FREEFORM™
ARCHITECTURAL PREMIXES

FREEFORM TILE ADHESIVES SELECTION AND SPECIFICATION GUIDE

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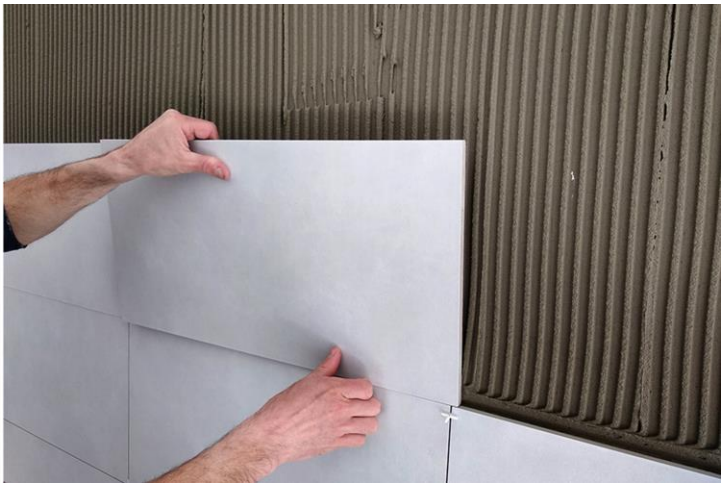


RANGE OF TILE AND STONE ADHESIVES FROM FREEFORM

FF DURAFIX BASIC
IS: Type 1 | EN: C1

FF DURAFIX PRO
IS: Type 1 | EN: C1

FF DURAFIX SURE
IS: Type 3 | EN: C2TE

FF DURAFIX FLEX
IS: Type 3 | EN: C2TE S1

FF DURAFIX RAPID

IS: Type 3 | EN: C2FT

FF DURAFIX ULTIMATE

IS: Type 4 | EN: C2TE S2

FF DURAFIX SURE + FF LATEX UNI (2K)
IS: Type 4 | EN: C2TE S2

FF DURAFIX RAPID + FF LATEX UNI (2K)
IS: Type 4 | EN: C2FT S2

FF DURAFIX D2
EN: D2TE

WHY ARE TILE ADHESIVES IMPORTANT?

The performance or the failure of the used tile often depends on the characteristics and selection of the tile adhesives and techniques, more than on the characteristics of the tile itself.

WHY TODAY?

Newer age materials make increasing demands on adhesives and these cannot be appropriately/suitably installed with conventional materials or methods. Similarly, certain substrates and conditions make particularly challenging requirements. Further, economic factors outlined above make it imperative to specify, select and properly use the correct tile adhesive materials.

Materials

- The increasingly larger sized tiles
- Tiles with reduced adhesion characteristics
- Tiles with high deformability (flexibility or bending capability)

Substrates and conditions

- Tile on tile
- Glass, metal, wood, boards
- Heating requirements
- Vibration in buildings
- Thermal stresses
- Flexible base

Economics

- Expensive tiling materials
- Critical projects
- High liability costs of failures
- Reputation of the specifiers and contractors associated with the job
- Thin bed setting requirements to save costs

FreeForm assures you of a technical edge and peace of mind necessary for critical installations by undertaking extensive in-house testing of materials.

Recent new standards **IS 15477:2019 and EN 12004-1,2 :2017** form the basis of this document, which is hoped, will be a useful selector and specification tool for use of tile adhesives.

CLASSIFICATION BASED ON INTERNATIONAL STANDARDS EN 12004:2017 AND ISO 13007-1

One often sees tile adhesive packs with marking of initials such as C1, C2, C2 TE, D1, R2, Type 2 etc. These are classifications of the tile adhesives according to respective international standards. Below are explained the meanings of some of the classifications.

BASED ON CHEMICAL NATURE

C- Cement based Tile adhesives

D- Dispersion based tile adhesives

R-Reactive resin based tile adhesives

BASED ON PERFORMANCE LEVEL

1- Normal

2- Improved

SPECIAL CHARACTERISTICS

F- Fast Setting

T- Slip Resistant

E- Extended Open Time

S1- Deformable

S2 - Highly Deformable

COMPARISON OF CEMENT, DISPERSION AND RESIN BASED ADHESIVES

	Parameter	Cement-based	Dispersion-based	Resin-based (Epoxy/Polyurethane)
1	**Application Range**	Indoor, Outdoor Floor, Wall	Indoor Wall	Indoor, Outdoor Floor, Wall
2	**Mixing**	Good	Ready to use	2K, exact mixing procedure necessary
3	**Non-sag**	Very good	Good	Middle
4	**Curing Time**	Middle	Slow	PU fast, Epoxy slow
5	**Washing Profile**	Very good	Good	Bad
6	**Adhesion**	Good	Good	Excellent
7	**Chemical Resistance**	Low	Low	High
8	**Temperature Resistance**	Middle	Low	Low
9	**Toxicity**	Alkalinity	Low	Skin sensitizers
10	**Price**	Low	Middle	High

CHARACTERISTICS AND REQUIREMENTS BASED ON INTERNATIONAL STANDARDS EN 12004:2017 AND ISO 13007-1

	Classification	Meaning	Characteristics	Requirements
1	**C1**	Normal adhesion	Tensile strength @ 28 days - 4 types(Open time @ 20 minutes)	≥ 0.5 N/mm^2
2	**C2**	Improved adhesion	High tensile strength @ 28 days - 4 types (Open time @ 20 minutes)	≥ 1.0 N/mm^2
3	**F**	Fast Setting	Early initial tensile strength @ 6 hours	≥ 0.5 N/mm^2
4	**T**	Slip Resistant (Non-sag)	Downward movement of a tile on a vertical surface	≤ 0.5 mm
5	**S1**	Deformable/ Flexible	Capacity of a hardened adhesive to be deformed	< 5 mm ≥ 2.5 mm
6	**S2**	Highly Deformable/Flexible	Capacity of a hardened adhesive to be deformed	≥ 5 mm
7	**E**	Extended open time	Extended open time @ 30 minutes with the tensile adhesion strength	≥ 0.5 N/mm^2
8	**2K (Non-EN)**	2 Component- Cement based powder mortar + Liquid Latex	The addition of latex liquid instead of water prevents possible back staining on tiles. They also reduce the effect of chemical reactions, improve adhesion and flexibility to withstand expansion due to stress and differential movement	
9	**D1, D2**	Dispersion based Tile adhesives	Easy to use, ready adhesive pastes. These are tested for Shear adhesion.	
10	**R1, R2**	Reactive Resin based tile adhesives	Adhesives with highest boding strength- usually available as two component PU or Epoxy based adhesives.	

Adhesives classified as per EN 12004 and ISO 13007 are tested for Tensile adhesion for strength in regular test conditions (initial tensile adhesion) and special test conditions (tensile adhesion after water immersion, heat ageing and freeze thaw). Adhesives cannot be considered meeting the requirements of the standard unless they satisfy the requirements of each of these test requirements.

Please note adhesives are not tested for freeze thaw requirements by us.

TIPS FOR SELECTION OF ADHESIVE CHARACTERISTICS AS PER CLASSIFICATION

	Reason	Classification
1	Basic small cement or ceramic tile	**C1**
2	Larger tiles need better adhesives	**C2**
3	Less absorbent tiles need better adhesives	**C2**
4	Areas likely to be exposed to heat have higher requirement from the adhesives (C2 grade adhesives are tested for adhesion under heat ageing conditions)	**C2**
5	Areas likely to be submerged in water have higher requirement (C2 grade adhesives are tested for adhesion under water immersion conditions)	**C2**
6	Large tiles/Stones subject to deformation have special requirements from Tile adhesives	**C2 + S1/S2**
7	Areas requiring quick return to service have higher requirements	**F**
8	Highly absorbent, or white colour or translucent tiles/stones, which are prone to staining have special requirements, and only white colour adhesives should be used. Materials prone to staining should use Rapid drying adhesives(F)	**F + 2K**
9	Wall tiles have higher requirements than floor tiles- (unless floor is subjected to traffic)- Anti Sag(T)	**T**
10	Deformable substrates that may be subject to movement and vibration e.g. drywall, chip-board, etc. have requirements from adhesives. Large format tile with deformable/flexible character.	**S2/2K**
11	Underfloor or undertile heating needs highly deformable adhesives. Large format tile with deformable/flexible character.	**S2**
12	External application has higher requirement of the adhesives- (Fast drying or hot ambient conditions require extended open time characteristics- E)	**E**
13	Ready to use tile adhesives for interior wall applications- dry areas only. Easy and convenient to use.	**D1**
14	Ready to use tile adhesives for interior wall applications-for areas subject to intermittent wetting and drying Kitchen and bathrooms). Easy and convenient to use.	**D2**
15	Reactive resin based adhesive either on Epoxy or Polyurethane base- for special applications	**R1/R2**

FREEFORM TILE ADHESIVE SELECTION GUIDE

	Type of Tile/Stone	Location	Type of Substrate	Suggested Adhesive Classification in Compliance with ISO 13007-1 EN 12004/12002	Not suitable for
1	Cement, Regular Ceramic tiles in sizes up to 300*300	Wall & Floor (Internal)	Concrete/Cement Render/Screed	**Durafix Basic (C1)**	Deformable substrates that may be subject to movement and vibration eg. drywall, chip-board, etc.
2	Homogeneous (full body) tile/Vitrified Tiles/ Ceramic tile with low water absorption up to 600*600 mm	Wall & Floor (Internal)	Concrete/Cement Render/Screed	**DuraFix Pro** for interiors and dry area. (Meets requirement of **C2** except under water immersion)	
3	Natural Marble & Granite up to 600*600 mm				
4	Glass and Ceramic Mosaic Tiles	Wall & Floor (Internal/External)	Concrete/Cement Render/Screed	**DuraFix Sure (C2TE) for exteriors or wet area.** With slip resistance and Extended open time	
5	Tiles for Swimming pools				
6	Glass mosaics in swimming pool				
7	Large Format Tiles with any side over 600mm (non-moisture sensitive)	Wall & Floor (Internal/External)	Concrete/Cement Render/Screed	**DuraFix Flex (C2TE S1)** Slip resistant, extended open time and Deformable	
8	Homogeneous (full body) tile/Vitrified Tiles/ Ceramic tile with low water absorption up to 600*600 mm- requiring quick return to service	Wall & Floor (Internal/External)	Concrete/Cement Render/Screed	**DuraFix Rapid (C2FT)** Rapid hardening and drying	
9	Natural/Agglomerated Stones with size 600x600 mm or more	Wall & Floor (Internal/External)	Deformable substrates such as drywall, board and plywood	**DuraFix Ultimate (C2TE S2)** Slip resistant, extended open time and highly Deformable	Metallic or PVC or linoleum surface
10	Large format Tile/ Stones with high water absorption- Possibility of staining	Wall & Floor (Internal/External)	Concrete/Cement Render/Screed	**DuraFix Sure+ FF Latex Uni (2K) (C2TE S2)** With slip resistance and Extended open time	
11	Ceramic / Homogeneous/Mosaic, Natural/Agglomerated Stones with size 600x600 mm or more- Early strength gain to avoid presence of superficial spotting or efflorescence.	Wall & Floor (Internal)	Concrete/Cement Render/Screed, Deformable substrates such as drywall, board and plywood	**DuraFix Rapid + FF Latex Uni (2K) (C2FT S2)** Fast setting, Slip resistant, extended open time and Deformable	
12	Small tiles (<600mm side) for easy and clean application in internal dry and wet areas	Wall (Internal)	Concrete/Cement Render/Screed	**DuraFix D2 (D2TE)** Ready to use, easy to use	Deformable substrates

Use white colour adhesives for white stones and tiles to prevent staining.

2K adhesives are recommended for natural stones which are prone to moisture ingress and back staining. These also reduce the effect of chemical reactions, improve adhesion and flexibility to withstand expansion due to stress and differential movement.

CLASSIFICATION BASED ON INDIAN STANDARD IS 15477:2019

	Type 1	Type 2	Type 3	Type 4	Type 5
Suitable for Tile Type	Tiles with apparent porosity > 3%.	Tiles with an apparent porosity ≤ 3%.	All types of tiles and stones except metal tiles or engineered stones	All types of tiles and stones except metal tiles or engineered stones	For all types of tiles including Engineered stones (manufactured stones)
Tile Examples	Most of the clay and ceramic (non-vitrified) tiles of small dimension (size not more than 300 mm x 300 mm)	Vitrified/fully vitrified tiles, glass mosaic tiles, all stones, dense and large dimension (More than 300 mm × 300 mm size) tiles and stones (slabs).	Tiles and stone tiles like ceramic, clay tiles, basalt tiles, vitrified, glass mosaic tiles and porcelain tiles and all natural stone tiles.	Tiles and stone tiles like ceramic, clay tiles, basalt tiles, vitrified, glass mosaic tiles and porcelain tiles and all natural stone tiles up to 600mm *600mm size. For all tiles/stones of size more than 600 mm × 600 mm, the adhesive shall also comply with 'S1' category of transverse deformation. For all tiles/stones of size more than 1 200 mm × 1 200 mm, the adhesive shall also comply with 'S2' category of transverse deformation.	Metal tiles, glass tiles, engineered stones or for all types of tiles and stones
Suitable for Substrate Type	Cement based backgrounds like cement plaster, cement concrete, cement screed.	Cement based backgrounds like cement plaster, cement concrete, cement screed.	Cement based backgrounds like cement plaster, cement concrete, cement screed.	All substrates as per Type 3 and for **installation on dry wall board substrates like gypsum boards, plywood, wood, calcium silicate boards, medium density fiber boards, fiber cement boards, cement boards, bison panel, etc. *** **	All substrates as per Type 4 3 and for **metallic substrates etc.**
Location	Interior	Interior walls and floor and exterior floors	Interior walls and floor and exterior walls and floors	Interior walls and floor and exterior walls and floors and Dry Walls	Floor/Wall
Wet/Dry Area	Dry	Wet and Dry	Wet and Dry	Wet and Dry	Wet and Dry

REQUIREMENTS BASED ON INDIAN STANDARD IS 15477:2019

	Type 1	Type 2	Type 3	Type 4	Type 5
Tensile adhesion(minimum) N/mm2					
Dry condition	0.5	1	1.5	1.5	2
Wet Condition	NA	1	1	1	NA
Shear adhesion (minimum)					
Dry condition after 14 days	1	1.25	1.5	1.5	6
Adhesion after heat ageing	NA	1	1	1	3
Humid condition	NA	1	1	1	NA

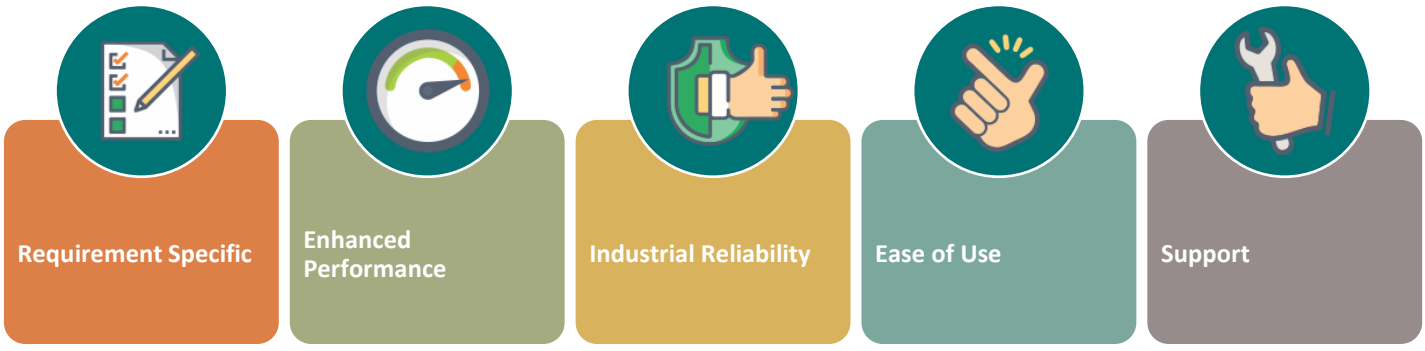
*** In Type 4 adhesive, for all tiles/stones of size more than 600 mm × 600 mm, the adhesive shall also comply with 'S1' category of transverse deformation. For all tiles/stones of size more than 1 200 mm × 1 200 mm, the adhesive shall also comply with 'S2' category of transverse deformation.

Deformable adhesive S1 type - Deformation > 2.5 mm, < 5.0 mm
Deformable adhesive S2 type- Deformation > 5.0 mm

COMPARISION BETWEEN FREEFORM AND COMPETITORS' TILE ADHESIVES

	FreeForm CTAs	Other branded suppliers	Ordinary competitors
Site specific solutions	Site specific, appropriate solutions available for all types of surfaces, materials and conditions.	Mostly yes	Not available
Range of products	Wide range of key products and supporting solutions like screeds, primers, etc.	Wide Range	Not available
Testing extent	Wide range of type testing and regular production testing as per all key features of latest international and Indian standards done regularly	Usually only one standard followed- and in some cases, outdated standards being referred to.	Often no testing being done
Testing Report	Factory test report certificates available with every truck load with perfect traceability	May or may not be available	Not available
Documentation	Declaration of product classes and laboratory parameters available on website.	Formal documentation available	Not available
Guidance and Technical Support	Available	Available	Not available

WHY TILE AND STONE ADHESIVES FROM FREEFORM?



EXTENSIVE TESTING AND DEVELOPMENT ACTIVITIES AT FREEFORM LAB

Preparation for Tensile Adhesion Strength

Preparation for Testing Shear Strength

Samples Under Standard Test Conditions

Testing of Deformability Characteristics

Testing Tensile Adhesion

Testing Shear Adhesion

TILE FIXING INSTRUCTIONS (SOME RECOMMENDATIONS)

- Carry out the work in temperatures between 5 Deg C and 35Deg C only. Avoid conditions of direct sunlight, high wind, or rain.
- Allow adequate lighting which will allow adequate inspections of the ongoing work.
- Avoid use of any defective tile/material. Report and remove.
- Mix the tiles before laying to make less visible the negative effects of any variations.
- Ensure proper substrate as prescribed. Do not try to cover undulations in substrate with excess use of adhesives.
- The tile laying operations must be completed while respecting the workable life/pot life/open time of the adhesives.
- Press tiles firmly into adhesive before it skins.
- Apply only up to 1m2 at a time to avoid skinning, if skinned, re-spread to expose 'wet' adhesive.
- Discard any material that has hardened before use.
- Use appropriate tools like Handheld mortar mixer, Notched Trowels, Lines and levels, spacers, levelling clips and wedges etc.
- Apply to the prepared substrate using a notched trowel.
    - 6mm notch for tiles up to 150x150mm.
    - 10mm notch for up to 250x250mm
    - 12mm notch for 300x300mm tiles.
- Tiles 400x400mm and larger should be back buttered in addition to using a 12mm notched trowel.
- In case of tiles with a reverse profile characterized by highly pronounced ridges, it is generally advised to fill with adhesive all the cavities caused by the ridges, before the application of the tiles.
- For tiles larger than 30cm on any side, double spread technique (back buttering of the tile with the adhesive too) is employed for best results.
- The tile joint filling activity must be carried out usually not before 24 hours of laying the tiles. The joint material must be at least 2/3rd deep of the thickness of the tile.
- The tile should be cleaned simultaneously during the laying and the joint filling processes.
- It is advisable to check the colour of the joint filling material by doing a small mockup and getting approval- before proceeding to joint fill the entire floor.
- After the tile laying and jointing process, the floor must be adequately protected from the work of the other tradespeople.

LARGER FORMAT TILE FIXING SPECIAL INSTRUCTIONS

- Variation in the floor substrate should be less than 3mm per 3000mm when checked with a straight edge. Prefer to use S2 grade (deformable more 5 mm when tested as per EN 12004:2017) of tile adhesive for tiles with any dimension over 600mm.
- Back buttering of tiles is important.
- Prefer to use spacers- The size of the joints should be minimum 3 times the size of the size variation. So, if the size variation between the tiles is 2 mm, minimum joint width should be 6 mm.
- When installing the tile, ensure a minimum 80% coverage of the adhesive on the tile in case of tiles for interiors. In case of large format tiles, and in exteriors, ensure coverage of adhesive on the tile more than 95%
- Use appropriate trowel size (large- may be 12-18 mm or large in case of large format tiles) to ensure the above coverage.
- Periodically keep checking the coverage by removing a recently fixed tile to check the coverage on the back.
- When laying the adhesive, first key in some adhesive into the substrate using the flat side of the trowel. Then add additional adhesive to the surface and comb the same using the notched side of the trowel, to ensure enough quantity of the adhesive on the surface.
- The adhesive mortar lines should be straight and parallel to the short side of the tile. This will allow entrapped air to escape once the tiles are laid.