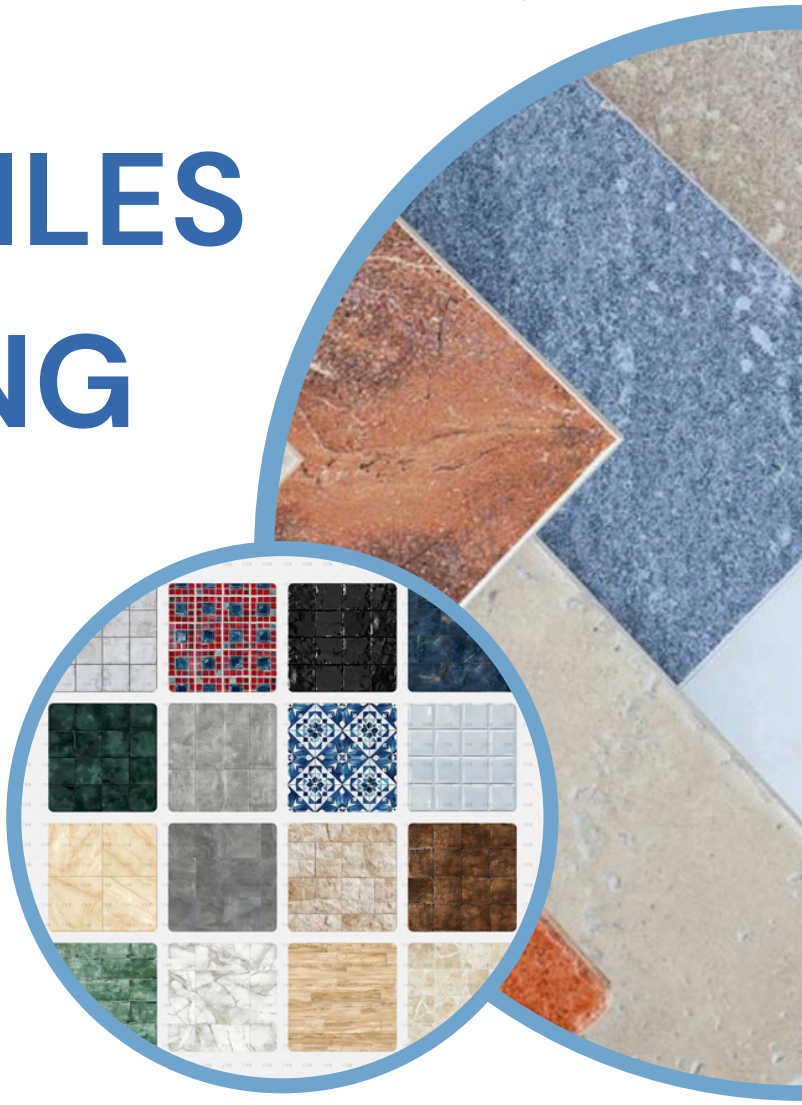
मानकः पथप्रदर्शकः

COMPENDIUM OF INDIAN STANDARDS ON

CERAMIC TILES AND TESTING



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PREFACE

Ceramic tiles are thin slabs made from inorganic raw materials such as clays, silica, fluxing aids such as feldspars, colouring and other mineral raw materials, generally used as coverings for floors, walls or facades.

Ceramic tiles are an integral part of modern construction and interior design, offering durability, versatility, and aesthetic appeal across a wide range of applications. These tiles are widely used in India for flooring, wall cladding, and decorative applications in residential, commercial, and industrial spaces. With the growing demand for high-quality tiles in residential, commercial, and industrial sectors, the need for well-defined standards and reliable testing methods has become increasingly significant. This compendium has been compiled to provide a consolidated reference to the key Indian Standards that govern the specifications, testing methods, classifications, and quality requirements for ceramic tiles.

Bureau of Indian Standards (BIS) had formulated various standards on ceramic tiles specifications, classification and their methods of test in order to establish uniform quality, composition, and properties for ceramic tiles.

By compiling relevant standards related to ceramic tiles in a single document, this compendium brings together detailed information from IS 13630 (Parts 1 to 16), IS 4457, IS 13712, and IS 15622, highlighting the essential performance requirements, tile performance evaluation. It aims to support manufacturers, quality control personnel, designers, architects, and consumers in understanding and implementing the relevant standards, thereby promoting consistency, transparency, and excellence in the ceramic tile industry in India.

1. Current Standards and Code Provisions for Ceramic Tiles and its Testing

1.1. IS 13712 covers definitions, classifications, characteristics and marking requirements for ceramic tiles generally used for floor and wall surfaces. It also includes ceramic tiles used for paving, external and internal cladding, and swimming pools. It is not applicable to decorative accessories such as trims, edges, corners, coves, or curved tiles.

1.2. IS 4457 focuses on ceramic unglazed vitreous acid-resistant tiles, specifying their requirements and testing methods for use in chemically aggressive environments.

1.3. IS 15622 provides comprehensive requirements for pressed ceramic tiles, including both glazed and unglazed types of premium quality, addressing their physical, mechanical, and chemical properties, as well as dimensional tolerances and marking, for application on floors and walls.

1.4. IS 13630 (Parts 1 to 16) outlines detailed test methods, sampling procedures, and acceptance criteria for ceramic tiles, covering a wide range of parameters such as dimensions, surface quality, water absorption, mechanical strength, chemical resistance, and the release of hazardous substances.

2. IS 13712 : 2019 - Ceramic Tiles — Definitions, Classifications, Characteristics and Marking (Second Revision)

2.1. This standard gives definitions, classifications, characteristics and marking requirements for ceramic tiles generally used for floor and wall surfaces. It also includes ceramic tiles used for paving, external and internal cladding, and swimming pools. It is not applicable to decorative accessories such as trims, edges, corners, coves, or curved tiles. This standard applies to tiles of the best quality (first quality) unless otherwise specified in the relevant product standard.

2.2. Ceramic tiles are divided into groups according to their method of manufacture and their water absorption..

2.3. A brief specification must be provided, including the tile description (e.g., split, dust pressed), relevant standard number, classification, nominal and work sizes, surface type (glazed or unglazed), edge finish (rectified or unrectified), and final finish (polished or unpolished).

3. IS 4457: 2007 - Ceramic Unglazed Vitreous Acid Resisting Tiles — Specification (Second Revision)

3.1. This standard lays down the requirements for ceramic unglazed vitreous acid resisting tiles.

3.2. These tiles are designed for industrial and commercial applications where high chemical resistance, durability, and mechanical strength are essential. These are commonly used in chemical plants, laboratories, food processing facilities, and areas exposed to aggressive chemicals. These tiles ensure safety and longevity under harsh operating conditions.

3.3. IS 4457: 2007 defines the physical and chemical properties of the tiles, specifying a maximum water absorption limit of 0.5 % (0.6 % individual), ensuring minimal porosity and high durability. The standard also outlines performance tests for chemical resistance, abrasion

resistance, and breaking strength to validate the product's suitability for heavy-duty applications. Dimensional tolerances are specified to ensure uniformity.

4. IS 15622 : 2017 - Pressed Ceramic Tiles - Specification (First Revision)

4.1. This standard specifies sizes, dimensional tolerances, surface quality, mechanical, physical and chemical requirements, and marking of pressed ceramic tiles.

4.2. This Standard is applicable for pressed ceramic glazed or unglazed tiles of first quality (also known as premium quality) for use as both floor and wall coverings. For the purpose of definition, first quality (premium quality) tiles are tiles that are fairly free from any kind of surface or dimensional defects that may otherwise impair the aesthetics or functionality of the product. These tiles should conform to dimensional, physical, chemical and surface requirements as defined in this standard.

4.3. IS 4457: 2007 classifies the tiles on the basis of their water absorption, surface finish, edge finish etc.

4.4. The standard defines the dimensions, physical properties such as water absorption, breaking strength, impact resistance, resistance to abrasion etc; and chemical properties like resistance to staining, resistance to acids etc.

5. IS 13630 (Part 1): 2019 - Ceramic Tiles — Methods of Test, Sampling and Basis for Acceptance Part 1 Determination of Dimensions and Surface Quality (Second Revision)

5.1. This standard (Part 1) covers methods for determining the dimensional characteristics (length, width, thickness, straightness of sides, rectangularity, surface flatness) and the surface quality of all ceramic tiles.

5.2. Tiles with area less than 400 mm^2 are excluded from measurements of length, width, thickness, straightness of sides, rectangularity, and surface flatness.

6. IS 13630 (Part 2): 2019 - Ceramic Tiles — Methods of Test, Sampling and Basis for Acceptance Part 2 Determination of Water Absorption and Bulk Density (Second Revision)

6.1. This standard (Part 2) covers methods of test for determining the water absorption and bulk density of all ceramic tiles.

6.2. There are two methods of obtaining impregnation with water of the tile’s open pores: a) Boiling, and b) Immersion under vacuum. Boiling will impregnate open pores that are easily fillable, and the vacuum method fills almost all the open pores. Any of these two test methods may be used to measure the water absorption.

7. IS 13630 (Part 3): 2019 - Ceramic Tiles — Methods of Test, Sampling and Basis for Acceptance Part 3 Determination of Moisture Expansion Using Boiling Water (Second Revision)

7.1. This standard (Part 3) covers methods of test for determining the moisture expansion of both glazed and unglazed ceramic tiles.

7.2. It is expressed as the difference between the means of measurements made on test specimens before and after subjecting them to boiling water.

8. IS 13630 (Part 4): 2019 - Ceramic Tiles — Methods of Test, Sampling and Basis for Acceptance Part 4 Determination of Linear Thermal Expansion (Second Revision)

8.1. This standard (Part 4) covers a method of test for determining the coefficient of linear thermal expansion of all ceramic tiles.

8.2. The coefficient of linear thermal expansion is determined for the temperature range from ambient temperature to 100°C.

9. IS 13630 (Part 5): 2019 - Ceramic Tiles — Methods of Test, Sampling and Basis for Acceptance Part 5 Determination of Resistance to Thermal Shock (Second Revision)

9.1. This standard (Part 5) covers a method of test for determining the resistance to thermal shock of all ceramic tiles in normal conditions of use.

9.2. Depending on the water absorption of the tiles, different procedures (tests with or without immersion) are used unless there is an agreement to the contrary.

9.3. Determination of resistance to thermal shock of a whole tile by cycling 10 times between the temperature of cold water and a temperature just above that of boiling water. Usually tests are carried out between 15 °C and 145 °C.

10. IS 13630 (Part 6): 2019 - Ceramic Tiles — Methods of Test, Sampling and Basis for Acceptance Part 6 Determination of Modulus of Rupture and Breaking Strength (Second Revision)

10.1. This standard (Part 6) covers a method of test for determining the modulus of rupture and breaking strength of all ceramic tiles.

10.2. Determination of modulus of rupture and breaking strength of a whole tile is done by means of three-point loading, the central point being in contact with the proper surface of the tile.

11. IS 13630 (Part 7): 2019 - Ceramic Tiles — Methods of Test, Sampling and Basis for Acceptance Part 7 Determination of Stain and Chemical Resistance of Unglazed Tiles (Second Revision)

11.1. This standard (Part 7) covers a method of test for determining the stain and chemical resistance of the proper surface of all unglazed ceramic tiles.

11.2. Determining the resistance to stains by maintaining test solutions in contact with the proper surface of the tiles for a certain duration. The surfaces are then subjected to defined cleaning methods and inspected for visual changes.

11.3. Subjecting the test specimens to the action of the chemical reagents and test solutions for a defined period of time and visually examining the surface for chemical attack

12. IS 13630 (Part 8): 2019 - Ceramic Tiles — Methods of Test, Sampling and Basis for Acceptance Part 8 Determination of Stain and Chemical Resistance of Glazed Tiles (Second Revision)

12.1. This standard (Part 8) covers a method of test for determining the stain and chemical resistance of the proper surface of all glazed ceramic tiles.

12.2. The method is applicable to all glazed ceramic tiles, except that the pencil test for chemical resistance is only applied to glazes from which pencil marks can be removed by means of a wet cloth.

12.3. Where the pencil test is not applicable, the chemical resistance of glazes shall be classified by the change in appearance resulting from chemical action.

13. IS 13630 (Part 9): 2019 - Ceramic Tiles — Methods of Test, Sampling and Basis for Acceptance Part 9 Determination of Crazing Resistance of Glazed Tiles (Second Revision)

13.1. This standard (Part 9) covers a method of test for determining the crazing resistance of all glazed tiles except when the crazing is an inherent feature of the product.

13.2. A craze is a crack, showing as a fine hairline, limited to the glazed surface of a tile.

13.3. The resistance to the formation of crazes is determined by subjecting whole tiles to steam at high pressure in an autoclave and then examining the tiles for crazes after applying a stain to the glazed faces.

14. IS 13630 (Part 10): 2019 - Ceramic Tiles — Methods of Test, Sampling and Basis for Acceptance Part 10 Determination of Frost Resistance (Second Revision)

14.1. This standard (Part 10) covers a method of test for evaluating the frost resistance of all ceramic tiles intended for use in conditions of frost in the presence of water

14.2. After impregnation with water tiles are cycled between +5 °C and -5 °C, all sides of tiles are exposed to freezing during 100 freeze thaw cycles.

15. IS 13630 (Part 11): 2019 - Ceramic Tiles — Methods of Test, Sampling and Basis for Acceptance Part 11 Determination of Resistance to Surface Abrasion of Glazed Tiles (Second Revision)

15.1. This standard (Part 11) covers methods of test for determining the resistance to surface abrasion of all glazed ceramic tiles used for floor covering.

15.2. Determination of the abrasion resistance of the glaze of tiles by rotation of an abrasive load on the surface and assessment of the wear by means of visual comparison of abraded test specimens and non-abraded tiles.

16. IS 13630 (Part 12): 2019 - Ceramic Tiles — Methods of Test, Sampling and Basis for Acceptance Part 12 Determination of Resistance to Deep Abrasion of Unglazed Tiles (Second Revision)

16.1. This standard (Part 12) covers a method of test for determining the resistance to deep abrasion of all unglazed ceramic tiles used for floor coverings.

16.2. Determination of the abrasion resistance of unglazed ceramic tiles by measuring the length of the groove produced in the proper surface by means of a rotating disc under given conditions and with the use of abrasive material.

17. IS 13630 (Part 12): 2019 - Ceramic Tiles — Methods of Test, Sampling and Basis for Acceptance Part 12 Determination of Resistance to Deep Abrasion of Unglazed Tiles (Second Revision)

17.1. This standard (Part 12) covers a method of test for determining the resistance to deep abrasion of all unglazed ceramic tiles used for floor coverings.

17.2. Determination of the abrasion resistance of unglazed ceramic tiles by measuring the length of the groove produced in the proper surface by means of a rotating disc under given conditions and with the use of abrasive material.

18. IS 13630 (Part 13): 2019 - Ceramic Tiles — Methods of Test Sampling and Basis for Acceptance Part 13 Determination of Scratch Hardness of Surface According to Mohs' Scale (Second Revision)

18.1. This standard (Part 13) covers a method of test for determining the scratch hardness of the surface of all ceramic tiles.

18.2. Determination of the scratch hardness on Mohs' scale by drawing minerals of defined hardness by hand over the surface.

19. IS 13630 (Part 14): 2019 - Ceramic Tiles — Methods of Test, Sampling and Basis for Acceptance Part 14 Determination of Impact Resistance by Measurement of Coefficient of Restitution (First Revision)

19.1. This standard (Part 14) defines a method of test for determining the impact resistance of ceramic tiles by measuring the coefficient of restitution.

19.2. The coefficient of restitution (e) between two impacting bodies is defined as the relative velocity of departure divided by the relative velocity of approach.

20. IS 13630 (Part 15): 2019 - Ceramic Tiles — Methods of Test, Sampling and Basis for Acceptance Part 15 Sampling and Basis for Acceptance (First Revision)

20.1. This standard (Part 15) defines rules for batching, sampling, inspection and acceptance/rejection. It applies to unfixed ceramic tiles that have been stored under cover.

20.2. This standard provides for a sampling inspection system with a double sampling plan, partly for the method of inspection by attributes (individual values) and partly for a method of inspection by average values (variables). The number of tiles to be tested varies for each property.

21. IS 13630 (Part 16): 2019 - Ceramic Tiles — Methods of Test, Sampling and Basis for Acceptance Part 16 Determination of Lead and Cadmium Given Off by Glazed Tiles

21.1. This standard (Part 16) specifies a method for the determination of lead and cadmium given off by the glaze of ceramic tiles.

21.2. This is done by exposing the glazed surface of a ceramic tile to an acetic acid solution and determining the amount of lead and cadmium released into the solution by Atomic Absorption Spectrometry (AAS).