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SRI LANKA STANDARD 408 : 1976

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CODE OF PRACTICE FOR LAYING OF IN-SITU TERRAZZO FINISH

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BUREAU OF CEYLON STANDARDS

CODE OF PRACTICE FOR LAYING OF IN-SITU TERRAZZO FINISH

S. L. S. 408 : 1976

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SRI LANKA STANDARD CODE OF PRACTICE FOR LAYING OF IN-SITU TERRAZZO FINISH

FOREWORD

This Sri Lanka Code of Practice has been prepared by the Drafting Committee of the Bureau on in-situ Laying of Terrazzo Finish. It was approved by the Civil Engineering Divisional Committee of the Bureau of Ceylon Standards and was authorised for adoption and publication by the Council of the Bureau on 1976-12-01.

In-situ terrazzo is preferred for its decorative and wearing properties and facilities for easy cleaning. Certain essential precautions are called for in laying in order to avoid crack development and consequent trouble in maintenance. This Code is intended for providing guidance in the selection of materials and in the laying and finishing of terrazzo so that a satisfactory performance is obtained from the finish.

The Drafting Committee responsible for the preparation of this Code has taken into consideration the views of the producers, consumers and technologists, and has related the Code to the manufacturing and trade practice followed in the country in this field.

Rational metric and inch sizes (which are not equivalent to one another and therefore not interchangeable) are specified in this Code of Practice. Both sets of sizes are to be considered as 'standard' until such time the inch set is withdrawn after the industry changes over completely to the metric system.

For the purpose of deciding whether a particular requirement of this Code is complied with, the final value, observed or calculated, expressing the results of a test, shall be rounded off in accordance with CS 102 : 1971*. The number of figures to be retained in the rounded off value shall be the same as that of the specified value in the Code.

The assistance derived from the publications of the British Standards Institution and the Indian Standards Institution in the preparation of this Code is acknowledged.

1. SCOPE

1.1 This Code covers the laying and finishing of in-situ terrazzo flooring, skirting and wall lining.

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* C.S. 102 : 1971 — Presentation of Numerical Values.

2. TERMINOLOGY

For the purpose of this Code, the following definitions shall apply.

2.1 General Terms

2.1.1 Base Concrete for Terrazzo — The layer of concrete on which terrazzo is laid. This layer acts as a ' cushioning layer ' to serve as a base for terrazzo finish to minimise cracking.

2.1.2 Terrazzo — A cement based polished exposed aggregate floor or wall surface, whether in pre-cast form or laid in-situ.

2.1.3 Underlayer — The lower layer of concrete in the terrazzo finish which occurs immediately below the terrazzo topping.

2.2 Tools and Accessories

2.2.1 Screed Strips — Narrow strips of wood laid on the base to act as guides for bringing the whole work to a true and even surface.

2.2.2 Screeding Board — A straight-edged wooden plank used for floating a plane surface. It is moved with a sawing action with the two ends resting on screed strips or guides set at the correct level.

2.3 Site Operations

2.3.1 Screeding — Bringing the floor to a true and even surface by means of screeding boards and screed strips.

2.4 Materials

2.4.1 Facing Aggregates - The aggregates shall consist of good quality marble, or other natural stone of similar characteristics such as Calcites, Dolomites, Serpentines, Calcitic and Dolomitic marbles and granites etc. They shall be of adequate hardness angular in shape as distinct from elongated and flaky. Aggregate shall not contain clay, iron oxide, pyrites or other harmful foreign matter in such a form or in sufficient quantity to affect adversely the bond or strength, or cause surface failure. Aggregate should preferably be graded and it is important to avoid a high fines or dust content. The approximate sizes of aggregates corresponding to commercial grades are given in Table 1.

Table 1 — Sizes of Facing Aggregate Corresponding to Commercial Grades

No.	mm	in.
0	less than 3	less than 1/8
1	3 to 5	1/8 to 3/16
2	5 to 7	3/16 to 1/4
3	7 to 10	1/4 to 3/8
4	10 to 13	3/8 to 1/2
5	13 to 19	1/2 to 3/4
6	19 to 25	3/4 to 1
7	25 to 32	1 to 1 1/4
8	greater than 32	greater than 1 1/4

3. NECESSARY INFORMATION

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

(*a*) 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 types 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 Clause 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 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 terrazzo finish and all others whose work will affect or will be affected.

4. MATERIALS

4.1 Aggregates for Terrazzo Topping — The aggregates used in terrazzo topping shall be facing aggregates (see Clause 2.4) unless otherwise specified.

4.1.1 Aggregates for terrazzo underlayer as well as the base concrete shall conform to requirements of SLS*.

4.2 The cement shall be ordinary, white or coloured portland cement complying with the requirements of CS 107 : 1971 — Specification for Portland Cement.

4.3 Pigments used shall normally comply with the requirements of any accepted international or national standard. Pigments may also be used by agreement between the purchaser and the supplier but some pigments may fade, especially if exposed to sunlight and weathering.

4.4 Water — Water used shall be clean and free-from oil, acid alkali, organic or vegetable matter and it shall conform to SLS**..... Potable water shall normally be used ; sea water shall not be used.

4.5 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 of copper, brass, aluminium, plastic, or similar material. Metallic dividing strips may have a protective coating of bitumen. The thickness of strip shall not be less than 1·5 mm (0·06 in) and width not less than 25 mm (1.0 in). Portions of the bottom edges of the dividing strips may also be cut to a height not exceeding 12 mm (0·5 in) and twisted so as to provide anchorage into the terrazzo finish. The spacing of such cut portions shall not be closer than 30 mm (12 in).

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. The arrangement of the various layers for terrazzo finish laid directly over ground will be as shown in Fig. 1 ; 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 base concrete on ground floor and on structural slab shall be of lean cement concrete of mix 1 : 5 : 10.

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* SLS — Specification for Aggregates (Under preparation).

** SLS — Water for Making Concrete (Under preparation).

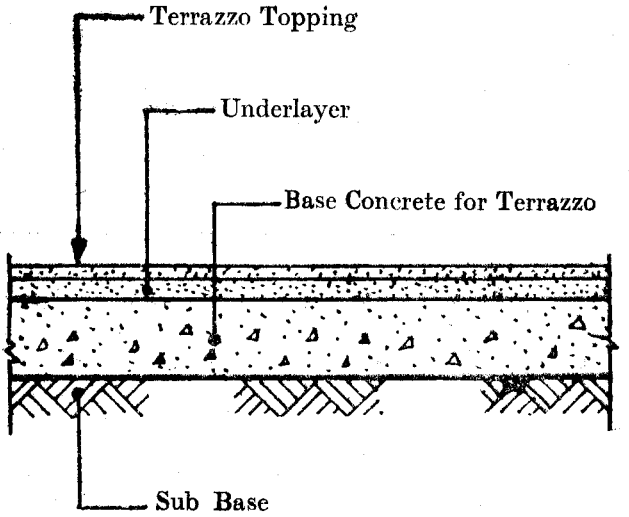

Fig. 1 - Terrazzo Finish Over Ground

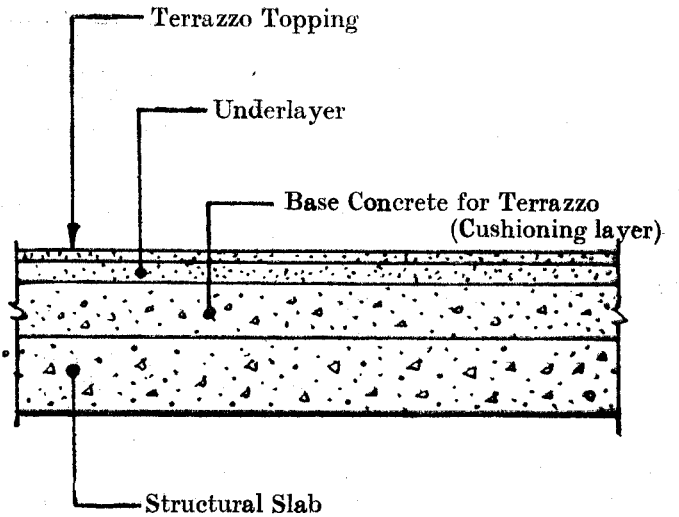

Fig. 2 - Terrazzo Finish On Structural Slab

5.2 Thickness — The thickness of the base concrete laid on sub-base less than 100 mm (4 in). The thickness of concrete laid over a structural slab (cushioning layer) shall not be less than 75 mm (8 in). The combined thickness of the underlayer and topping shall not be less than 40 mm (1·6 in), the thickness of terrazzo topping shall be not less than the following depending upon the grades of chips used.

Grade No.	*Size of Chips*		*Minimum Thickness*
	Retained on sieve size mm (in)	*Passing sieve size mm (in)*	*mm (in)*
0	—	3 (1/8)	5 (0·2)
1	3 (1/8)	5 (3/16)	5 (0·2)
2	5 (3/16)	7 (¼)	5 (0·2)
3	7 (¼)	10 (3/8)	8 (0·3)
4	10 (3/8)	13 (½)	8 (0·3)
5	13 (½)	19 (¾)	8 (0·3)
6	19 (¾)	25 (1)	10 (0·4)
7	25 (1)	32 (1¼)	10 (0·4)
8	32 (1¼)	—	10 (0·4)

Note 1 : However, if the cushioning layer is to be dispersed with in order to reduce the load and thickness, pre-cast terrazzo tiles should be used instead of in-situ terrazzo finish.

Note 2 : It is not necessary that any one chip should be wholly within the top terrazzo layer.

5.3 Ingredients and Mix Proportions

5.3.1 The underlayer shall be of cement concrete mix 1 : 2 : 4. The maximum size of aggregates used shall not exceed 10 mm (0·4 in).

5.3.2 The mix for terrazzo topping shall consist of cement with or without pigments, chips, aggregates and water. A mix richer than one part of cement to two parts of chips aggregate by volume should be avoided.

5.3.2.1 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 exclusive of any pigments added to cement. (see Appendix A).

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 open 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 underlayer and later on the topping, shall be divided into panels where the longer dimension does not exceed 2 m 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 (7 ft). The panels shall preferably be separated by means of dividing strips. However, where butt joints are provided, the bays shall be laid alternatively allowing for an interval of at least 24 h between the laying of adjacent base.

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, which will affect 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 level surface 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. Wherever 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 moisture penetrates to the 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 (3 in) thick with a layer of waterproof membrane inserted between them. The water proofing shall be continued to a height of at least 150 mm (6 in) along the side walls.

Note : However the decision and responsibility regarding the provision of the base concrete as well as the water proof membrane will rest with the designer and not with the terrazzo dealer.

7. PREPARATORY WORK

7.1 Handling and Storage of Materials – Clean, dry storage shall be provided at the site for all the materials. Cement shall be stored under cover.

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 avoiding variation in colour the complete quantities 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 at site ; and in the latter case the pigment and cement in the required proportions shall be mixed thoroughly and sieved before further mixing with aggregate.

7.2.2.2 The coloured cement and the chips shall be mixed dry together.

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 larger 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 worked 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 drying shrinkage.

7.2.4 Machine mixing may preferably be used, but the common type of concrete mixer will not be 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 will, however, justify 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 UNDERLAYER

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 (1·6 in) long cross nails through the strips or by cutting the edges as mentioned in Clause 4·5.

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

8.3 Before spreading the underlayer, the base shall be cleaned of all dirt, laitance, or loose material and then well wetted with water

without forming any water pool on the surface. It shall then be smeared with cement slurry just before the spreading of underlayer.

8.4 After application of cement slurry, the underlayer 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 underlayer is still green, but has hardened sufficiently. This is normally achieved 24th after the underlayer 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 Clause 7.2.1).

9.2 The terrazzo mix shall be placed on the screed bed and be 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 laying. Further compacting shall be carried out at intervals, the amount depending upon the temperature and rate of settling of cement. Excessive trowelling or rolling in early stages shall be avoided as this will tend to work up cement to the surface which will produce a finish liable to cracking and will also necessitate more grinding of surface to expose the 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 terrazzo tile 200 mm × 200 mm × 20 mm (8 in × 8 in × 0·8 in) 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 will be 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 flooring. 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 of 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 four days.

11. GRINDING

11.1 The grinding and processing of terrazzo may be commenced not less than two days from the time of completion of laying for manual grinding and not less than seven days for machine grinding. The period that should be allowed before the floor is fit for grinding depends upon the material, their proportions and the weather. The sooner the grinding is done the easier it will be, but 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 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 ; and this will make sure 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 Clause 11.3.1 to Clause 11.3.8.

11.3.1 The first grinding shall be done with grinding stone of low grit size not coarser than size 10 ; at least 4 grindings of different grit size shall be carried out finishing with grit size 200.

11.3.2 At the end of each of the first three grindings, the surface shall be washed, cleaned and grouted with neat cement grout of creamy like consistency. It shall be allowed to dry for 24 h and wet cured for 4 days in the same manner as specified in Clause 10.

11.3.3 After the 4th grinding, the surface shall be washed, cleaned and rubbed hard with felt and slightly moistened oxalic acid powder. Five grams of oxalic acid powder will be generally adequate for one square metre 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 for floors, the wax-polish shall be sparingly applied with soft linen on the clean and dry surface. Then the polishing machine fitted with pads shall be run over it.

11.5 Due precautions should be taken in the disposal of the washed-off ground material and the oxalic acid used for cleaning. It is important to ensure that the ground material does not enter sewer pipes and the oxalic acid is not washed out into the surrounding area of the building as it will have a harmful effect on vegetation.

12. LAYING TERRAZZO SKIRTINGS AND WALL LININGS

12.1 Underlayer — For terrazzo finish on vertical surfaces like skirtings and wall linings, the underlayer shall consist of a layer of stiff cement mortar 1 : 3 (1 cement : 3 sand), finished rough so as to provide adequate key for the topping.

12.2 Thickness — The combined thickness of underlayer and terrazzo topping shall not be less than 20 mm (0·8 in).

12.2.1 The minimum thickness for terrazzo topping, shall not be less than 6 mm (0·25 in).

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 may have to 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, underlayer and the base ;

(*g*) Suitable size of base ;

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

(*i*) Sufficient and correct consolidation ; and

(*j*) 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 will have a similar effect. The surface may also be kept free from oil and grease to avoid slipperiness.

APPENDIX A

Cement Pigment Proportions for Various Colours of Matrix in Terrazzo Work

(all proportions shall be by weight)

Colour	*Pigment to be used*	*Proportion of pigment*	*Proportion of ordinary Portland Cement*	*Proportion of white cement*
Red	Red oxide of iron	1	15 to 20	Nil
Black	Carbon black	1	25 to 40	Nil
Bottle green	Green chromium oxide	1	15 to 30	Nil
Pink	Red oxide	1	nil	100 to 300
Cream	Yellow oxide of iron	1	nil	100 to 400
Yellow	Yellow oxide of iron	1	nil	25 to 75
Light green	Green chromium oxide	1	nil	50 to 100
French grey	—	nil	1 to 2	1
Fawn	Yellow oxide or iron	1	6	4

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SRI LANKA STANDARDS INSTITUTION

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The principal objects of the Institution as set out in the Act are to prepare standards and promote their adoption, to provide facilities for examination and testing of products, to operate a Certification Marks Scheme, to certify the quality of products meant for local consumption or exports and to promote standardization and quality control by educational, consultancy and research activity.

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