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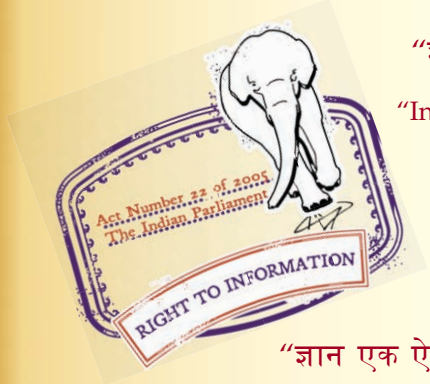

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(Reaffirmed 2006)

Indian Standard

CODE OF PRACTICE FOR LAYING *IN-SITU* TERRAZZO FLOOR FINISH

(First Revision)

Fourth Reprint JANUARY 1999

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NEW DELHI 110002

October 1984

Indian Standard

CODE OF PRACTICE FOR LAYING *IN-SITU* TERRAZZO FLOOR FINISH

(First Revision)

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Indian Standard

CODE OF PRACTICE FOR LAYING *IN-SITU* TERRAZZO FLOOR FINISH

(First Revision)

0. FOREWORD

0.1 This Indian Standard (First Revision) was adopted by the Indian Standards Institution on 31 July 1984, after the draft finalized by the Flooring and Plastering Sectional Committee had been approved by the Civil Engineering Division Council.

0.2 *In-situ* terrazzo is a popular floor finish in residential and public buildings preferred for its decorative and wearing properties and facility for easy cleaning. However, certain essential precautions are called for in laying the floor to avoid crack development and consequent trouble in maintenance. This standard is intended for providing guidance in the selection of materials and in the laying and finishing of terrazzo floor so that a satisfactory performance is obtained for the finish.

0.3 This standard was first published in 1962. The use of Portland pozzolana cement conforming to IS : 1489-1976* has been included in this revision. The combined thickness of the under layer and topping for flooring has also been reduced to 30 mm. Provision of cutting of dividing metallic strips for anchorage purposes has also been deleted.

0.4 The Sectional Committee responsible for the preparation of this standard has taken into consideration the views of producers, consumers and technologists and has related the standard to the manufacturing and trade practices followed in the country in this field. Due weightage has also been given to the need for international co-ordination among standards prevailing in different countries of the world in this field.

0.5 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960†. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

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*Specification for portland-pozzolana cement (*second revision*).

†Rules for rounding off numerical values (*revised*).

1. SCOPE

1.1 This standard covers the laying and finishing of *in-situ* terrazzo floors, skirtings and dadoes.

2. TERMINOLOGY

2.0 For the purpose of this standard, the definitions of terms given in IS : 10403-1983* shall apply.

3. NECESSARY INFORMATION

3.1 For the efficient planning and execution of the work detailed information with regard to the following is necessary:

a) Floor area to be covered;

b) Location and size of openings, if any, to be left out;

c) Details of the base of sub-floor;

d) The type and grades of aggregates to be used and specific requirements, if any, regarding the pattern, colour and appearance of the finished surface; and

e) Treatment at all corners and adjacent floors or walls.

3.2 All the information stated in **3.1** shall be made available by the appropriate authority responsible for the construction of the whole building to those who are entrusted with the work of laying the terrazzo floor before the work is started. Necessary drawings and instructions for preparatory work shall also be given where required.

3.3 Arrangements shall also be made for the proper exchange of information between those engaged in laying the floor finish and all others whose work will effect or will be affected.

4. MATERIALS

4.1 Aggregates — The aggregates used in terrazzo topping shall be marble aggregates size varying from 1 mm to 25 mm. Marble powder used in terrazzo topping shall pass through sieve 300 conforming to IS : 460 (Part I)-1978†. Aggregates for terrazzo underlayer as well as the base concrete shall conform to the requirements of IS : 383-1970‡.

4.2 Cement — Cement used for the floor work shall conform to IS : 269-1976§, IS : 455-1976‖ or IS : 1489-1976¶.

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*Glossary of terms relating to building finishes.

†Specification for test sieves : Part 1 Wire cloth test sieves (*second revision*).

‡Specification for coarse and fine aggregates from natural sources for concrete (*second revision*).

§Specification for ordinary and low heat Portland cement (*third revision*).

‖Specification for Portland slag cement (*third revision*).

¶Specification for Portland-pozzolana cement (*second revision*).

4.3 White Cement — It shall conform to IS : 8042-1978*.

4.4 Pigments — The pigments to be used in terrazzo shall be of permanent colour and shall conform to the requirements mentioned in Table 1.

4.5 Water — Water used for mixing and curing shall conform to the requirements given in 4.3 of IS : 456-1978†.

4.6 Dividing Strips — The material for dividing strips shall be such that it has similar resistance to wear as the flooring. The dividing strips may be aluminium, brass, copper, glass, plastic or similar materials. Aluminium dividing strips when used should have a protective coating of bitumen. The thickness of strip shall not be less than 1·5 mm and width not less than 25 mm for flooring.

5. DESIGN CONSIDERATIONS

5.1 The terrazzo finish normally consists of the topping and an underlayer and is laid over a layer of base concrete or cushioning layer. The arrangement of the various layers for terrazzo finish laid directly over ground shall be as shown in Fig. 1 and when laid on a structural slab, the arrangement shall be as shown in Fig. 2. The sub-base shall be a well consolidated layer of earth or preferably sand. The cushioning layer shall preferably be lime concrete. The base concrete shall be lean cement concrete of mix 1:5:10 or lime concrete.

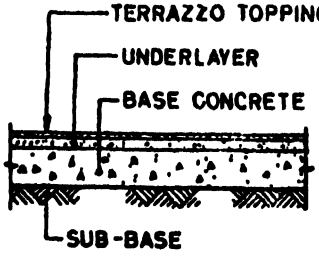

FIG. 1 TERRAZZO FINISH OVER GROUND

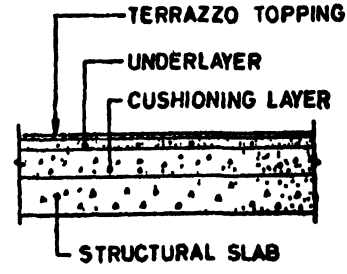

FIG. 2 TERRAZZO FINISH ON STRUCTURAL SLAB

5.2 Thickness — The thickness of base concrete shall be not less than 100 mm and of cushioning layer not less than 75 mm. The combined thickness of the under layer and topping for flooring and dado/skirting shall be not less than 30 and 20 mm respectively. The thickness of terrazzo

*Specification for white Portland cement (*first revision*).
†Code of practice for plain and reinforced concrete (*third revision*).

topping shall be not less than the following depending upon the size of chips used:

Size of Chips	*Minimum Thickness*
mm	mm
1 to 2 2 to 4	6
4 to 7	9
7 to 10	12

5.2.1 Where chips of size larger than 10 mm are used, the minimum thickness of topping shall be not less than one and one-third times the maximum size of the chips.

5.3 Ingredients and Mix Proportions

5.3.1 The under layer shall be of cement concrete of mix 1 : 2 : 4 by volume. The maximum size of aggregate used shall not exceed 10 mm.

5.3.2 The mix for terrazzo topping shall consist of cement with or without pigments, marble powder, marble aggregates, and water. The proportions of cement and marble powder shall be 3 parts of cement and one part of powder by mass. For every part of cement marble powder mix, the proportion of aggregates by volume shall be as follows depending upon the size of aggregates:

Size of Aggregate	*Proportion of Aggregate of Binder Mix*
mm	Parts
1 to 7	One and three-fourth
7 to 15 15 to 25	One and one-half

5.3.3 The aggregates may be of the required colour or may be a mix of aggregates of different colours in the required proportions. The proportions of cement shall be inclusive of any pigments added to cement.

5.3.4 The proportions in which pigments are mixed with cement or white cement to obtain different colours for the binder shall be as specified in Table 1.

5.4 Prevention of Cracks in *In-situ* Terrazzo Floor — While laying the floor the joints in flooring shall always coincide with the expansion joints, if any, in the structural slab so that any movement of the base will be in the joints in the flooring instead of forming uncontrolled cracks.

5.4.1 *Size of Terrazzo Panel* — Differential shrinkage or expansion between terrazzo and the sub-floor may cause cracks in the flooring and floor joints shall be formed so that the positions of such cracks are controlled. The floor, both while laying the under layer and later on the topping, shall be divided into panels not exceeding 2 m^2 so as to reduce the risk of cracking. The joints shall be so located that the longer dimension of any panel does not exceed 2 m. The panel shall preferably be separated by means of dividing strips. However, where butt joints are provided, the bays shall be laid alternately allowing for an interval of at least 24 h between the laying of adjacent bays.

TABLE 1 CEMENT PIGMENT PROPORTIONS FOR VARIOUS COLOURS OF MATRIX IN TERRAZZO WORK

(*Clauses* 4.4 *and* 5.3.4)

(All proportions shall be by mass.)

Colour	Pigment to be Used	Proportion of Pigment	Proportion of Cement	Proportion of White Cement
(1)	(2)	(3)	(4)	(5)
Red	Red oxide of iron (*see* 2 or 3 of IS : 44-1969*)	1	15 to 20	nil
Black	Carbon black (*see* IS : 40-1971†)	1	25 to 40	nil
Bottle Green	Green chromium oxide (*see* IS : 54-1975‡)	1	15 to 30	nil
Pink	Red oxide (*see* 2 or 3 of IS : 44-1969*)	1	nil	100 to 300
Cream	Yellow oxide of iron (*see* 4 of IS : 44-1969*)	1	nil	100 to 400
Yellow	Yellow oxide of iron (*see* 4 of IS : 44-1979*)	1	nil	25 to 75
Light Green	Green chromium oxide (*see* IS : 54-1975‡)	1	nil	50 to 150
French Grey	—	nil	1 to 2	1
Fawn	Yellow oxide of iron (*see* 4 of IS : 44-1969*)	1	6	4

*Specification for iron oxide pigments for paints (*first revision*).
†Specification for carbon black for paints (*first revision*).
‡Specification for green oxide of chromium for paints (*first revision*).

6. PROGRAMMING OF THE WORK IN RELATION TO FLOOR FINISH

6.1 In preparing the time schedule, due attention shall be given to provide sufficient time for:

a) the completion of all preliminary operations such as laying of services, affecting the schedule of commencement and completion of the flooring work, and

b) the hardening of any concrete in the base before laying of the floor finish.

6.2 All the inside walls, ceiling and outside walls shall be plastered and door frames and windows fixed in place. All heavy work in the room shall be completed.

6.3 The base concrete shall be finished to a reasonably true plane surface and to a level which is lower than the level of the finished floor by the depth specified for the thickness of the terrazzo flooring.

6.4 Before the floor finish work is started, all points of level for the finished surface shall be marked out. Whenever slope in finished floors is desired points of level and outlets shall be correctly marked and outlet openings made before hand.

6.5 Wherever it is suspected that dampness or water may find way to be top of the base concrete in the course of usage of floor the base concrete shall be laid in two layers, each not less than 75 mm thick with a layer of waterproof membrane inserted between them. The waterproofing shall be continued to a height of at least 150 mm along the side walls.

7. PREPARATORY WORK

7.1 Handling and Storage of Materials — Clean, dry storage shall be provided at the site for all the materials in accordance with the provisions of the relevant Indian Standards. Cement shall not be stored in the open.

7.2 Mixing of Materials

7.2.1 The mixing of materials is of the greatest importance, for if this is not done thoroughly the work will not have a uniform appearance. If done manually the mixing shall preferably be done in a trough or tub. With a view to avoid variation in colour the complete quantitites of cement and pigment required for one operation shall be mixed at the beginning of work and stored properly.

7.2.2 Where different coloured chips are used they shall first be well mixed in required proportions of various colours and sizes.

7.2.2.1 Coloured cement may be procured as ready mixed material or mixed in site; in the latter case the pigment and cement in the required proportions shall be mixed thoroughly and sieved before further mixing with marble powder and aggregates.

7.2.2.2 The coloured cement shall be mixed thoroughly in dry state with marble powder. The binder so obtained and the mix of chips shall then be mixed dry together (Proportions given in **5.3.2**).

7.2.2.3 While mixing the aggregates, care shall be taken not to get the materials into a heap, as this would result in the coarsest chips falling to the edge of the heap and the cement working to the centre at the bottom. The material shall be kept, as far as possible, in an even layer during mixing.

7.2.3 After the materials have been thoroughly mixed in the dry state water shall be added in small quantities, preferably in a fine spray, while the materials are being mixed until proper consistency is obtained. The mixture shall be plastic but not so wet that it will flow; a rough indication for the addition of proper quantity of water in the mix is that it shall be capable of being moulded when squeezed in hand without water flowing out. A high water cement ratio will produce a mixture with a high dry shrinkage.

7.2.4 Machine mixing may preferably be used but the common type of concrete mixer is not as suitable for terrazzo work as the mixer specially made for this purpose, in which segregation is prevented by blades with a lifting as well as rotating movement. Only constant work justifies the installation of such special machines.

7.2.5 The mix shall be used in the work within half an hour of the addition of water during preparation.

8. SPREADING THE UNDER LAYER

8.1 Dividing strips including the strips required for decorative design shall be fixed on the base to the exact surface level of floor so as to divide the surface of the base into the required arrangement of panels. Anchorage arrangements shall be provided either by fixing 40 mm long cross nails through the strips or by cutting the edges as mentioned in **4.6**.

8.2 Where dividing strips are not used, the screed strips shall be fixed on the base, properly levelled to the correct height to suit the thickness of floor.

8.3 Before spreading the under layer, the base shall be cleaned of all dirt, laitance, or loose material and then well wetted with water without forming any water pools on the surface. It shall then be smeared with cement slurry just before the spreading of under layer.

8.4 After application of cement slurry, the under layer shall be spread and levelled with a screeding board. The slightly rough surface left by the screeding board will form a satisfactory key for the terrazzo.

9. LAYING TERRAZZO TOPPING

9.1 Terrazzo topping shall be laid while the under layer is still plastic but it has hardened sufficiently to prevent cement from rising to the surface; this is normally achieved between 18 to 24 h after the under layer has been laid. A cement slurry, preferably of the same colour as the topping shall be brushed on the surface immediately before laying is commenced. If possible, the entire work of laying the topping shall be completed at one stretch (*see* 7.2.1).

9.2 The terrazzo mix shall be placed on the screed bed and compacted thoroughly by tamping or rolling and trowelled smooth. The time interval allowed between each successive trowelling is important as only that much trowelling which is just sufficient to give a level surface is needed immediately after layer. Futher compacting shall be carried out at intervals, the amount depending upon the temperature and rate of set of the cement. Excessive trowelling or rolling in early stages shall be avoided as this tends to work up cement to the surface producing a finish liable to cracking and also necessitates more grinding of surface to expose the marble chips.

9.3 The surface shall then be rammed in order to consolidate the terrazzo; it is not sufficient just to 'float' lightly, as this would cause depressions which have to be filled with mortar. A piece of smooth marble stone of size 150 mm × 150 mm × 25 mm may be advantageously used for ramming. Following the rammer a trowel may be used. When using the trowel the object should be to make the surface level and smooth with as little use of the float as possible relying upon pressure rather than upon a trowelling action to achieve this end. Rolling will be easier than tamping and patting but a rolled terrazzo is more likely to crack since the roller would draw the cement to the surface unless the mixture is very dry. The best results are obtained by tamping combined with a minimum of trowelling. The compaction shall ensure that air bubbles are cleared from the mix.

9.4 **Work on Borders and Decorative Designs** — Borders and decorative designs shall be laid before the main body of the floorings. They shall be laid and finished in the same manner as flooring, preferably using dividing strips. Where, however, stencils or formwork of wood or metal are used instead of dividing strips they shall be removed before the topping mix commences to harden. The removal shall be effected with as little disturbance to the materials as possible and any ragged edges left after removal of the stencils or formwork shall be rectified with a trowel, care being taken to consolidate the terrazzo to avoid damage to the edges of the design.

10. CURING

10.1 The surface shall be left dry for air-curing for a duration of 12 to 18 h depending upon atmospheric temperature conditions. It shall then be cured by allowing water to stand in pools over it for a period of not less than 4 days. Precautions shall also be taken to prevent the floor from being subjected to extreme temperature.

11. GRINDING

11.1 The grinding and processing of terrazzo may be commenced not less than 2 days from the time of completion of laying for manual grinding and not less than 7 days for machine grinding. The period that should be allowed before the floor is fit for grinding depends upon the materials, their proportions and the weather. The sooner the grinding is done the easier it is; if it is done too soon the grinding may tear out the chips from the matrix.

11.2 The filling shall be done with a grout using the same coloured cement (without marble powder) as in the original mix for terrazzo topping and a portion of the coloured cement shall be kept for this purpose when the floor is laid; this ensures that patches do not differ in appearance from the remainder of the floor.

11.3 Grinding and polishing may be done either by hand or by machine. The operations shall be as given in **11.3.1** to **11.3.8.**

11.3.1 The first grinding shall be done with carborundum stones of 60 grit size.

11.3.2 The surface shall then be washed clean and grouted with neat cement of the same colour as matrix grout of creamlike consistency. It shall then be allowed to dry for 24 h and wet-cured for 4 days in the same manner as specified in **10.**

11.3.3 The second grinding shall be done with carborundum stone of 80 grit size.

11.3.4 The surface shall then be prepared once more as in **11.3.2.**

11.3.5 The third grinding shall be done with carborundum stone of 120 to 150 grit size.

11.3.6 The surface shall again be washed clean and allowed to dry for 12 h and wet-cured for 4 days in the same manner as specified in **10.**

11.3.7 The fourth grinding shall be done with carborundum stone of 320 to 400 grit size.

11.3.8 The surface shall again be washed clean and rubbed hard with felt and slightly moistened oxalic acid powder and 5 g of oxalic acid powder is adequate for 1 m^2 of floor surface.

11.4 When all constructional and finishing works, namely, painting, distempering, electrical work, plumbing, joinery work, etc, are completed and just before the area is occupied the floor shall be washed clean with dilute oxalic acid solution and dried. Floor polishing machine fitted with felt or hessian bobs shall then be run over it until the floor shines.

11.4.1 In case wax-polished surface is desired, the wax-polish shall be sparingly applied with soft linen on the clean and dry surface. Then the polishing machine fitted with bobs shall be run over it. Clean sawdust shall then be spread over the floor and polishing machine again applied mopping up surplus wax and leaving glossy surface. Care shall be taken that the floor is not left slippery.

12. LAYING TERRAZZO SKIRTINGS AND DADOES

12.1 Under Layer — For terrazzo finish on vertical surfaces like skirtings and dadoes, the under layer shall consist of a layer of stiff cement mortar 1 : 3 (1 cement : 3 sand) by volume, finished rough so as to provide adequate key for topping.

12.2 Thickness — The combined thickness of under layer and terrazzo topping shall not be less than 20 mm.

12.2.1 The minimum thickness for terrazzo topping shall not be less than 6 mm.

12.3 Other details regarding laying, curing, grinding, polishing and maintenance shall be similar to those described for *in-situ* terrazzo flooring except that the grinding will be done manually.

13. INSPECTION AND TESTING

13.1 The work should be inspected while in progress and after completion, special attention being paid to the following points:

a) General condition of the base;

b) Correct level of base in relation to flooring;

c) Suitability of aggregate;

d) Correct proportioning of materials;

e) Proper mixing;

f) Adequate bond between wearing surface, under layer and the base;

g) Suitable size of bay;

h) Correct level of dividing strips and the gradient of floor;

j) Sufficient and correct consolidation; and

k) Correct curing.

14. MAINTENANCE

14.1 Under normal conditions the flooring may be kept clean by washing periodically with water and occasionally with a dilute solution of oxalic acid after which it shall be mopped down with cold water and dried. If desired, the floor may be polished using a hard wax polish or an emulsion polish.

14.1.1 Soap in any form shall not be used as it tends to make the terrazzo dangerously slippery; excessive polishing have a similar effect. The surface may also be kept free from oil and grease to avoid slipperiness.

BUREAU OF INDIAN STANDARDS

Headquarters:
Manak Bhavan, 9 Bahadur Shah Zafar Marg, NEW DELHI 110002
Telephones: 323 0131, 323 3375, 323 9402 **Fax** :+ 91 11 3234062, 3239399, 3239382
E - mail : bisind @ del 2.vsnl.net.in **Internet** : http://wwwdel.vsnl.net.in/bis.org

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