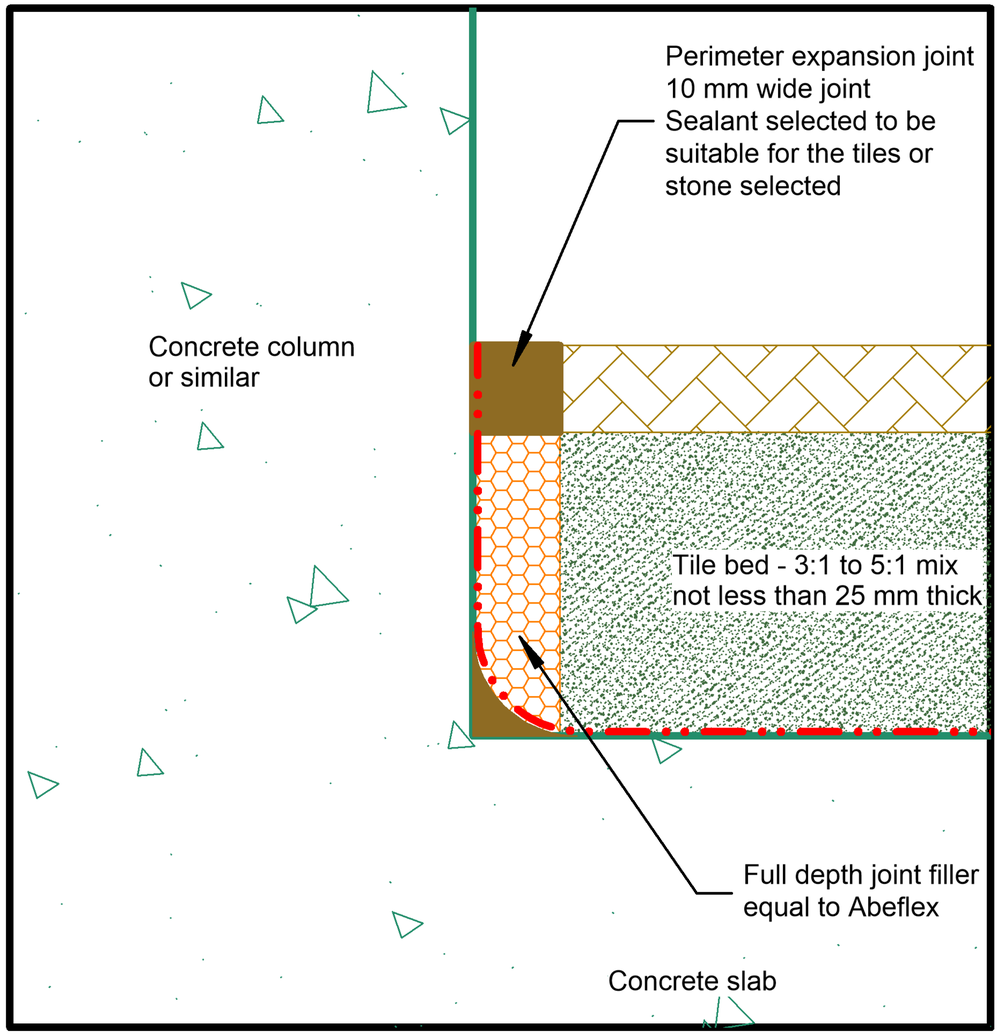
project	title	date	drawing no.	issue
Multiplex Standard Details - Hard Floor Finishes	Sections 1 & 2 From 3003	December 2018	3004	B

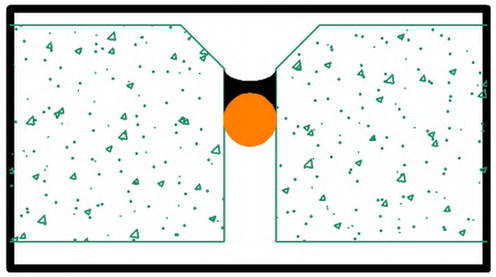




SECTION 1

MULTIPLEX
Built to outperform.

project	title	date	drawing no.	issue
Multiplex Standard Details - Hard Floor Finishes	Detail D From 3001	December 2018	3005	B

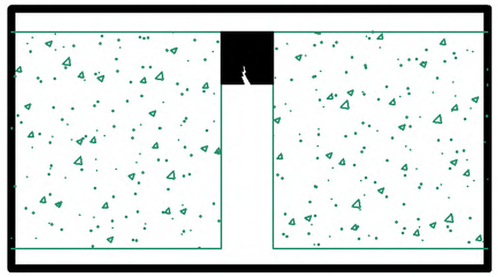


Good joint width/depth profile

Concave sealant surface

Depth/width ratio correct

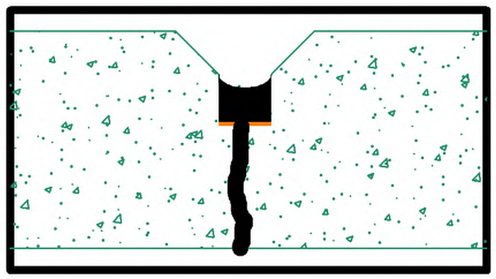
Hour glass shape ideal



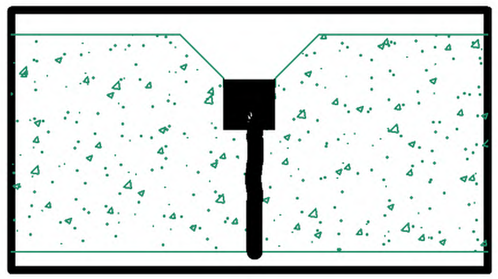
Joint too deep

No bond breaker or back up

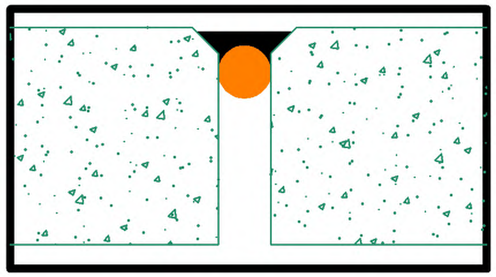
Poor geometry for movement



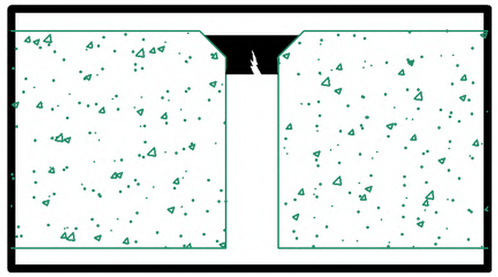
Bond breaking tape eliminates adhesion of the sealant to the base of the joint



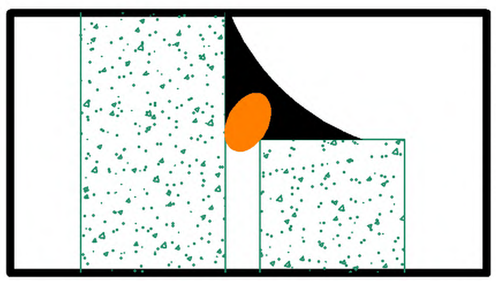
3 sided bonding
No bond breaker
Sealant adheres to base of joint, thus creating a cohesive tear when movement occurs



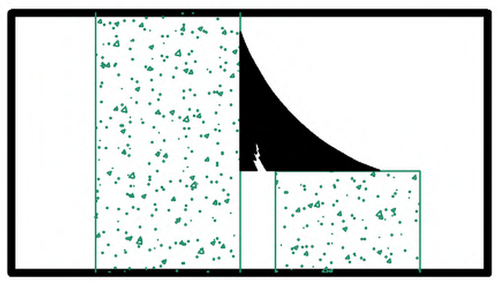
Backing rod has now increased width at the base of sealant allowing sealant greater ability to compensate



Cohesive tear Sealant can only compensate for movement at the narrowest point.
Tear may develop if movement exceeds sealants limits at the neck of the joint



Backing rod has now increased width at the base of sealant allowing sealant greater ability to compensate



Cohesive tear Sealant can only compensate for movement at the narrowest point.

CORRECT DETAILING

INCORRECT DETAILING

MULTIPLEX
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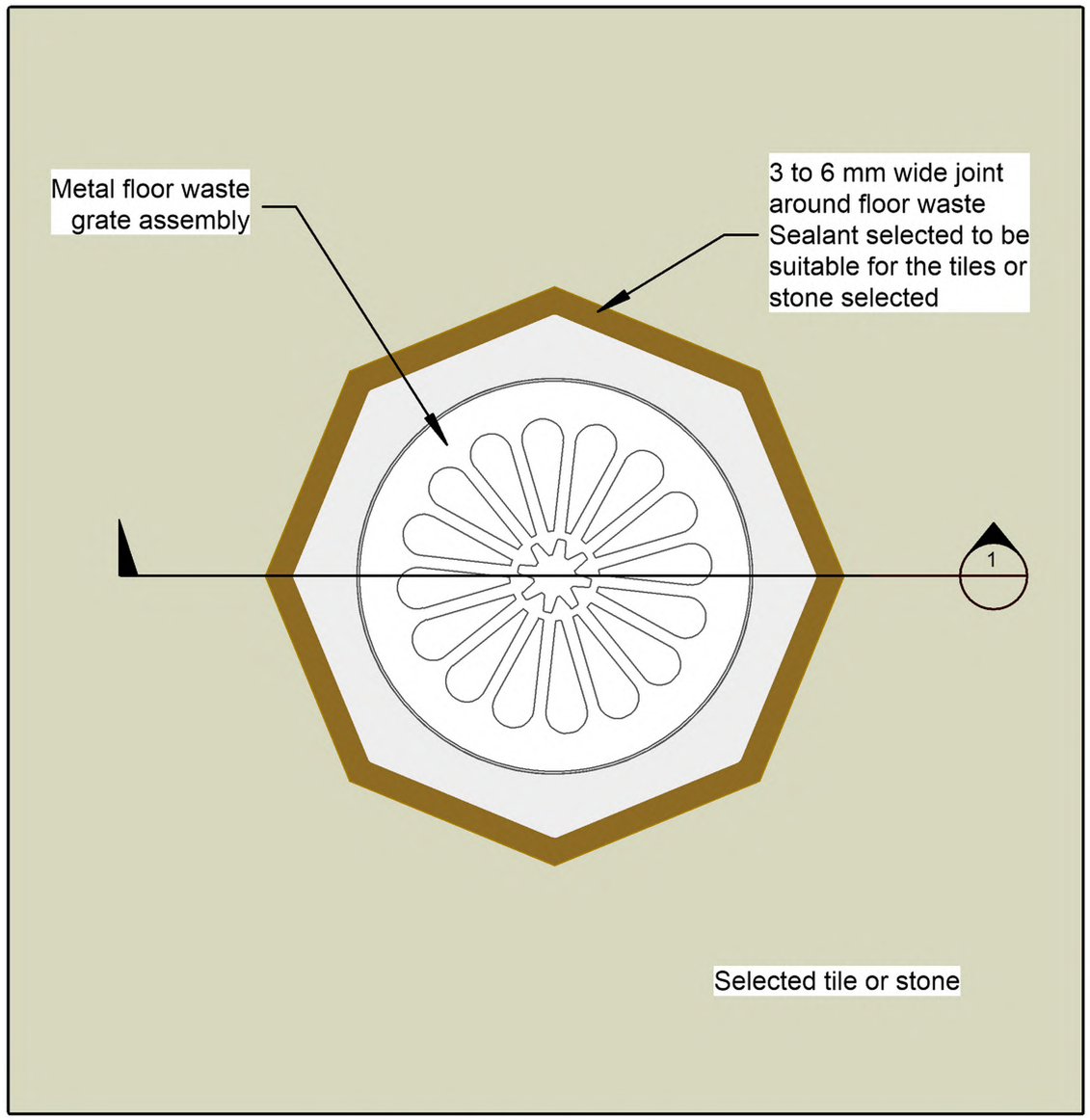
project: Multiplex Standard Details - Hard Floor Finishes

title: Joint Detailing

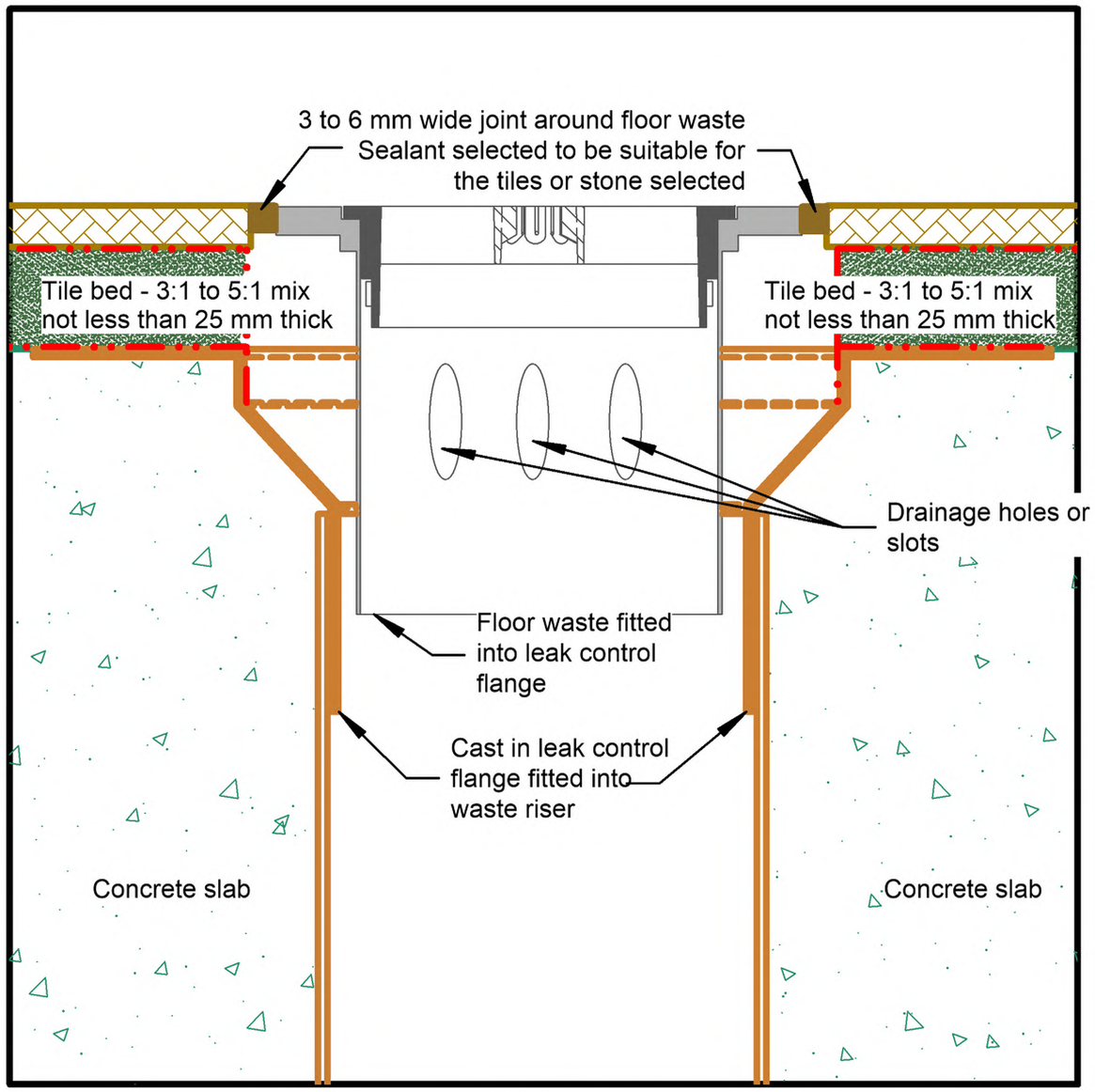
date: December 2018

drawing no.: 3006

issue: B



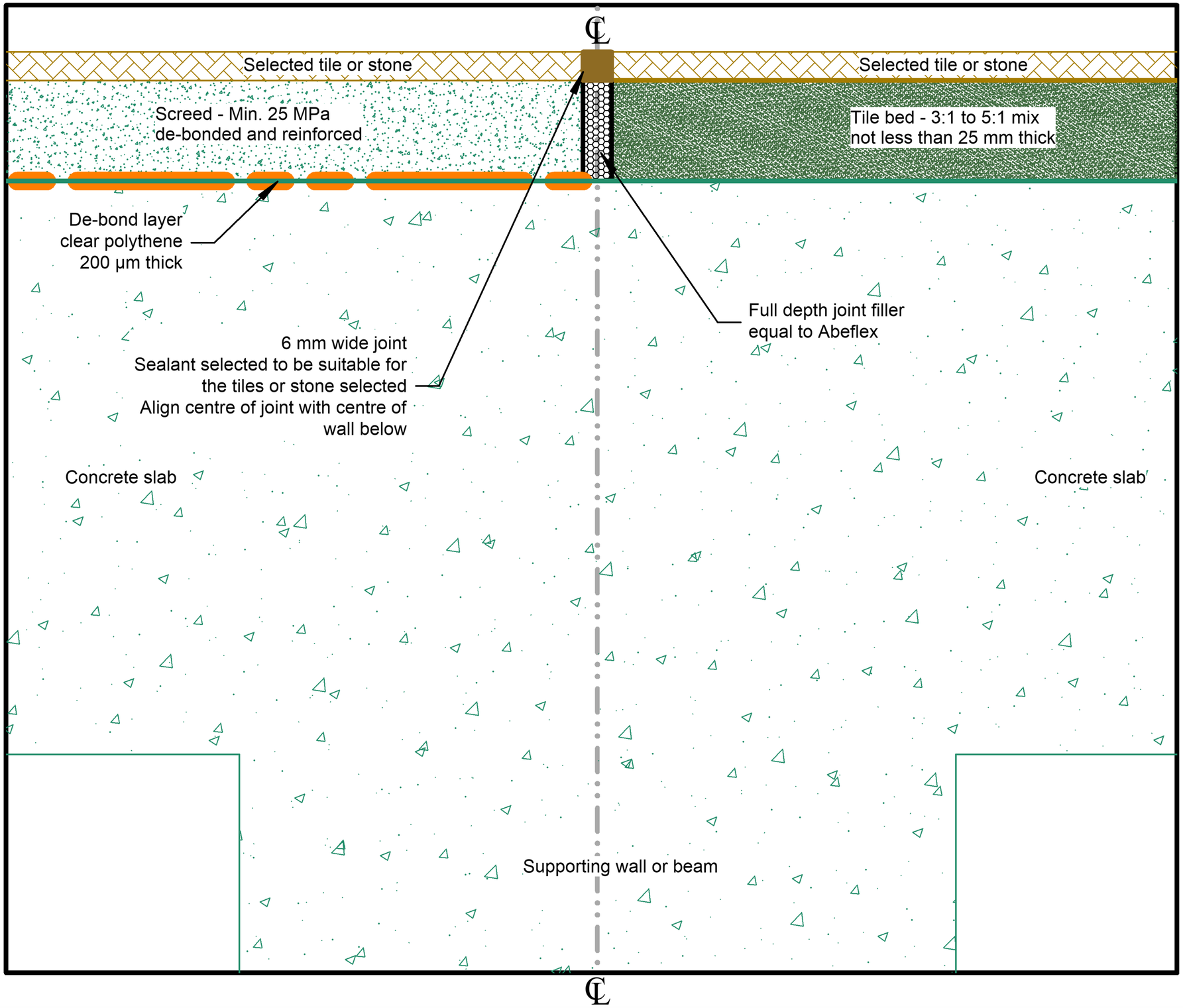
DETAIL C FROM SHEET 3001



SECTION 1

MULTIPLEX
Built to outperform.

project	title	date	drawing no.	issue
Multiplex Standard Details - Hard Floor Finishes	Floor Waste	December 2018	3007	B

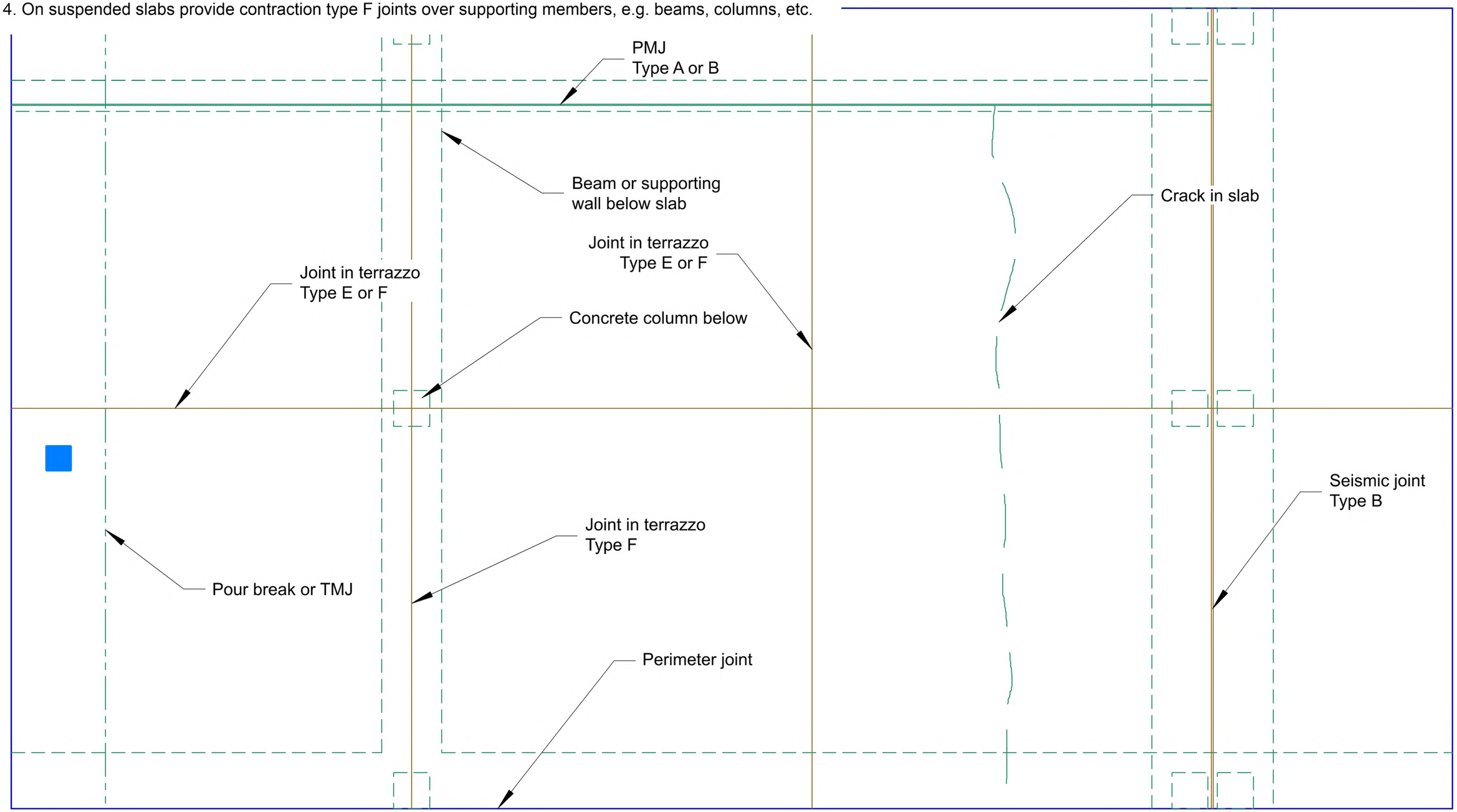


MULTIPLEX
Built to outperform.

project	title	date	drawing no.	issue
Multiplex Standard Details - Hard Floor Finishes	Section 1 From 3001 - Joint Over Supporting Structural Element	December 2018	3008	C

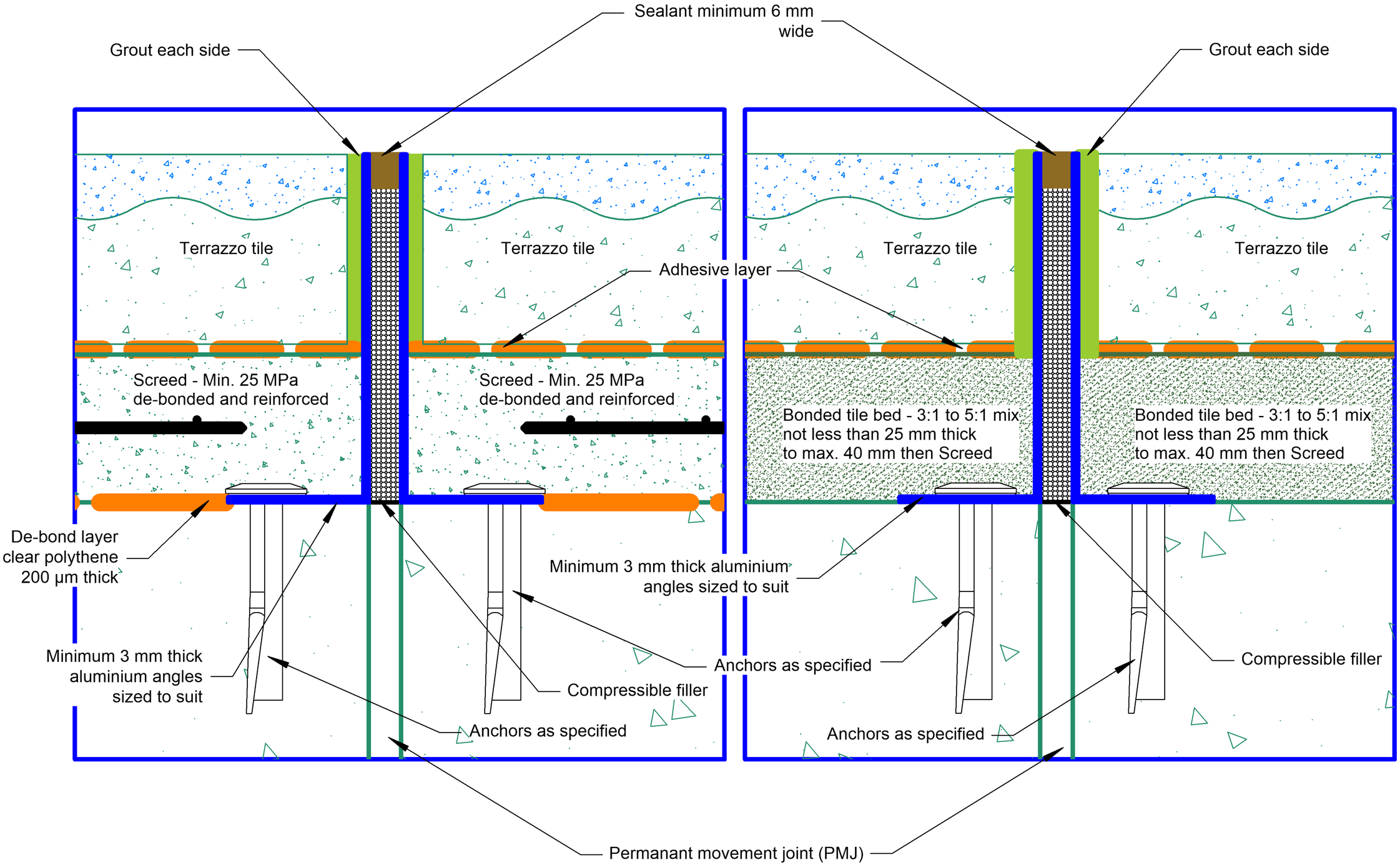
JOINT FREQUENCY

1. Provide perimeter joints to all floors.
2. Very large floors must be divided at not more than 30 metres centres with type E or type F joints;
   - subdivided into smaller bays by contraction joints at 6 metre intervals.
3. Smaller floors must be subdivided by type F joints at 6 metre intervals.
4. On suspended slabs provide contraction type F joints over supporting members, e.g. beams, columns, etc.



MULTIPLEX
Built to outperform.

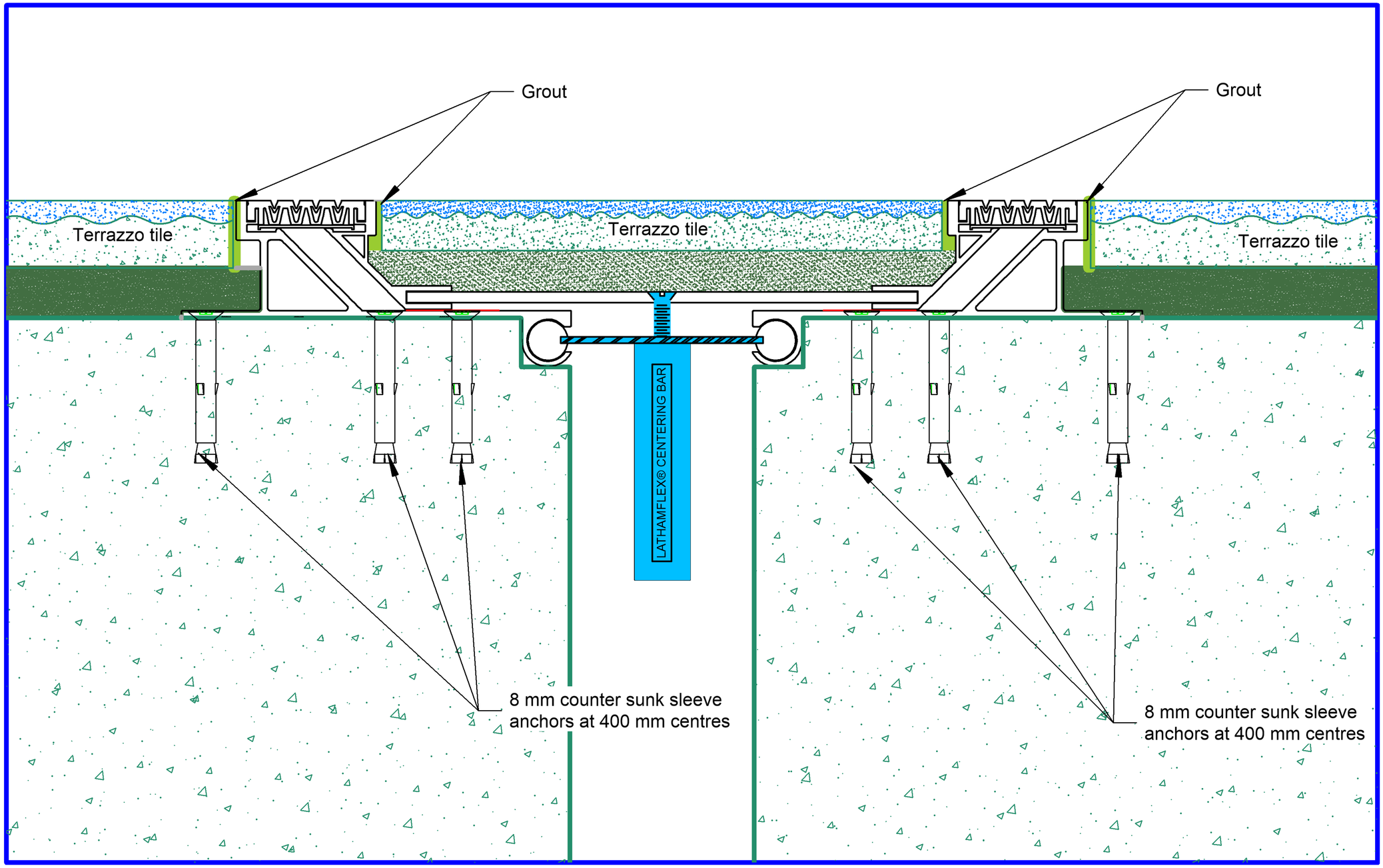
project	title	date	drawing no.	issue
Multiplex Standard Details - Hard Floor Finishes	Terrazzo Details - Joints, Typical Locations	February 2020	3009	B



MULTIPLEX
Built to outperform.

project	title	date	drawing no.	issue
Multiplex Standard Details - Hard Floor Finishes	Terrazzo Details - Joints, Type A	February 2020	3010	A

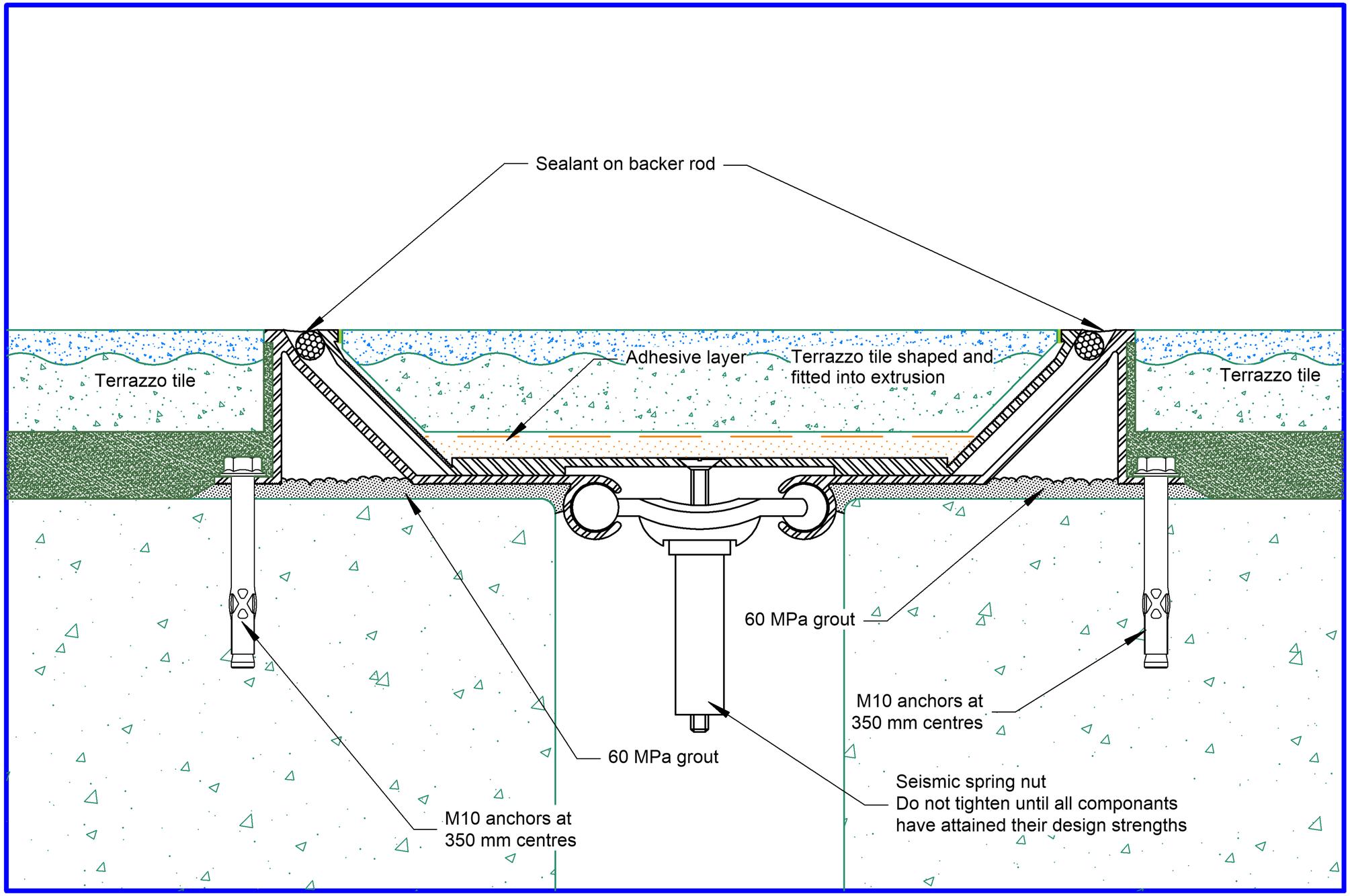
NOTE:
Cut edges of aluminium must be protected from contact with cementitious materials.
Refer to manufacturer for complete installation details.



MULTIPLEX
Built to outperform.

project	title	date	drawing no.	issue
Multiplex Standard Details - Hard Floor Finishes	Terrazzo Details - Joints, Type B Seismic Rated by Latham SGAL PAVA Series	February 2020	3011	A

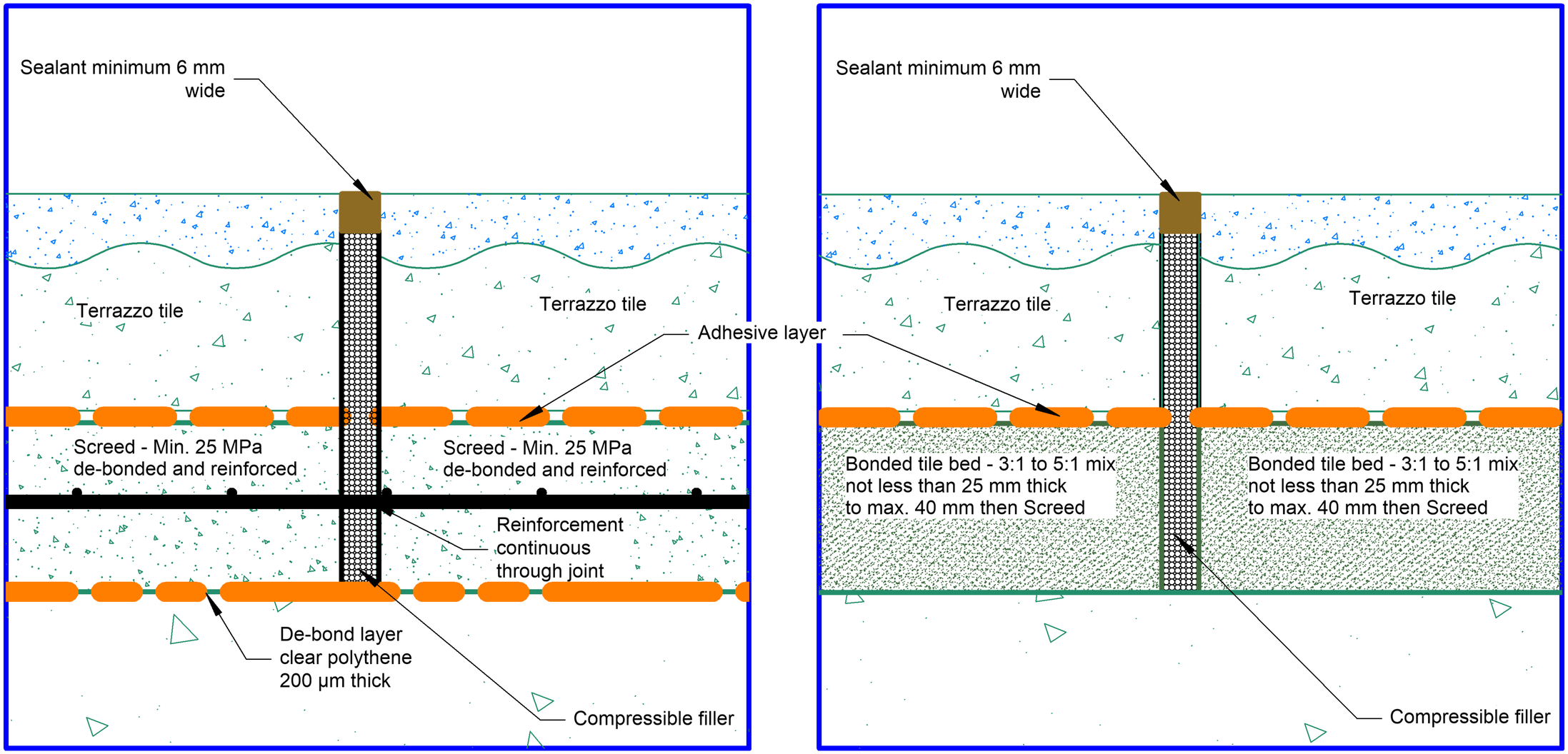
NOTE:
Cut edges of aluminium must be protected from contact with cementitious materials.
Refer to manufacturer for complete installation details.



MULTIPLEX Built to outperform.	project: Multiplex Standard Details - Hard Floor Finishes	title: Terrazzo Details - Joints, Type B Seismic by Unison Model Si T	date: February 2020	drawing no.: 3012	issue: A

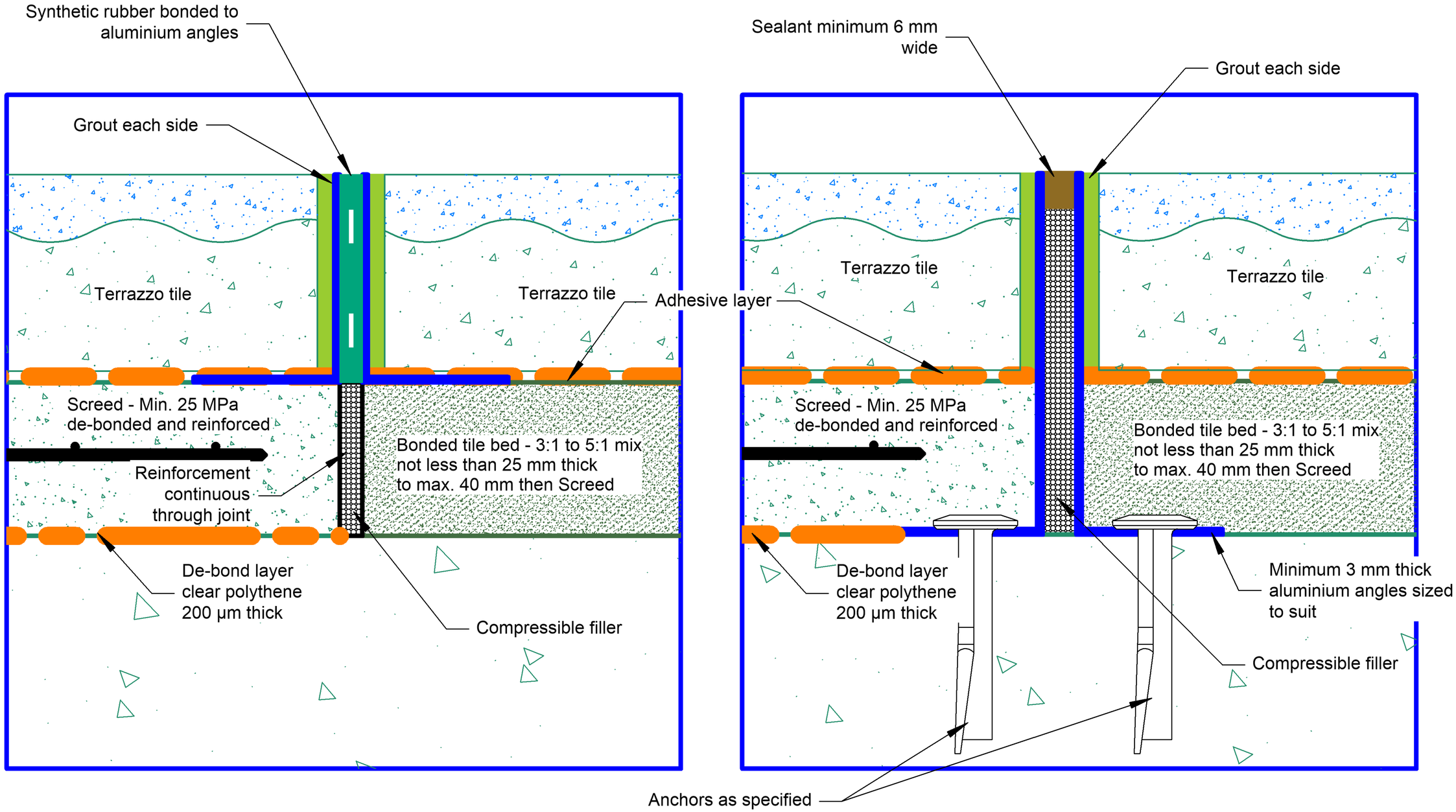
Beds and Screeds

1. Bed. A mixture of fine aggregate (sand), potable water and Portland cement. This is applied to a concrete substrate (fully bonded) to provide a smooth flat surface to fix the floor finishes onto. It can be laid level or to fall to floor wastes in locations that require drainage. Minimum thickness of 15 mm with admixture or 25 mm without.
2. Screed. A mixture of fine aggregate (sand), coarse aggregate, potable water, reinforcement and Portland cement. A concrete mix that floats (de-bonded) over a concrete substrate. A screed provides a similar function as a “Bed”. Minimum thickness 40 mm, maximum is not specified but requires a Structural Engineer or an Independent Concrete Technologist to design when > 80 mm.
3. Minimum strength of either is compressive strength of 20 MPa and 1.5 MPa tensile strength.
4. Reinforcement must be galvanised steel welded wires of a minimum thickness before galvanizing of 1.2 mm to 2.0 mm maximum, and
   - Have a tensile strength of not less than 380 MPa, and
   - Have bars spaced in either a square or rectangular pattern at minimum 25 x 25 mm centres, up to 50 x 50 mm centres, and
   - Be lapped at joints a minimum of 2.5 bar centres.
5. Unbonded screed to be laid onto smooth concrete over a 200 µm sheet of clear polythene.



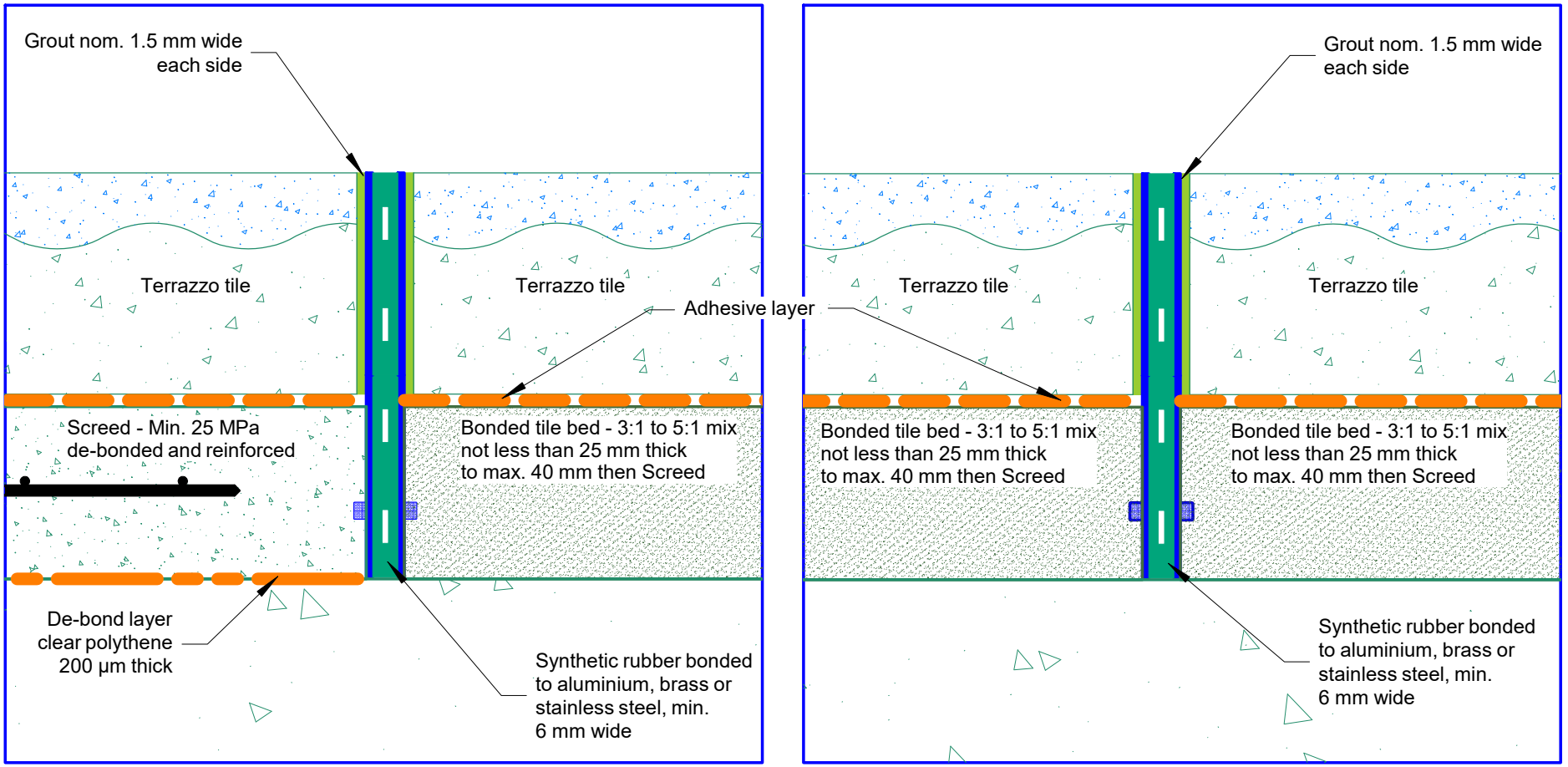
MULTIPLEX
Built to outperform.

project	title	date	drawing no.	issue
Multiplex Standard Details - Hard Floor Finishes	Terrazzo Details - Joints, Type C	February 2020	3013	A



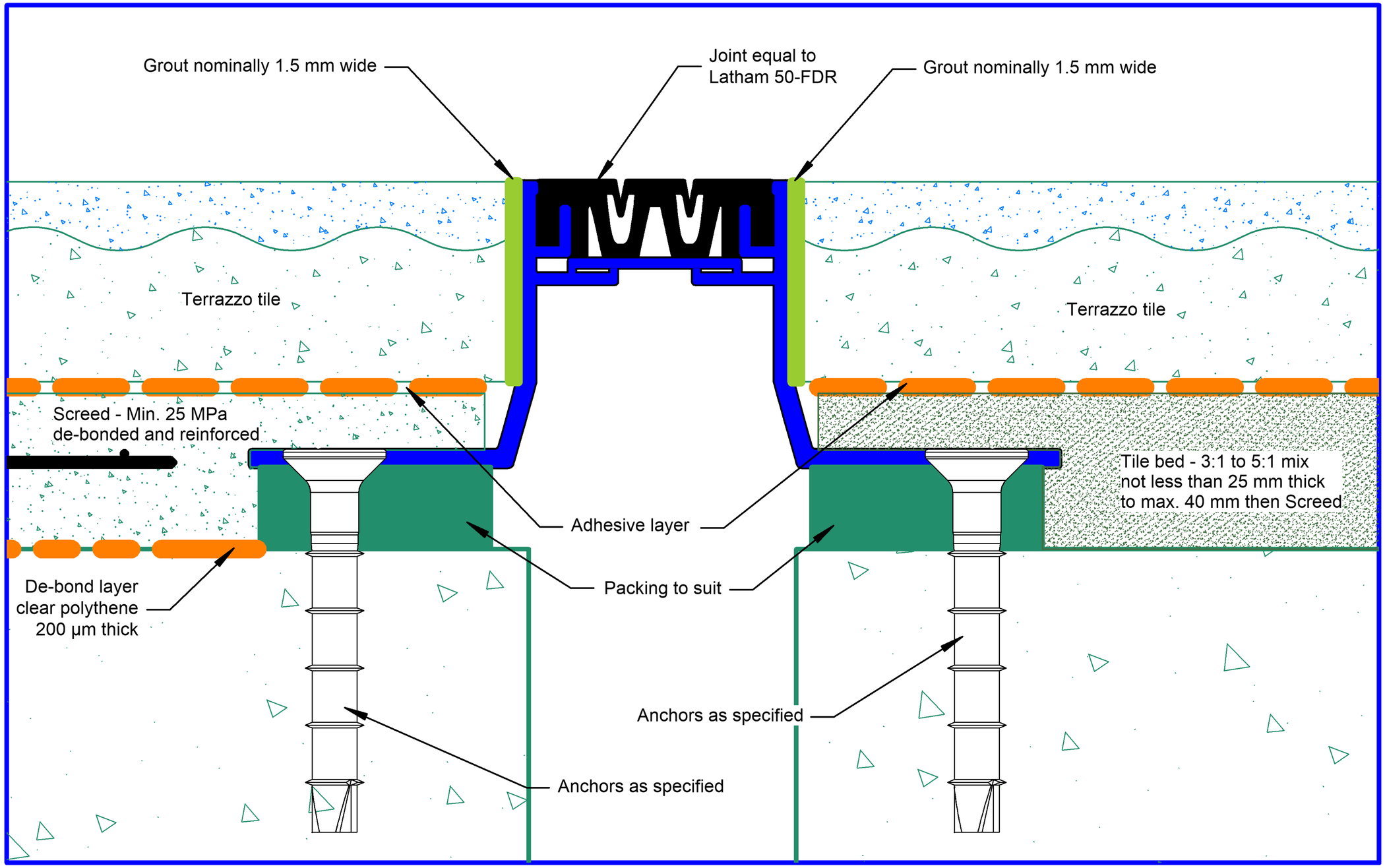
MULTIPLEX
Built to outperform.

project	title	date	drawing no.	issue
Multiplex Standard Details - Hard Floor Finishes	Terrazzo Details - Joints, Type D	February 2020	3014	A



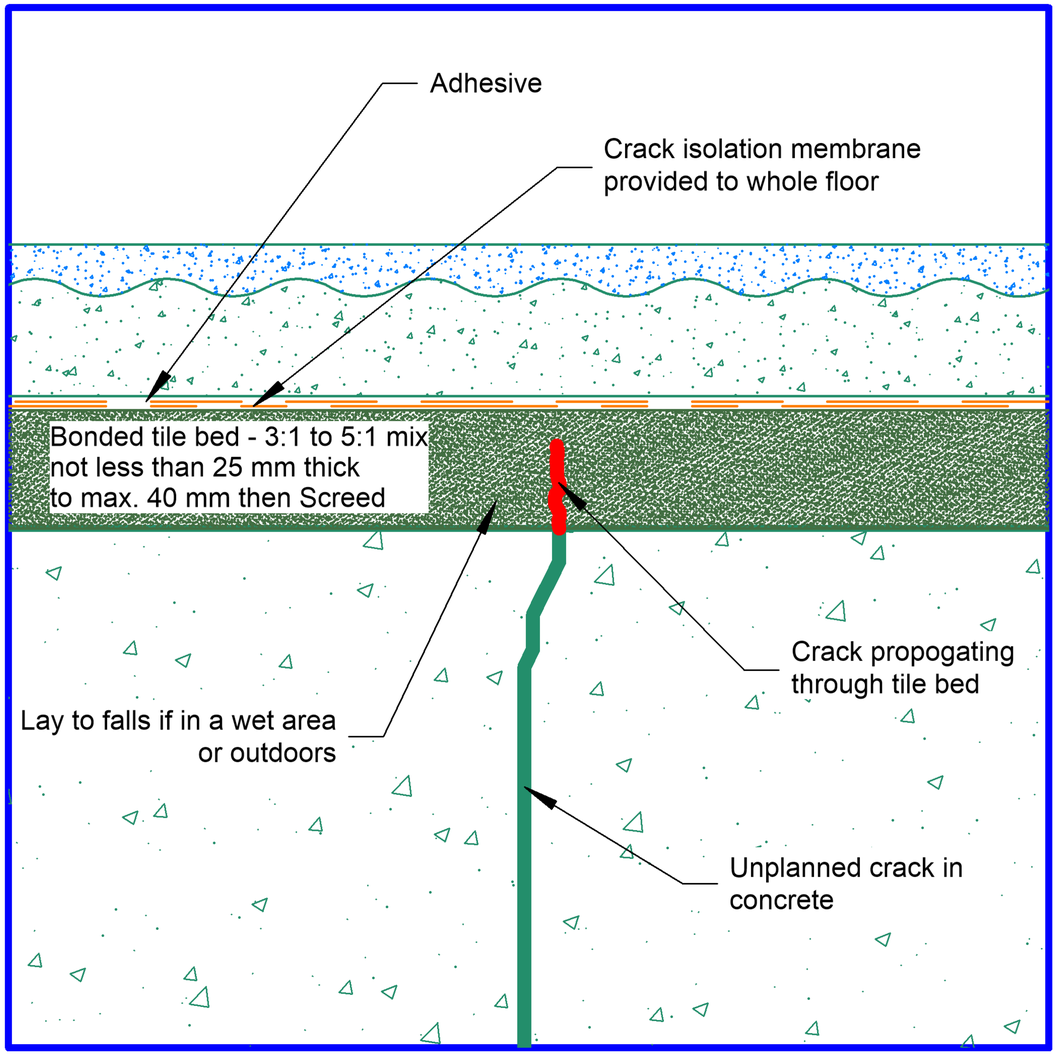
MULTIPLEX
Built to outperform.

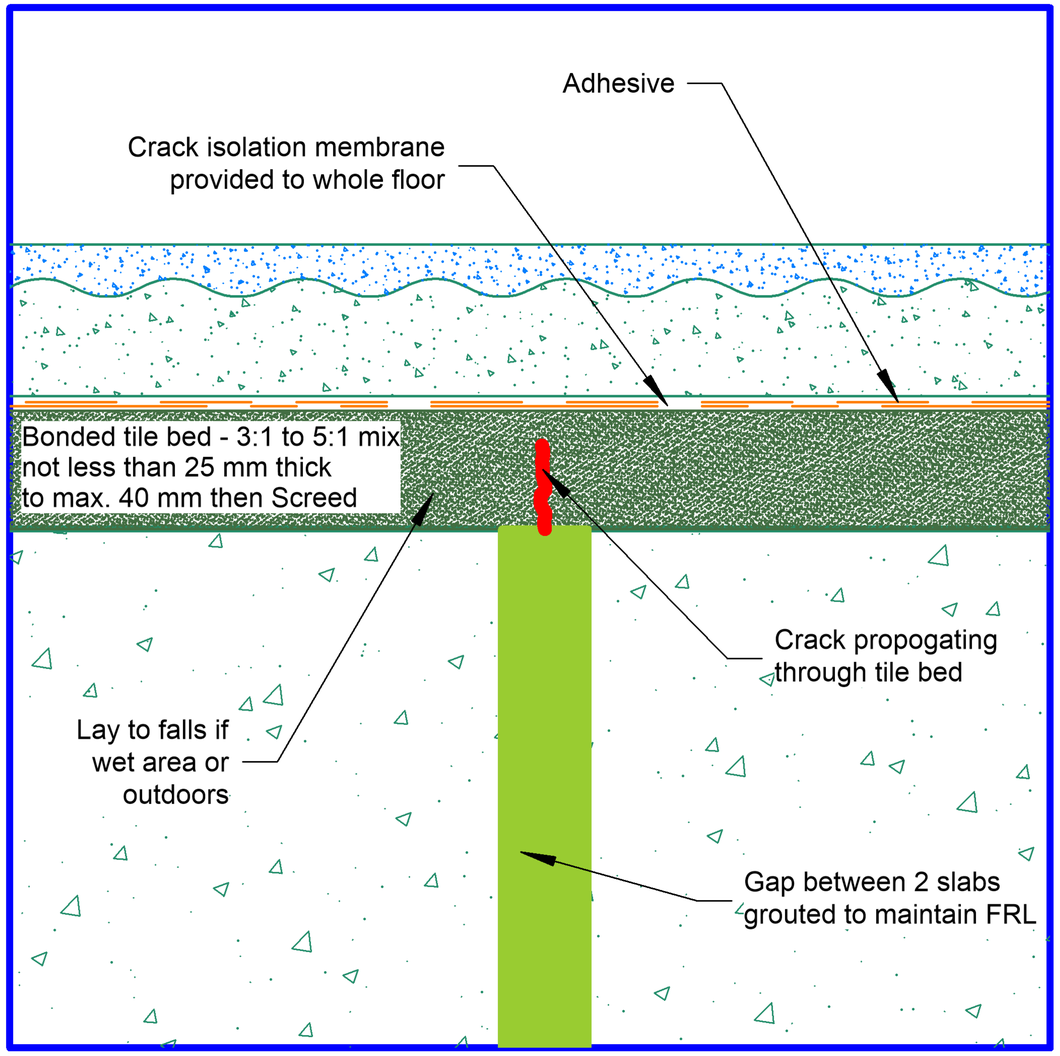
project	title	date	drawing no.	issue
Multiplex Standard Details - Hard Floor Finishes	Terrazzo Details - Joints, Type E	February 2020	3015	A



MULTIPLEX
Built to outperform.

project	title	date	drawing no.	issue
Multiplex Standard Details - Hard Floor Finishes	Terrazzo Details - Joints, Type B Light Duty	February 2020	3016	A





ECB Classic Anti-Fracture Membrane System
DURABASE CI++
ARDEX UI 740 FLEXBONE Uncoupling Membrane

MULTIPLEX
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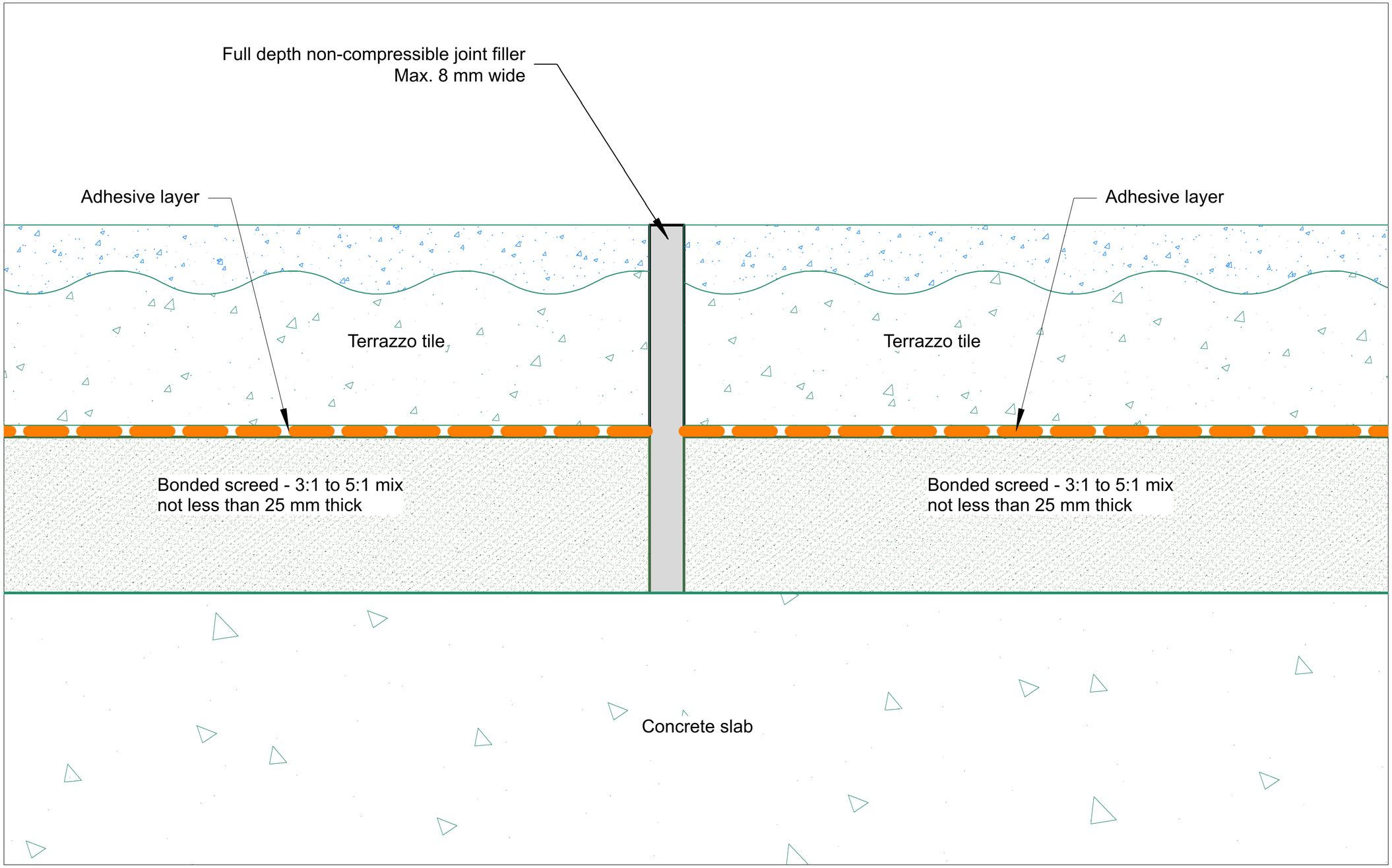
project	title	date	drawing no.	issue
Multiplex Standard Details - Hard Floor Finishes	Terrazzo Details - Joints, Cracked Concrete and Temporary Movement Joints (TMJ)	February 2020	3017	A



MULTIPLEX
Built to outperform.

project	title	date	drawing no.	issue
Multiplex Standard Details - Hard Floor Finishes	Terrazzo Details - Joints, Type F Contraction Joint	February 2020	3018	A