



East Central Railway

Office of the
General Manager (Engg)
Hajipur

PCE's CIRCULAR No-23/2007/WORKS

Sub-VITRIFIED TILES

1. Vitrified tiles are pre polished special type of ceramic tiles having fully homogeneous bodies of clay, which have been fired at high temperatures to impart low water absorption as compared to ceramic tiles. Vitrified tiles being harder are more abrasion resistant than ceramic tiles and therefore ideally suited for flooring. The sizes possible in vitrified tiles are larger than ceramic tiles, which again make them the ideal medium for flooring. These are generally used for floors, walls or facades. As compared to natural stones like marble these tiles retain polish and colour in long run due to its high abrasion resistance. Ceramic tiles have an inherent nature due to which variation in length & width ($\pm 5\%$ internationally acceptable limit) generally occurs. This is off-set by using the 'grouting' technique, wherein a gap of about 5 mm is left between the tiles to cover up such dimensional inaccuracies that may occur in the lot. On the other hand vitrified tiles have a very high dimensional accuracy and so are butt-jointed and laid without 'grouts'. Due to flatter joints less dirt is collected at the joint. At present there is no relevant IS code of practice available for these tiles, however these tiles are being manufactured on the basis of International code. Since it is costly item almost similar in cost of granite, about 2 times costlier than normal ceramic tiles and about 3 times costlier than Kota stone, therefore, vitrified tiles flooring may be used wherever considered desirable keeping in view the financial implications and importance of the location with prior written approval of DRM/CAO (Con).

2. SPECIFICATION FOR VITRIFIED TILES

2.1 Materials

Vitrified tiles are available in wide range of colours and design patterns and are superior to marble and granite on both look and features. Product from reputed manufacturers like SOMANY, ORIENT, ASIAN, KAJARIA etc can only be used.

2.2 Size and Thickness

- (i) The size and thickness of commonly available vitrified tiles are (i) 605mm x 605mm x 10 mm (ii) 925 mm x 925 mm x 12 mm & (iii) 808 mm x 1212 mm x 14 mm
- (ii) Since the cost of vitrified tiles very much depends upon the size, therefore, in general vitrified tiles of size 605 mm x 605 mm shall only be used.
- (iii) Tolerances allowed on size of the Vitrified tiles shall be as under:-

Allowable tolerance in	605mm x 605mm	925 mm x 925 mm	808 mm x 1212 mm
Length & width	(+) / (-) 4 mm	(+) / (-) 6 mm	(+) / (-) 5 mm and (+) / (-) 7 mm
Thickness	(+) / (-) 0.5 mm	(+) / (-) 0.6 mm	(+) / (-) 0.7 mm

2.3 Acceptance Criteria

2.3.1 Before starting the work, the contractor shall get the samples of vitrified tiles approved by the AEN in charge of the work. **The tiles procured from reputed manufacturers shall only be used.** The physical properties of the Vitrified tiles shall conform to the following standard.

Properties	Acceptance Limit	Test Methods
A. Dimensions and Surface Quality		
(i) Deviation in length	(+) / (-) 0.6 %	IS:13630 Part-I
(ii) Deviation in thickness	(+) / (-) 5 %	
(iii) Straightness of sides	(+) / (-) 0.5 %	
(iv) Rectangularity	(+) / (-) 0.6 %	
(v) Surface flatness	(+) / (-) 0.5 %	
(vi) Surface Quality	Minimum 95% of tiles shall be free from visible defects	
B. Physical Properties		
(i) Water absorption	≤ 0.5 % by weight	IS:13630 Part-2
(ii) Modulus of Rupture	Average ≥ 27 N/mm ²	IS:13630 Part-6
(iii) Scratch Resistance (Moh's Scale)	Min 6	IS:13630 Part-13
C. Chemical Properties		
(i) Resistance to household chemicals	No Damage	IS:13630 Part-8
(ii) Resistance to alkalis	No Damage	IS:13630 Part-8

For first 50 No of tiles or less, minimum one sample of the tile to be randomly selected and tested for various properties in accordance with the test methods as detailed above. Further testing is required @ one sample for every additional 200 Nos of tiles or part there of.

2.3.2 While framing special condition and or specification to be included in the tender/contract agreement for such works, a Para with caption " **Sampling, Testing and Acceptance of Materials**" should invariably be included in which reference of relevant IS codes and other standard specifications should be made. All the field Supervisors and Officers associated with execution should also be well conversant with provisions of these codes and specifications and should check/test-check the works following the same.

2.4 Workmanship

2.4.1 Completion of Preliminary Operations: All the inside walls shall be plastered and doorframes and windows to be fixed in position. Before tiling work is started, all points of level for the finished tile surface shall be marked out. Wherever slope in finished floor is required, points of level and outlets shall be correctly marked and outlet opening made before hand.

Where big areas of floor are to be tiled, the level of the central portion of the hall shall be kept about 10mm higher than the level of the floor near the walls. This is required to avoid optical illusion of a depression in the central portion of the tiled hall.

2.4.2 Preparation of surface

(a) **Sub-Base-** In order to ensure stability of the floor structure a sub-base is required to be provided over well-compacted earth filling of plinth for vitrified tile floorings. For building floors, one layer of well burnt bricks over 100mm thick compacted sand layer is to be provided as sub base. In case of floorings of Platform/Concourse/Pathway etc sub base will consists of 75 mm thick stone ballast over one layer of well burnt brick over 100 mm thick compacted sand layer. **The required slope in floor topping to be given at the sub base stage itself.**

(b) **Base Course-** Vitrified tile floorings when laid on ground floor, a base course of lean concrete mix 1:4:8 (Cement, Course Sand, Stone Aggregate 40mm nominal size) is to be provided between flooring and well compacted sub-base. The minimum thickness of Base Course will be 100 mm for floors of buildings/Platform/Concourse etc.

(c) **Cushioning Layer-** In RCC Slab of upper floors in order to provide proper slope in floor topping, a cushioning layer of minimum thickness of 40 mm of concrete mix 1:3:6 (Cement, Course Sand, Stone Aggregate 20 mm nominal size) is to be provided over slab.

2.4.3 Bedding

Bedding for the Vitrified tiles shall be of cement mortar 1:4 (1 Cement: 4 Coarse sand) of average thickness of 20 mm. Minimum thickness at any place shall not be less than 10 mm. In case of existing mosaic or cement concrete floors even 10 mm thickness of bedding mortar is sufficient.

2.4.4 Laying

Base Course/Cushioning layer shall be cleaned, wetted and mopped. Bedding Mortar of the specified mix shall be spread, tamped and corrected to proper levels and allowed to harden sufficiently to offer a fairly rigid cushion for the tiles to be set. Water absorption of the vitrified tiles is quite low and wetting of the back of the tile surface before laying is adequate. Neat cement slurry of honey like consistency shall be spread over the mortar bed over such an area as would accommodate about twenty tiles to cover any hollows and to avoid air pockets in the bedding mortar. The quantity of cement shall be @ 4.4Kg of cement per square meter.

The tiles shall be washed clean and fixed in this grout one after other, each tile being tapped with wooden mallet till it is properly bedded in level with the adjoining tiles. The joint shall be kept in a

straight line, or suit the required pattern. The surface of the flooring during laying should be frequently checked with a straight edge at least 2 m long, so as to obtain a true surface with the desired slope.

Where full tiles or half tiles can not be provided, the tiles should be cut with a cutter from full tiles to the required size. The edges of the cut tiles should be rubbed smooth to ensure a straight and true joint.

The tiles, which are fixed in the floor adjoining the wall, shall enter not less than 12 mm under the plaster, skirting or dado. For this purpose the wall plaster may be left unfinished by about 50 mm above the level of the finished flooring or skirting. The unfinished strip shall be plastered later on neatly and without waviness after the tiles are fixed.

After the tiles have been laid for the day, surplus cement grout may have come out of the joints shall be cleared off.

- 2.4.5 Finishing of Joints:** Allow 24 hours for the bedding mortar to set. During this period no one should walk on the tiles. As vitrified tiles have a very high dimensional accuracy and so are butt-jointed and laid without 'grouts'. However where cut tiles are used or due to any other location wherever it is required to grout the joints, at that locations the joints shall be cleaned off the grey cement grout with a wire brush or trowel to slight depth and all loose mortar removed and cleaned. Joints shall be pointed with grey or white cement mixed with or without pigments to match the shade of the topping of the wearing layer of the tiles.

If any tile is disturbed or damaged, it shall be replaced, properly jointed. The finished floor should not sound hollow when tapped with a wooden mallet.

2.4.5 Curing

The floor shall be kept wet for a minimum of 7 days so that bedding and joints set properly. After curing, surface shall be washed and finished clean. The finished surface shall be suitably protected against any damage by subsequent building activity.

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Copy-

1. CAO/Con/N, CAO/Con/S/MHX for Information PI.
2. DRM/DNR, DHN, MGS, SPJ & SEE for Information PI.
3. Sr.DEN/ (Co-ord)/DNR, DHN, MGS, SPJ & SEE for Information and necessary action.
4. All HOD, Dy HOD/Engg Dept/ECR

(V.KUMAR)
Chief Engineer/Works
Date-29.11.07
3/12

(Dy Chief Engineer/Works)
Dy Chief Engineer/Works
For General Manager (Engg)