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Indian Standard

SPECIFICATION FOR FARM DRAINAGE CONCRETE TILES

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INDIAN STANDARDS INSTITUTION
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
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0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 30 November 1978, after the draft finalized by the Farm Drainage Tiles Sectional Committee had been approved by the Agricultural and Food Products Division Council.

0.2 Different types of concrete pipes have been in use in this country for water mains, sewers, culverts and in irrigation. IS : 458-1971* covers concrete pipes. Use of concrete pipes has also been recently increased for drainage of sub-surface water in farms. A need has, therefore, been felt to formulate requirements for such pipes also known as 'tiles' which are intended for farm drainage purposes. This standard has been prepared to cover these tiles.

0.3 In the preparation of this standard, assistance has been derived from Indian Hume Co Limited, Bombay.

0.4 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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1. SCOPE

1.1 This standard covers the requirements and method of test for concrete tiles with open joints used for farm drainage purposes.

2. MATERIAL

2.1 Cement — The cement used for the manufacture of tiles shall conform to IS : 269-1976‡ or IS : 455-1976§ or IS : 1489-1976‖.

*Specification for concrete pipes (with and without reinforcement) (*second revision*).
†Rules for rounding off numerical values (*revised*).
‡Specification for ordinary and low heat portland cement (*third revision*).
§Specification for portland slag cement (*third revision*).
‖Specification for portland — pozzolana cement (*second revision*).

2.2 Aggregates — The aggregates used for the manufacture of tiles shall conform to IS : 383-1970*.

NOTE — The grading requirements as given in IS : 383-1970* shall be waived in case tiles meet the physical requirements (*see* **6**).

2.3 Admixtures and Blends — If required by the purchaser, suitable admixtures and blends may be used.

3. CLASSIFICATION

3.1 For the purpose of this standard, the concrete tiles based on their physical properties (*see* **6.1**) shall be of following three classes:

a) Light-duty tiles,

b) Medium-duty tiles, and

c) Heavy-duty tiles.

4. DIMENSIONS AND TOLERANCES

4.1 The size (internal diameter) of the tiles of each class shall be 80, 100, 125, 150, 200, 250 and 300 mm.

4.1.1 Permissible variation in diameter for tiles up to and including 150 mm shall be ± 5 mm and for sizes more than 150 mm shall be ± 6 mm.

4.2 The length of the tiles shall be 300 to 450 mm.

4.2.1 Permissible variation in length from the specified length shall be $\pm$ 1 percent. However, the length shall be not less and not more than the values specified under **4.2.**

4.3 The thickness of the tiles shall be such that tiles shall meet the physical requirements (*see* **6**).

4.3.1 Permissible variation in specified thickness for tiles up to and including 25 mm thickness shall be $\pm$ 1·5 mm and above 25 mm thickness shall be $\pm$ 2 mm.

NOTE — The tile wall thickness shall be measured as the average of 12 wall thickness measurements made at the top, centre and bottom locations on each of the four quarter segments that usually result when a tile is tested for crushing strength test (*see* **A-1**). If a tile breaks in such a manner that a satisfactory quarter segment is not obtained then the 12 wall thickness measurements shall be made on the broken pieces that best represent the top, centre and bottom on the four circumferential locations of the tiles.

5. GENERAL REQUIREMENTS

5.1 The tiles shall be substantially free from fractures and surface roughness.

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

5.2 The ends of the tiles shall be square with their longitudinal axis so that when placed in a straight line in the trench no opening in end contact shall exceed 3 mm.

5.3 The outside and inside surfaces of the tiles shall be smooth and shall not be coated with cement wash or other preparation unless otherwise agreed between the purchaser and the supplier.

5.4 The tiles shall be free from defects resulting from imperfect grading or the aggregates, mixing or moulding.

5.5 The tiles shall be free from local dents or bulges greater than 3 mm in depth and extending over a length in any direction greater than twice the thickness of the tile.

5.6 The deviation from straight in any tile throughout its effective length, tested by means of a rigid straight edge parallel to the longitudinal axis of the tile shall not exceed 3 mm for every metre length.

5.7 The aggregates shall be graded, proportioned and thoroughly mixed with such proportions of cement and water as will produce a homogenous concrete or mortar mixture of such quality that the tiles shall meet the requirements of this standard.

5.8 Special treatment shall be given to tiles for increasing their durability if the tiles are required by the purchaser for unusually acid soil or water or for soil containing unusual quantities of sulphate.

NOTE 1 — Soils or drainage water with a *p*H of 5·5 or lower shall be considered having unusually acid.

NOTE 2 — Where the sulphates are chiefly sodium or magnesium, singly or in combination, unusual quantities of these sulphate shall be assumed to be 3 000 ppm (0·3 percent).

6. PHYSICAL REQUIREMENTS

6.1 When tested in accordance with method given in **A-1**, the crushing strength of the tiles shall be in accordance with Table 1 for respective classes and sizes.

6.2 When tested in accordance with method given in **A-2**, the maximum allowable absorption shall be 9 percent for all the classes of tiles.

7. SAMPLING

7.1 For type testing 5 tiles shall be selected at random.

7.2 For lot acceptance, unless otherwise agreed between the supplier and the purchaser, the scale of sampling and criteria for conformity given in Appendix B shall be followed.

TABLE 1 CRUSHING STRENGTH OF TILES

(*Clause* 6.1)

Sl No.	Size mm	Minimum Crushing Strength, kN/m					
		Light Duty Tiles		Medium Duty Tiles		Heavy Duty Tiles	
		Average of 5 tiles	Individual	Average of 5 tiles	Individual	Average of 5 tiles	Individual
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
i)	80	11·7	9·9	16.0	14·4	20·4	18·4
ii)	100	11·7	9·9	16·0	14·4	20·4	18·4
iii)	125	11·7	9·9	16·0	14·4	24·8	18·4
iv)	150	11·7	9·9	16·0	14·4	20·4	18·4
v)	200	11·7	9·9	16·0	14·4	21·8	19·7
vi)	250	11·7	9·9	16·0	14·4	22·6	20·4
vii)	300	11·7	9·9	16·0	14·4	24·8	22·3

8. MARKING AND PACKING

8.1 Marking — Each tile shall be marked in a suitable manner with the following information:

a) Manufacturer's name or identification mark,

b) Size,

c) Length, and

d) Class.

8.1.1 Each tile may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

8.2 Packing — The tiles should be packed for safe handling as agreed between the purchaser and the supplier.

APPENDIX A

(*Clauses* 4.3.1, 6.1 *and* 6.2)

TESTS FOR FARM DRAINAGE CONCRETE TILES

A-1. TEST FOR CRUSHING STRENGTH

A-1.1 Test Specimen — Take required number of tiles of each specified size and length. The tiles shall be surface dried before testing.

A-1.2 Procedure — The three-edge bearing method given in **5.2** of IS : 3597-1966* shall be followed.

A-2. TEST FOR WATER ABSORPTION

A-2.1 Test Specimen — All the tiles tested for crushing strength test (*see* **A-1**) shall be tested for water absorption test. Three test pieces shall be taken from each tile which had withstood the crushing strength test. One of the piece shall be taken from one end of the tile, second piece from the opposite end and the third from centre or near centre of the tiles. Each piece shall be free from visible cracks having a minimum area of 128 cm^2 as measured on one surface of tile. Thickness of the piece shall be equal to the thickness of tiles.

A-2.2 Procedure — The procedure as given in **6.3** of IS : 3597-1966* shall be followed. The average absorption of the three pieces shall be considered as absorption for that tile.

APPENDIX B

(*Clause* 7.2)

SAMPLING OF FARM DRAINAGE CONCRETE TILES

B-1. SCALE OF SAMPLING

B-1.1 Lot — In any consignment all the concrete tiles of the same size, same shape and manufactured under similar conditions of production shall be grouped together to constitute a lot.

B-1.2 The conformity of the material in a lot to the requirements of this specification shall be ascertained on the basis of tests on concrete tiles selected from it.

*Methods of tests for concrete pipes.

B-1.3 The number of concrete tiles to be selected from the lot shall be in accordance with col 2 of Table 2.

TABLE 2 SCALE OF SAMPLING AND CRITERIA FOR CONFORMITY

(*Clauses* B-1.3, B-2.2 *and* B-3.2)

Lot Size	For Requirements Under 4 and 5 (Except 5.8)		Sample Size for Tests in 5.8 and 6
	Sample Size	Acceptance No.	
(1)	(2)	(3)	(4)
Up to 50	8	0	5
51 ,, 100	13	1	5
101 ,, 300	20	2	5
301 ,, 500	32	3	10
501 and above	50	5	10

B-1.3.1 The concrete tiles shall be selected at random. In order to ensure the randomness of selection, a random number table shall be followed. For guidance and use of random number tables, IS : 4905-1968* may be followed. In the absence of a random number table the following procedure may be adopted.

Starting from any tile in the lot, count them as 1, 2, 3.....up to r and so on where r is the integral part of N/n (N/n being the lot and sample size respectively). Every rth tile thus counted shall be withdrawn to constitute the required sample.

B-2. NUMBER OF TESTS

B-2.1 All the concrete tiles selected according to **B-1.3** shall be examined for visual and dimensional requirements given in **4** and **5** (except **5.8**) of the specification.

B-2.2 The number of tiles to be tested for tests under **5.8** and **6** of the specification shall be according to col 4 of Table 2. These tiles shall be selected from those tiles that have satisfied the requirements mentioned in **B-2.1.**

B-2.2.1 For crushing strength, whenever more than five tiles are selected from a lot, the tiles shall be separated into different sets each of five tiles, at random. The individual test results and the average for each set shall be reported. For example, for a lot of 500 tiles, 10 tiles shall be selected at random and then randomly separated into two sets each having five tiles. The individual test results for ten tiles and the average for both sets shall be reported.

*Methods for random sampling.

B-3. CRITERIA FOR CONFORMITY

B-3.1 The lot shall be declared as conforming to the requirements of this specification if the conditions mentioned in **B-3.2** and **B-3.3** are satisfied, otherwise it shall be considered as not conforming to the requirements of this specification.

B-3.2 The number of defective tiles [those not satisfying one or more of the visual and dimensional requirements given in **4** and **5** (except **5.8**) of the specification] shall not be more than the corresponding acceptance number given in col 3 of Table 2.

B-3.3 All the tiles tested for various tests under **5.8** and **6** except crushing strength test shall satisfy corresponding specification requirements. For crushing strength requirement, the lot shall be declared as conforming to the requirements of this specification if each individual test result satisfies the corresponding specification requirement and the average of each set of five tiles (*see* **B-2.2.1**) satisfies corresponding specification requirement.