TECHNICAL EVALUATION REPORT

LODHA
BUILDING A BETTER LIFE

PROJECT:	LODHA PROJECTS	Report Date:	16 September 2020
Report Compiled by:	Vipul Pandya- GM-QA	Report No.:	GEN-TER--002

Subject: Report on Technical Evaluation of Conventional Tile Dedo work with cement Paste and with Tile Adhesive.

REPORT	No. of Pages: 10

1. Objective:

The subject report has been complied to evaluate merits/demerits both Tile dedo Application system, Distinctive advantages, limitations, challenges and above all impact on final Product Quality for Lodha Projects.

2. General Information:

Challenges of hollow sound and tile cracking, de-bonding and compromised aesthetics observed using conventional cement past application for tile dedo. An initiation is taken to study reasons for the same and compare conventional verses tile adhesive application system.

3A. Evaluation of Current Practice and Problem statement:

Current Practice –

1. AAC blocks being used for Partition wall of toilet and kitchen
2. block work construction with pre-packed jointing mortar
3. No curing normally to block work
4. Tile application on vertical with cement paste on dry/min. soaked wall.
5. Paste application not uniform which left some porosity/air bubbles behind tiles provides hollow sound.
6. AAC blocks has moisture retention capacity of about 30% and absorb water from paste
7. Cement sets faster and shrinks, no curing of tile normally
8. Adhesion of cement paste to substrate and non-absorbent vitrified tiles get reduced during course of time.
9. Door frame fixing with anchors and door installation on already tile fixed wall result in further reduction in bond due to jerk.
10. Due to above, tiles get de-bonded once mechanical adhesion reduced to a point.

Options to avoid this issues are:

1. Select solid block wall instead of AAC block. This has less water absorption, better strength, absorb jerks and socks and better bonding of cement paste. But, solid block increases dead weight on structure result in more reinforcement and cost.
2. Selection of Polymerized pre-blend Tile Adhesive for tile installation

With modern Technology today have superior options to get optimum quality output. Tile installation with Appropriate tile adhesive for any substrate and any type of tiles and stones without any issue.

Adoption of tile adhesive for tile installation may be restricted/not considered due to higher cost, However, Usage of Tile adhesive are superior option with excellent quality product at Par cost if not less.

Refer detailed analysis in present report

Cost Analysis:

Area - Vertical Wall		
For 100 sq. ft.		
Description	**Conventional System**	**Tile Adhesive Application System**
Base Material	Cement	Tile Adhesive
Packing	50 kg	25 kg
Application thickness (Average)	15 mm	6 mm
Consumption for 100 sq. ft. area	150 kg	80 kg
Cost per kg	Rs.6	Rs.11
Actual cost for 100 sq. ft.	Rs.900	Rs.880
Cost/Sq. ft	Rs.9.00	Rs.8.80

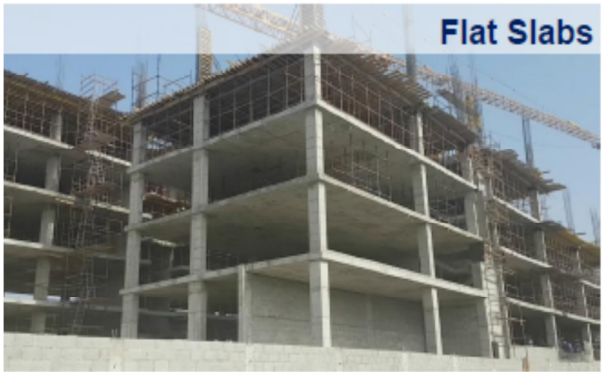
3B. Highlights of Study/Feedback:

The following points noted / feedback received from various sites regarding usage of conventional systems:

1. Challenging substrates – Earlier Tiles/stone were installed only on cement plaster, whereas today on diverse substrate like AAC Block wall, smooth finish non-structure concrete wall, drywall boards and metal.









2. Hollow sound and tile cracking – Thick Cement paste of 10-20mm applied for tile installation does not have uniform distribution result in cavity and hollowness. For floor bedding excessive water in bed results slow cure and shrinkage. When the water evaporates from the system and cement bed shrinks and settles down. Further cement has limited bonding and may causes poor adhesion with vitrified tiles. Cracks in tile develop due to no place for movement when the tiles are in settling process.





3. Tile de-bonding - Cement is a good binder, but if your tile is a first class vitrified tile which has very low water absorption, de-bonding is Likely to happen. Differential curing rates of mortar bed and thick bed leading to buckling in case of Floor bedding. When de-bonding occurs tiles not only pop up but also crack under very normal loads like people's movement on floor.









4. Compromised Aesthetics - Bed room wall adjoining the bathroom loses its paint and becomes ugly with peeled off paint as water penetrates from cavity of conventional system.



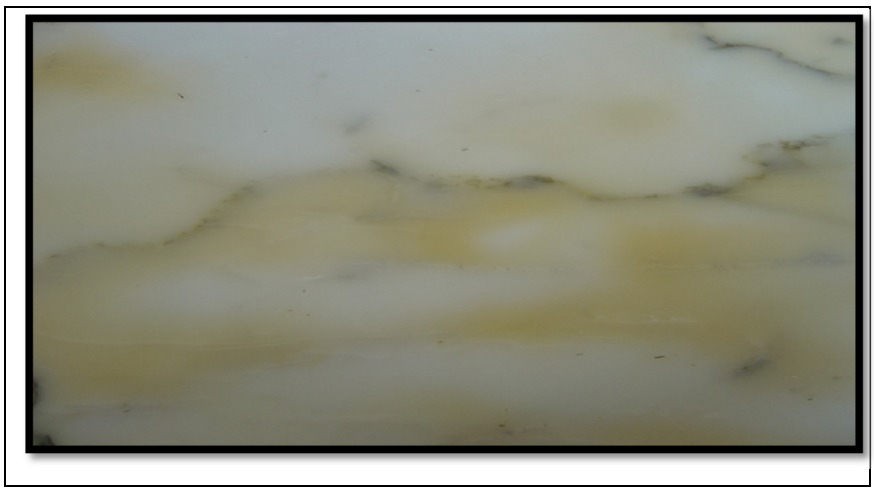

5. Poor Mechanical Adhesion – With very Low water absorption of tiles installed with conventional cement paste/cement mortar bed which dries very fast and then causes the difficulty to adjust the tiles after being laid. This leads to aesthetic problem of the line of tiles and also poor bonding strength, which will be the main cause of de-bonded Tiles later.




6. Chipping off - Problems start with tiles pressing against each other, corners chipping off as end result



7. Stains on Precious stone/Marble – Traditional cement slurry may results in staining and patching of precious porous nature stone



4 Performance Properties comparison:

TEST	OBSERVATION		
Substrate and Tile Saturation	Mandatory		Not Required
Pot life of Mix	5-7 mins		30 mins
Open Time	2-3 min		15 mins
PERFORMANCE PROPERTIES	**CEMENT**		**Prepacked Tile Adhesive**
1. Tensile Adhesion strength, (N)			
a) Dry conditions	167 N, 139 N		1270 N
b) Wet conditions	22 N		1120 N
2. Shear adhesion strength, (KN)			
a) Dry conditions, 24 hours	1.98 N	8X	4.04 KN
b) Dry conditions, 14 days	5.2 KN		10.7 KN
c) Heat aging conditions	0.2 KN		8.2 KN
d) Wet conditions	7.4 KN		8.5 KN

5 Limitations of the Conventional System:



INCONVENIENCE TO WORK WITH

- Sourcing of huge quantity of cement
- Tiles and substrate to be saturated a day before tiling



TIME CONSUMING & LABOUR INTENSIVE

- To lay tiles with sand-cement traditional way is to apply the mixture of sand-cement in lump on tiles' back so it has to be done with one tile at a time.



LOW DURABILITY

- Low adjustability to tiles as cement has very low pot life
- Poor bonding strength leads to debonding of tiles hence damaging the aesthetics



HIGH WASTAGE

- Low pot life leads to material wastage since the mix dries faster than the application

6. Issues with Conventional System:

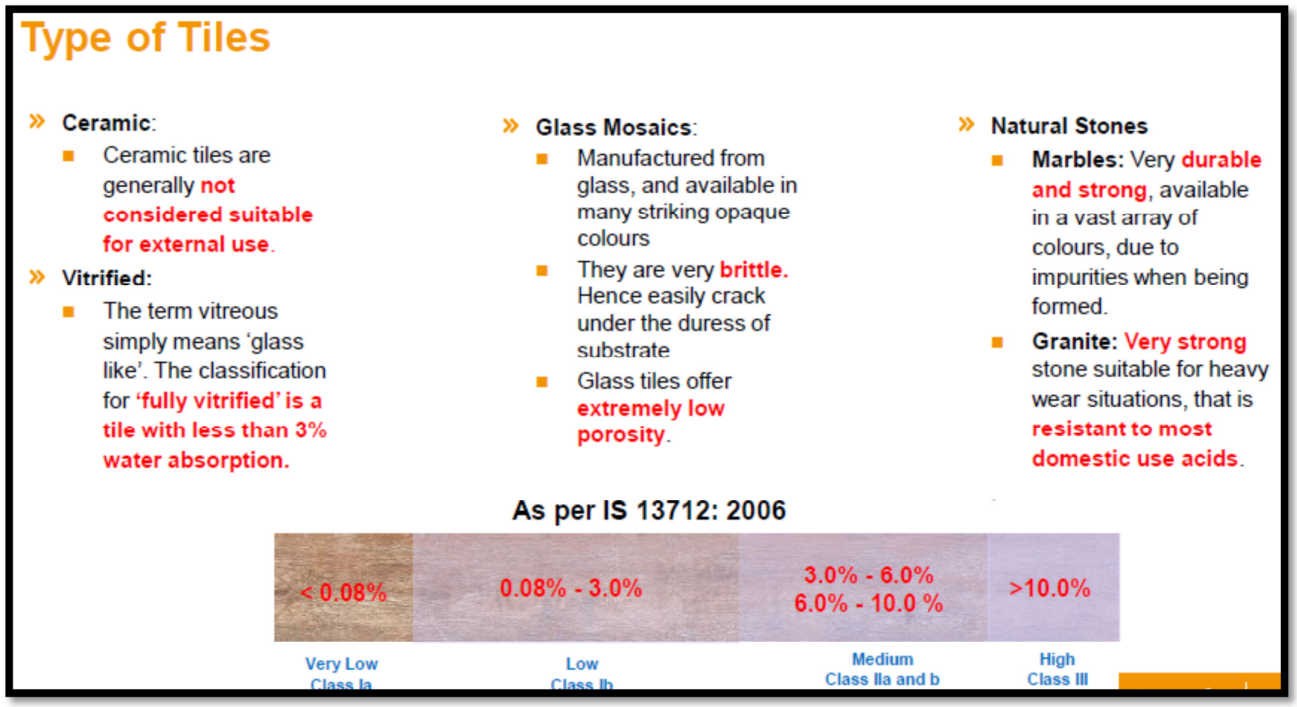
Challenging substrates	**Poor Sand Quality & Shortage**
Hollow sound & tile cracking	**Paint Peel Off**
Excess Water in the bed	**Chipping off**
Stains on precious stones/marbles	**Stains on precious stones/marbles**
Tile De-bonding	**Inconsistent mixing**
Poor Adhesion	**Labour intensive**

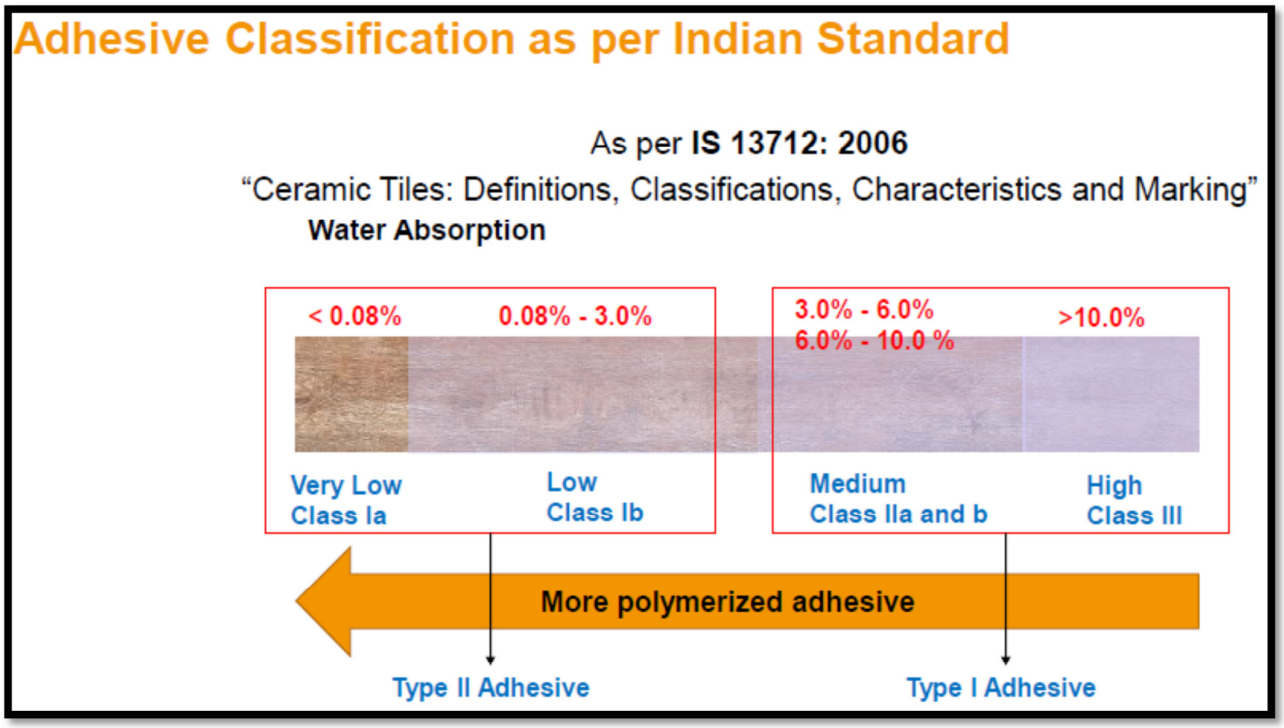
7. Comparison of Traditional Vs. Tile Adhesive System:

Sr. No.	Evaluation points	Traditional System	Tile Adhesive System
			
1	Installation Method (Thickness)	Thick bed Installation Method (Less Carpet Area)	Thin Bed Installation Method with Notch Trowel (More Carpet Area)
2	System Characteristics	Rigid - Brittle - Tile de-bonds	More Flexible - No De-bonding
3	Bond Strength	Low (0.4 -0.6 N/mm2)	Excellent (1.5 to 4.0 N/mm2)
4	Compressive strength	Low	High
5	Mixing and Uniformity	Cement/Sand/Water Mixed at site Manually.	Pre-blended Cemenitious Polymerzed Adhesives required gauging water. Better Consistency
6	Workability and Open Time and Pot life	Low workability and less open Time and Short pot life	Better workability and extended open time and Long pot life
7	Adhesion to substrate	Comperatively Low (Chances of de-bonding and Hollow sound)	Excellent and Uniform Adhesion
8	Suitability	Limited - Preferable for Ceramic (porous) tiles and cementous substrate	Suitable for All (cementious/metal/ Wood/drywall) substrate and all types of Tiles and stones
9	Anti slip (T) and deformability (S)	Low	Better
10	Adjustment Time - Max. time after which tiles can be adjusted without loss of Adhesion	Very low	Better
11	Curing	Required	Not Required
12	Cost Impact	Cost may be low but negative points are more due to limitations of application system	Offer superior quality with zero issues at marginally high cost if not par.
13	Productivity	Low to Moderate	Ease of Application, cleaning, minimal wastage with high productivity
14	Durability and service life	Limited without issues	Increased durability and uniformity

8. Selection of Correct Tile Adhesive (AS per IS 15477-2019):

Based on type of tiles and performance requirement, appropriate quality of tile adhesive to be selected to get optimum performance.



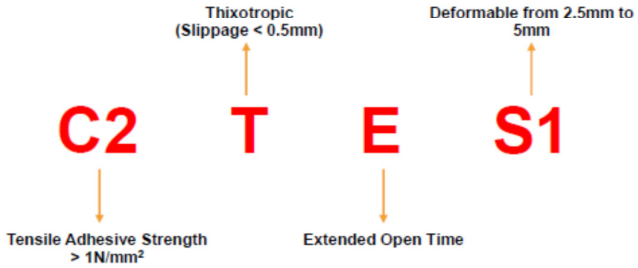


Classification of Adhesives

As per European Standard EN 12004

Adhesives for tiles - requirements, evaluation of conformity, classification and designation regarding ceramic tile adhesives for internal and external tile installations for floors and walls.

- **Types of Adhesives;**
  - Cementitious Adhesives — C
  - Dispersion Adhesives — D
  - Reaction Resin Adhesives — R
- **Classes of Adhesives**
  - Normal Adhesive — 1
  - Improved Adhesive — 2
  - Fast-Setting Adhesive — F
  - Adhesive with Reduced Slip — T
  - Adhesive with Extended Open Time — E
  - Deformable Adhesive — S1
  - Highly Deformable Adhesive — S2



Tensile Adhesion Strength

» C1 – tensile adhesion strength ≥ 0.5 N/mm²

» C2 – tensile adhesion strength ≥ 1.0 N/mm²

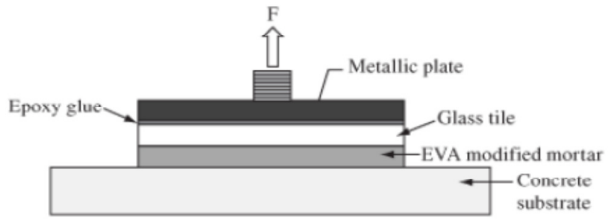
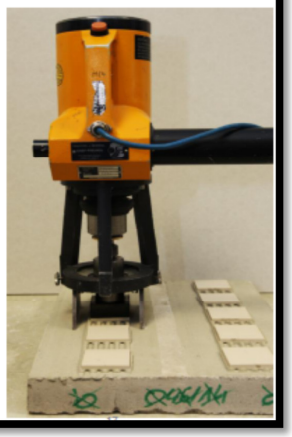


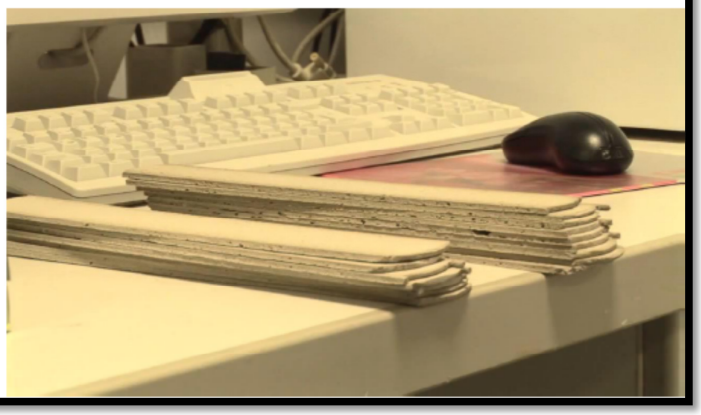
Figure 2. Test method for adhesion in tension for bond strength measurement.

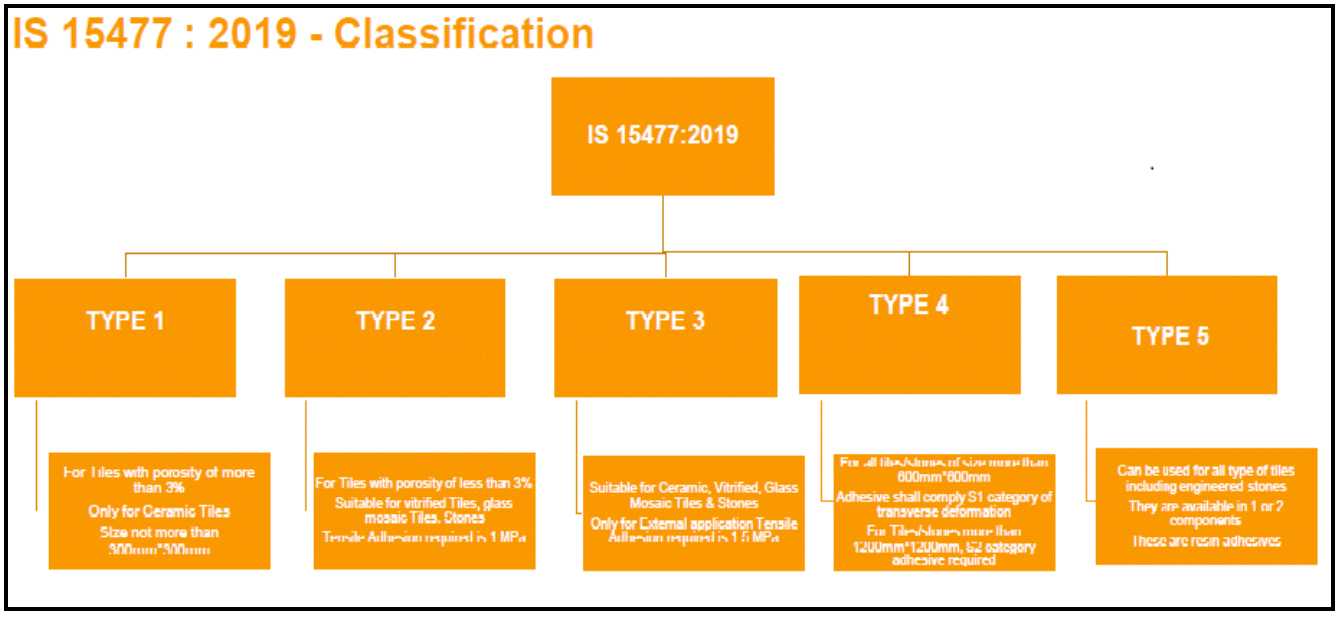


What does S1/S2 signify?

» **S1 : deformable from 2.5mm to 5mm**
- Moisture sensitive Natural stone
- Exterior cladding
- Dry walls, fiber cement board, Gypsum boards

» **S2 : deformable by greater than 5mm**
- High risk cladding
- Tiling on Wood





9. Conclusion:

1. Referring to comparison table and explanation given in this report Tile Adhesive application system is superior system of tile application than conventional cement paste application.
2. Offers solutions to issues arise due to limitations of conventional system.
3. Superior and Uniform Product quality with plus durability and productivity at Par cost.
4. Ample product range for all kind of versatile substrate with suitability
5. Better bonding and adhesion which is primary requirement.
6. Complying all specification requirements of IS 15477 – 2019.

In view of above, Tile installation with modern tile adhesive is highly recommended and justified for superior quality and freedom from rework.

NOTE: This report has been compiled referring to the discussions with concerned personnel during the visit and to the understanding of undersigned. Discrepancies if any, shall address in writing within 3 days from issued date of this report.

Report Issued by Name: Vipul Pandya Designation: GM – Quality Assurance	Report Issued on: 18th September 2020