

Indian Standard

CODE OF PRACTICE FOR GENERAL DESIGN
DETAILS AND PREPARATORY WORK FOR
DAMP-PROOFING AND WATER-PROOFING
OF BUILDINGS

(First Revision)

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0. FOREWORD

0.1 This Indian Standard (First Revision) was adopted by the Bureau of Indian Standards on 22 March 1988, after the draft finalized by the Water-Proofing and Damp-Proofing Sectional Committee had been approved by the Civil Engineering Division Council.

0.2 Different types of damp-proofing and water-proofing materials are used in the building industry. In order to obtain satisfactory performance, it is essential that prior to the application of these materials for the damp-proofing and water-proofing treatment, special care has to be taken to the design details and carefully preparing the building surface for receiving the treatment as recommended in this standard. This standard provides guidance for the preparation of building's surfaces for damp-proofing and water-proofing treatment. This standard is, therefore, an essential adjunct to the standards on damp-proofing and water-proofing of buildings.

0.3 This standard was first published in 1966. The present revision was done on the basis of experience gained over the years on this subject. In this revision, instead of giving requirements of size of rain water pipe for every 40 m² of roof area, Table 3 of IS : 2527-1984* which gives the required sizes of pipes depending upon the rain-fall intensities for areas ranging from 3.3 to 85.4 m², has been referred to in 3.2. A new clause, illustrated with the help of a sketch on damp-proofness in basement walls of residential buildings, has also been added (see 6.1.1).

0.4 In the formulation of this standard, due weightage has been given to international co-ordination among the standards and practices

prevailing in different countries in addition to relating it to the practices in the field in this country.

0.5 This standard is one of a series of Indian Standards on water-proofing and damp-proofing of buildings. Other standards published so far in the series are:

IS : 1346-1976 Code of practice for water-proofing of roofs with bitumen felts (*second revision*)

IS : 1609-1976 Code of practice for laying damp-proofing treatment using bitumen felts (*second revision*)

IS : 3036-1980 Code of practice for laying lime concrete for a waterproofed roof finish (*first revision*)

IS : 4365-1967 Code of practice for application of bitumen mastic for water-proofing of roofs

IS : 6494-1972 Code of practice for water-proofing of underground water reservoirs and swimming pools (*under revision*)

IS : 7198-1974 Code of practice for damp-proofing using bitumen mastic

IS : 9918-1981 Code of practice for *in-situ* water-proofing and damp proofing treatments with glass fibre tissue reinforced bitumen.

0.6 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.

*Code of practice for fixing rainwater gutters and downpipes for roof drainage (*first revision*).

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

1. SCOPE

1.1 This standard covers the essential details of design for damp-proofing and water-proofing of new as well as existing buildings and also the

preparatory work, such as dewatering, surface preparation and other related works necessary, before the application of the actual treatment.

1.1.1 This standard shall apply to several

types of damp-proofing and water-proofing treatment using bitumen felts, bitumen mastic, lime concrete, etc.

2. NECESSARY INFORMATION FOR DESIGN AND PREPARATORY WORK FOR DAMP-PROOFING AND WATER-PROOFING

2.1 For Damp-Proofing of Basements — The damp-proofing work shall be taken up only when the subsoil water level is at its lowest, that is, in dry season. For efficient design and construction of damp-proofing of basement, it shall be necessary for the designer to have the following basic information:

- a) Anticipated highest water level;
- b) Anticipated water table in rainy season;
- c) Anticipated rate of change of water table, taking into consideration other constructional activities, topography of site, etc;
- d) Anticipated maximum water pressure;
- e) Chemical composition and bacteriological effects of subsoil water;
- f) Drawings and design features of the foundation or basement, or both of the building or the structure so as to facilitate effective application of damp-proofing treatment; and
- g) Construction schedule for related items of work.

2.2 For Water-Proofing of Roofs — For the efficient design and laying of water-proofing treatment, the designer shall take into consideration the following salient factors:

- a) Shape of the roof, such as flat, sloping or curved;
- b) Type of roof;
- c) Type of finish required;
- d) Type of thermal insulation treatment;
- e) Projections through roofs;
- f) Drainage arrangement;
- g) Intensity of rain fall; and
- h) Total weight of water-proofing treatment on the roof.

3. DESIGN CONSIDERATIONS

3.1 The following points shall be taken into account for the effectiveness of damp-proofing treatment of the basements:

- a) Construction joints as far as possible shall be avoided;

- b) In case of expansion joints, adequate supports shall be provided at the vertical and horizontal expansion joints to support the damp-proofing treatment from bursting under water pressure;
- c) The wall faces shall, as far as possible, be free from obstruction to enable continuous laying of damp-proofing treatment;
- d) Damp-proofing treatment shall be external for all new structures. The success of damp-proofing on the basement is dependent on the structural soundness of the walls, floors, etc, which shall be designed to withstand external earth and water pressure without cracking. Sufficient working space shall always be provided which shall in no case be less than 600 mm suitably protected all-round the basement; and
- e) In the case of reinforced gunite work, dowels shall be used on underground structures subjected to subsoil water pressure, otherwise the damp-proofing gunite may be blown off the surface to which it is applied.

3.2 The following points shall be taken into account for the effectiveness of water-proofing treatment of the roofs:

- a) The expansion joint in the roof shall be so designed as not to impair the effectiveness of water-proofing treatment with the joint treated with suitable non-absorbent, compressible, non-brittle and water-tight sealants.
- b) Adequate opening in both numbers and sizes shall be provided to drain water conforming to Table 3 of IS : 2527-1984*.
- c) The design of openings shall be such that water-proofing treatment may be easily applied;
- d) Adequate securing arrangement, such as a groove in the vertical face of the parapet for inserting the water-proofing treatment at least 150 mm above the roof level shall be provided in the parapet wall. In the case of ornamental parapets, provision shall be made for tucking the water-proofing treatment in the solid portion of the ornamental parapet; and
- e) In the case of lime terracing at the junction of the roof and the parapet, a cavity shall be left for insertion of the lime concrete treatment which shall act as flashing (see IS : 3036-1980†).

*Code of practice for fixing rainwater gutters and downpipes for roof drainage (*first revision*).

†Code of practice for laying lime concrete for a waterproofed roof finish (*first revision*).

4. PLANNING IN RELATION TO SUBSOIL DRAINAGE

4.1 The following points shall be taken into consideration for effective site and underground drainage:

- Efficient drainage of the site shall be carried out during the entire period of laying the damp-proofing treatment. An adequate dewatering arrangement shall be made for pumping out subsoil water to keep the water level below the level of work in progress (*see* Fig. 1, 2 and 3). In particular situations where the space available is limited, alternative dewatering arrangement for pumping subsoil water and shoring of the excavation shall be made (*see* Fig. 4).
- For existing structures, internal tanking for damp-proofing has perforce to be applied. This damp-proofing work has to be taken up during the season when water is not there in the basement. If there is standing water in the basement, it should be drained out and damp-proofing work started. If, in spite of draining out the water, percolation of subsoil water continues, dewatering by well-point system may be adhered to. Where it is not possible to employ well-point system for dewatering and the pressure of water during the dry season is negligible, it is possible to carry out the work by making a pump in the floor and pumping the water out. In this case, the damp-proofing treatment shall be carried out

all round the surface, that is, on the walls and the floor. When the entire treatment is completed, the pump shall be plugged in with waterproof cement concrete and the damp-proofing treatment completed over it.

5. TIME SCHEDULE

5.1 In preparing a time schedule for the work involved in the construction of basement and damp-proofing treatment, each operation shall be considered in relation to the other, due consideration being given to economical use of pumps and other equipment by the general contractor and the damp-proofing contractor. The time schedule shall include the following so as to avoid interference with each other's working:

- Dates when the excavation is complete;
- Dates when the base and the walls, scaffolding and pumping arrangements are to be ready for the damp-proofing treatment to start; and
- Dates when damp-proofing treatment is to make a certain given progress so that the construction of structural walls and floor may start, and so on.

6. PREPARATION OF SURFACE AND GENERAL RECOMMENDATIONS FOR DAMPPROOFING OF BASEMENTS AND WATER-PROOFING OF ROOFS

6.1 Damp-Proofing of Basements

6.1.1 *Above Ground Level* — The moisture rising above ground level due to capillary action

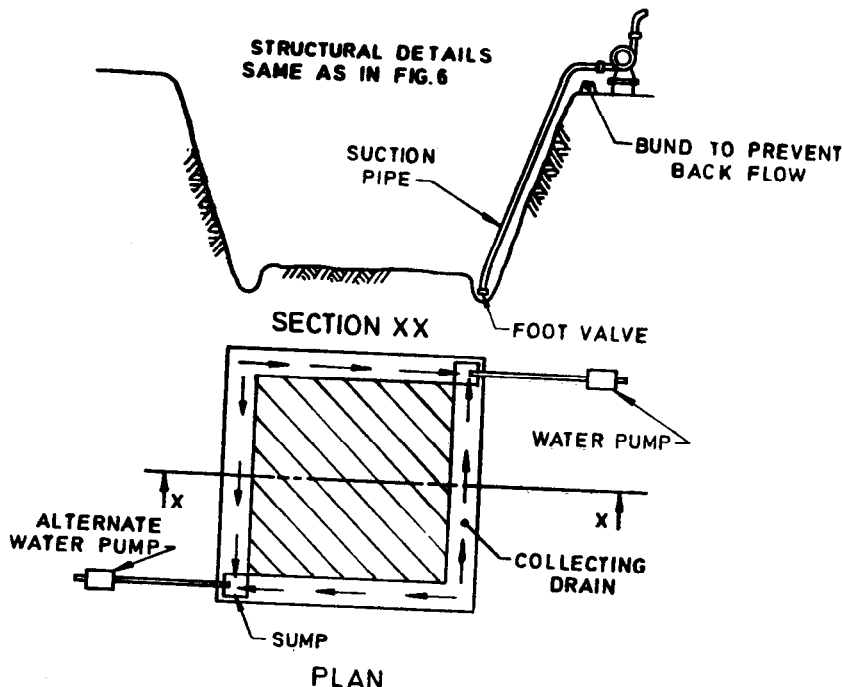


FIG. 1 ARRANGEMENT SHOWING DEWATERING OF SMALL BASEMENT BY DRAINS AND PUMPS

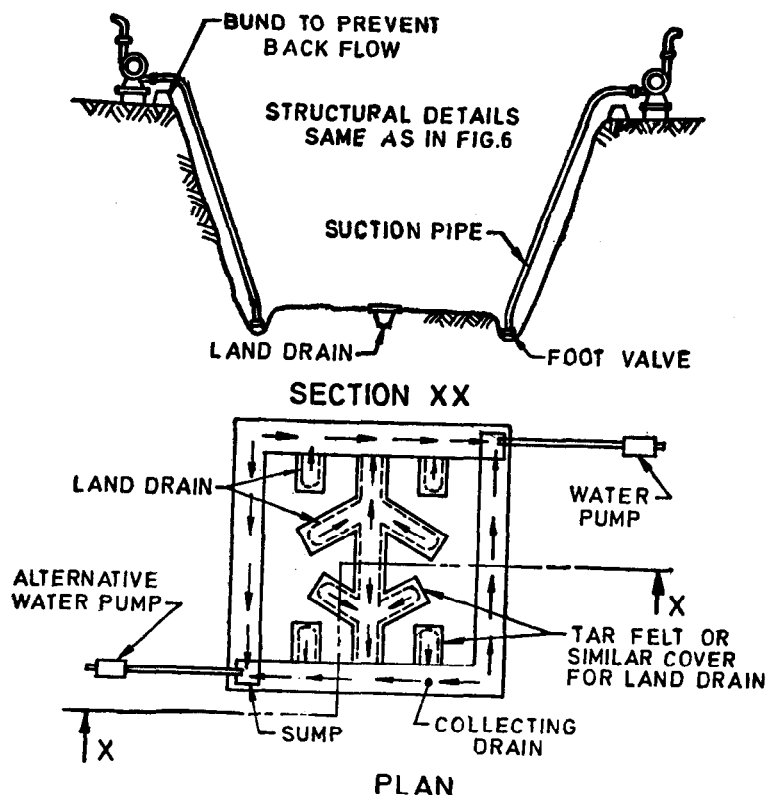


FIG. 2 ARRANGEMENTS SHOWING DEWATERING OF LARGE AREAS WHERE IT IS NECESSARY TO DEWATER UNDER THE FLOOR

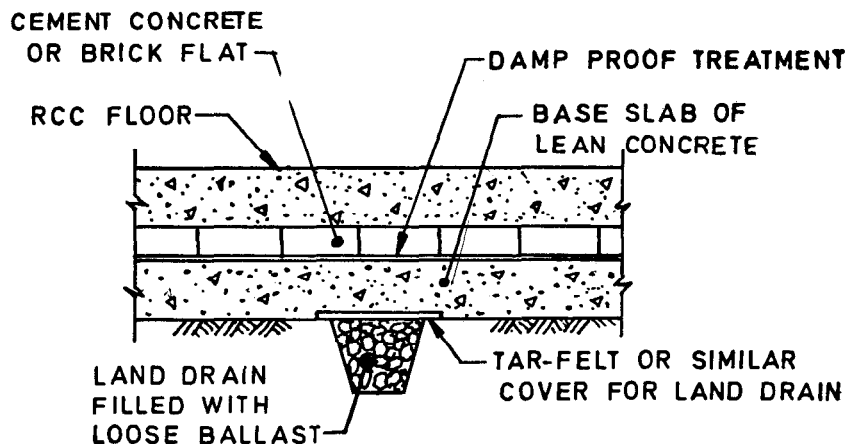


FIG. 3 CROSS-SECTION OF LAND DRAIN WITH DETAILS

has to be dealt with suitably to obtain the maximum effects of damp-proofing in flooring in buildings like godown and factory, and buildings constructed in places where rise in sub-soil water table is severe, the following points shall be taken into consideration (see Fig. 5A):

- a) The mortar bed on which the damp-proofing treatment is to be laid shall be levelled and made free from projections liable to cause damage to the damp-proofing treatment;
- b) When a horizontal damp-proofing treatment is to be continued to vertical face, a cement mortar (1 : 4) fillet 75 mm in radius shall be provided at the junction between the horizontal and the vertical faces. Both the horizontal and the vertical faces, on which the damp-proofing treatment is to be laid, shall be finished smooth;
- c) The damp-proofing treatment shall cover the full thickness of the walls excluding rendering and shall not be set back from the wall face for pointing; and
- d) For effecting damp-proofness in basement walls of residential buildings, a course of DPC in cement-mortar 1 : 4 or cement-concrete 1 : 2 : 4, 12 mm thick with necessary

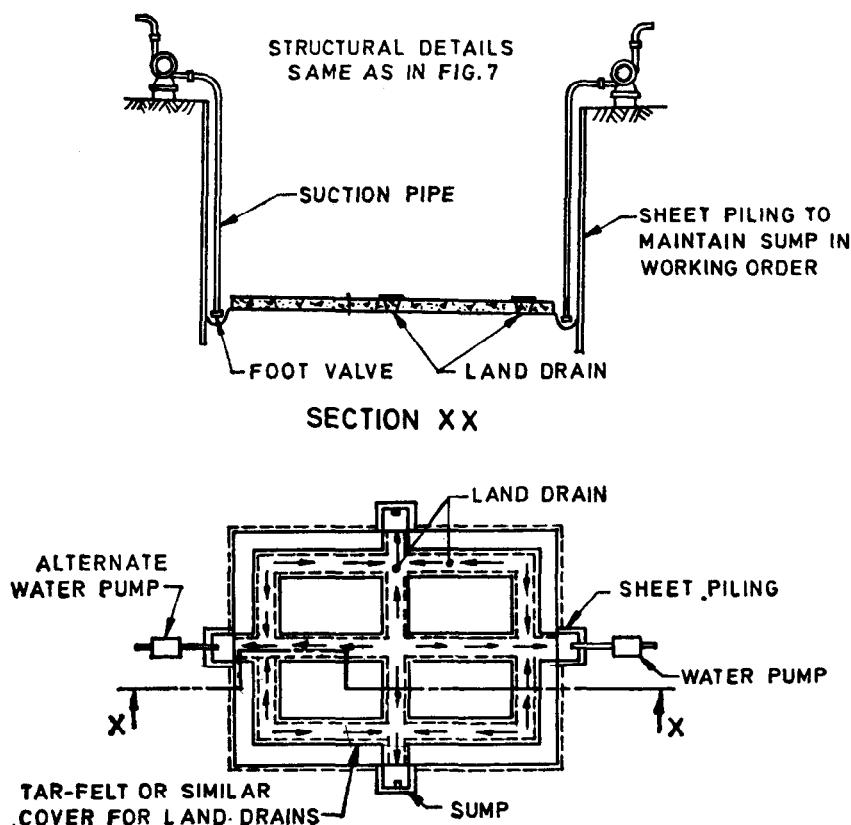
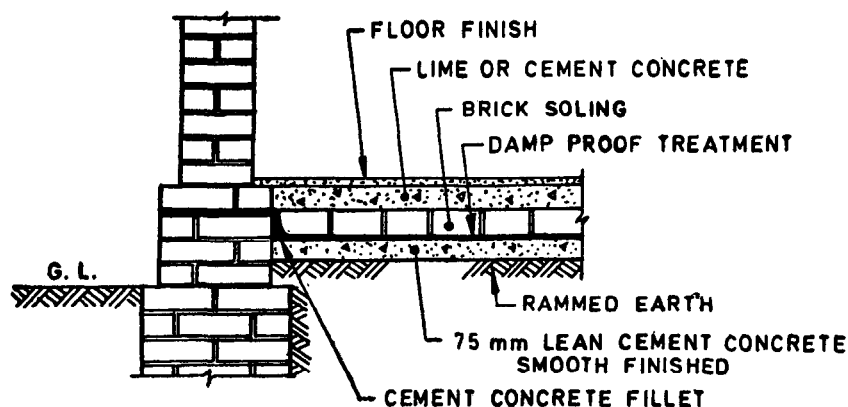


FIG. 4 ALTERNATE ARRANGEMENTS OF DEWATERING FOR LAYING DAMP-PROOF TREATMENT IN BASEMENT WHERE SPACE IS RESTRICTED



5A

FIG. 5 DAMP-PROOF TREATMENT ABOVE GROUND LEVEL FOR NEW BUILDING (Contd.)

water-proofing compound conforming to IS : 2645-1975* may be laid below the course of brick on edges. The DPC so laid may also be extended vertically over the inner surface of the brick on edges of the basement wall. The floor finish on top may be taken up to the inner face of the superstructure (see Fig. 5B).

*Specification for integral cement waterproofing compounds.

6.1.2 Below Ground Level

6.1.2.1 For internal tanking of existing building:

- The vertical walls shall be roughened by hacking to provide a proper grip or roughened with plaster finish,
- The floor shall be cleaned and levelled as far as possible, and

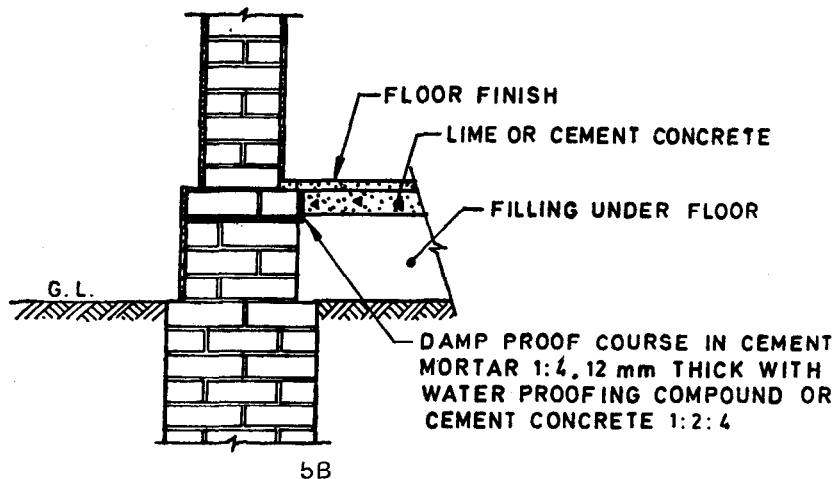
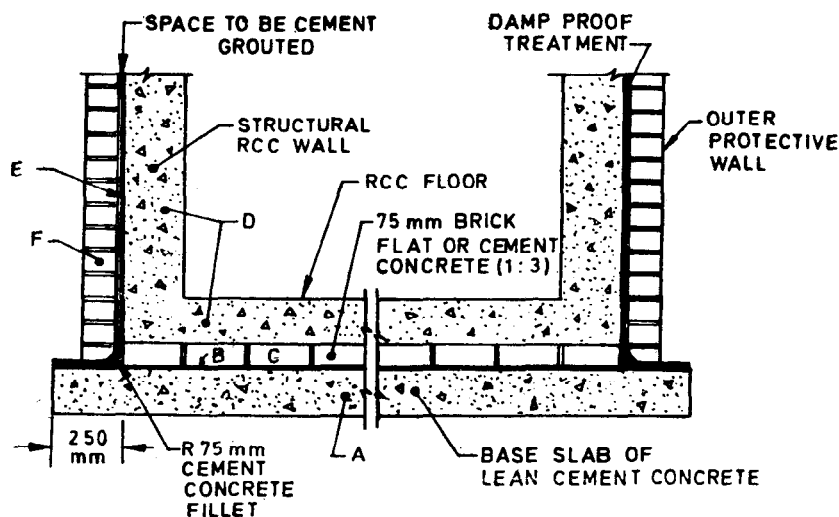


FIG. 5 DAMP-PROOF TREATMENT ABOVE GROUND LEVEL FOR NEW BUILDING



NOTE — Sequence of work:

- A — Base slab
- C — Brick flat or cement concrete (1 : 3)
- E — Vertical damp-proofing treatment on outside faces of structural walls

- B — Horizontal damp-proofing treatment
- D — Structural walls and floor
- F — Outer protective walls

FIG. 6 TYPICAL DAMP-PROOF TREATMENT FOR BASEMENT IN NEW BUILDINGS UNDER CONSTRUCTION

- c) A cement mortar fillet 75 mm in radius shall be provided at the junction between horizontal and vertical faces as well as at the junction between adjacent walls.

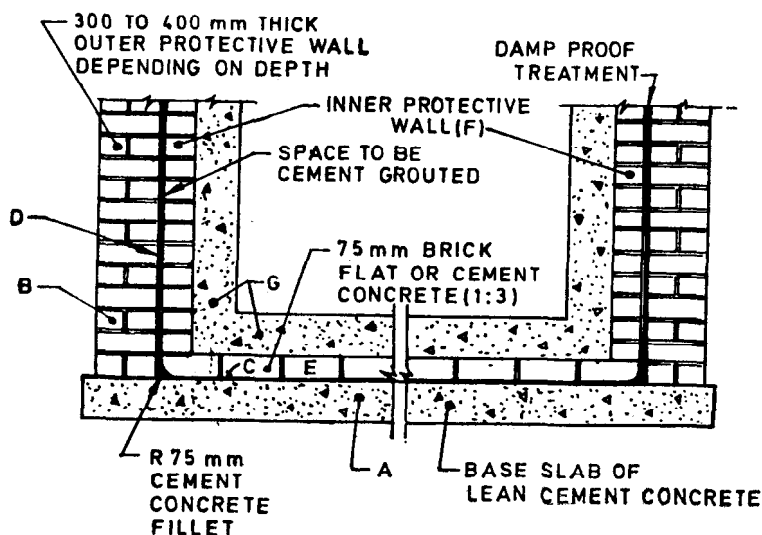
6.1.2.2 For external tanking of new building —

Where adequate space is available for excavation, the basement shall be of sufficient dimensions to provide for the details given below:

- a) A base slab of lean cement concrete rendered to a smooth surface finish shall be constructed on the floor of the excavation. The concrete slab shall be of sufficient strength to withstand construction traffic. The slab shall project at least 250 mm beyond the outer faces of the structural walls when completed (see Fig. 6);
- b) The exterior of the structural walls shall be true and free from protrusions but shall

be smooth or roughened as required;

- c) Where vertical damp-proofing treatment is to be laid continuous with the horizontal one, a fillet 75 mm in radius shall be provided; and
- d) Where space is limited, the external protective wall shall be constructed first and its internal face plastered evenly but roughened. The wall shall be one brick thick or more depending on height and earth pressure behind it. The damp-proofing treatment shall be applied on the internal face of this wall continuous with the horizontal damp-proofing treatment (see Fig. 7). A cement mortar fillet 75 mm in radius shall, in this case, be constructed at the inside junction of the base slab and the external protective wall



NOTE — Sequence of work:

- A — Base slab
- C — Horizontal damp-proofing treatment
- E — Brick flat or cement concrete 1 : 3
- F — Inner protective walls

- B — Outer protective wall
- D — Vertical damp-proofing treatment on the inside of outer protective walls
- G — RCC structural wall or floor thickness and reinforcement will be designed according to the depth and maximum water pressure

FIG. 7 ALTERNATE DAMP-PROOF TREATMENT FOR BASEMENT IN NEW BUILDINGS UNDER CONSTRUCTION

and allowed to set before the application of damp-proofing treatment. After laying of damp-proofing treatment on the vertical face, another protective wall shall be built half brick thick against the damp-proof treatment keeping approximately 100 mm space in between which shall later be grouted with cement mortar. The structural wall shall be built against this.

6.1.3 Guniting Work — The concrete and masonry surfaces both above and below ground level may be gunited for damp-proofing purposes. The surfaces shall be prepared by removing all loose and disintegrated materials and shall be cleaned by compressed air and water prior to guniting. Concrete surfaces shall be roughened by light chipping and the joints in the masonry walls shall be raked out to a depth of 12 mm to form good bond for the gunite.

6.2 Water-Proofing of Roofs — These preparations, where applicable, relate to the use of bitumen felts, bitumen mastic, lime concrete and guniting for water-proofing treatment.

6.2.1 Concrete and Masonry Roofs

- a) Well defined cracks other than hair cracks in the roof structure shall be cut to 'V' section, cleaned and filled up flush with cement-sand slurry or with cold applied bituminous caulking compound conforming to IS : 1580-1969*. The roof surface

shall be regraded and cured prior to the application of water-proofing treatment by cement mortar or lime *SURHHI* mortar, where necessary.

- b) The surface of roof and that part of the parapet and gutters, drain mouths, etc, over which the water-proofing treatment is to be applied shall be cleaned of all foreign matter, namely, fungus, moss and dust, by wire brushing and dusting.
- c) In the case of lime concrete treatment, the structural roof surface shall be finished rough to provide adequate bond.
- d) In the case of gunite treatment, the roof surface shall be prepared in the manner given at 6.1.3.
- e) Drain outlets shall be suitably placed with respect to the roof drainage and prevent local accumulation of water on the roof surface. Masonry drain mouths shall be widened two-and-a-half times the diameter of the drain and rounded with cement mortar.
- f) For cast iron drain outlets, a groove shall be cut all-round to tuck the treatment.
- g) When a pipe passes through a roof on which waterproofing treatment is to be laid, a cement concrete angle-fillet shall be built round it and the water-proofing treatment taken over the fillet (see Fig. 8A and 8B).

*Specification for bituminous compounds for water-proofing and caulking purposes (first revision).

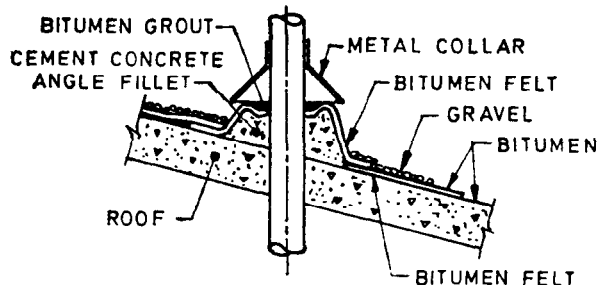
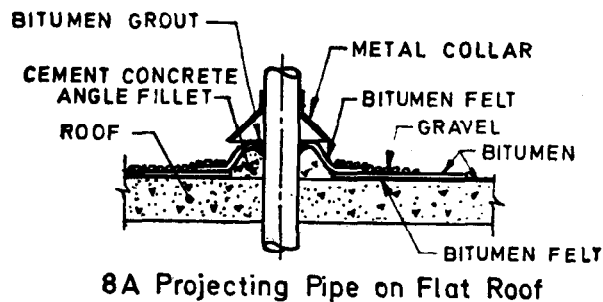


FIG. 8 TYPICAL WATER-PROOFING TREATMENT WHEN A PIPE PASSES THROUGH A CONCRETE ROOF

- h) In case of parapet walls over 450 mm in height, for tucking in the water-proofing treatment, a groove at a minimum height of 150 mm above roof level may be left in the vertical face at the time of construction. This groove shall be 75 mm wide and 65 mm deep. The horizontal face of the groove shall be shaped with cement mortar (see Fig. 9A).
- j) In case of low parapets where the height does not exceed 450 mm, no groove shall be provided and the water-proofing treatment shall be carried right over the top (see Fig. 9B).
- k) In the case of existing RCC and stone walls, cutting the chase for tucking in the water-proofing treatment is not recommended. A typical treatment is shown in Fig. 10.
- m) At the junction between the roof and the vertical face of the parapet wall, a fillet 75 mm in radius shall be constructed (see Fig. 9).
- n) At the drain mouths, the fillet shall be suitably cut back and rounded off for easy application of the water-proofing treatment and easy flow of water.
- p) Outlets at every low dividing wall, say less than 300 mm in height, shall be cut

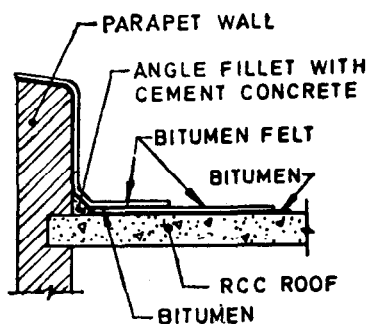
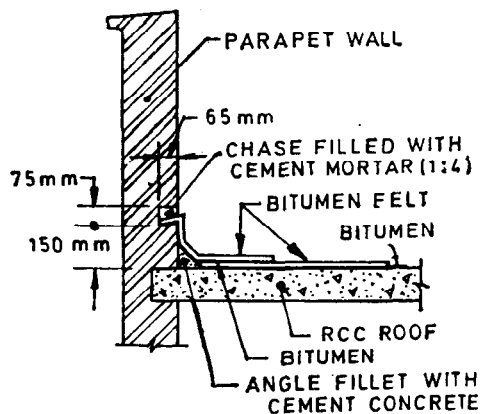


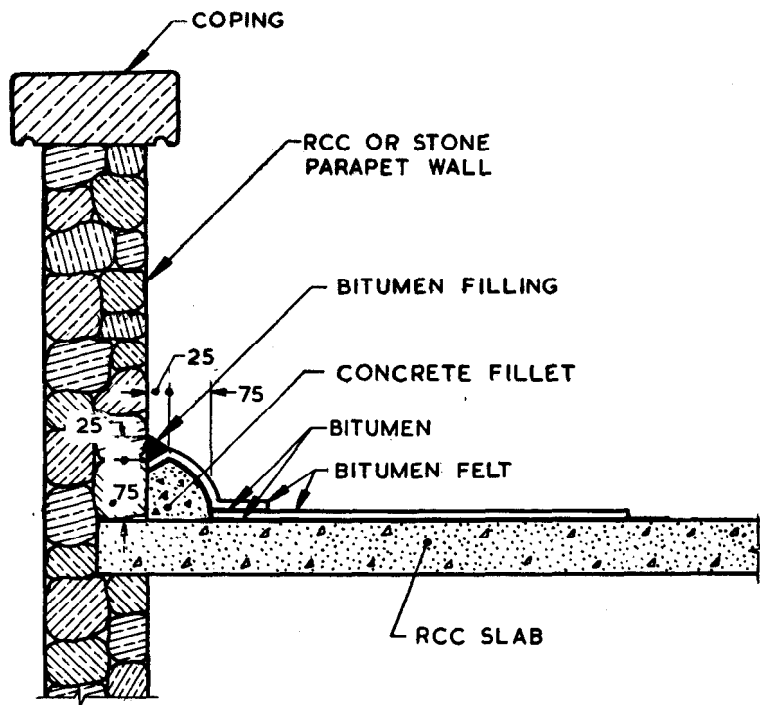
FIG. 9 WATER-PROOFING TREATMENT OF JUNCTION ON ROOF AND PARAPET WALL

open to full depth and the bottom and sides shall be rendered smooth and corners rounded off for easy application of water-proofing treatment.

6.2.2 Timber Roofs

- a) On boarded roofs where timber boards are not tongued and grooved, the gap at
- b) All the boards shall be adequately nailed at each joint to minimize curling. All

joints shall be caulked with hemp, hessian or other suitable fibre impregnated with bitumen or some other suitable filler. In case of tongued or grooved joints too, it is necessary to caulk the gaps, if any (see Fig. 11).



All dimensions in millimetres.

FIG. 10 DETAILS OF WATER-PROOFING TREATMENT IN PARAPET WALL WHERE CUTTING OF GROOVE IS NOT POSSIBLE

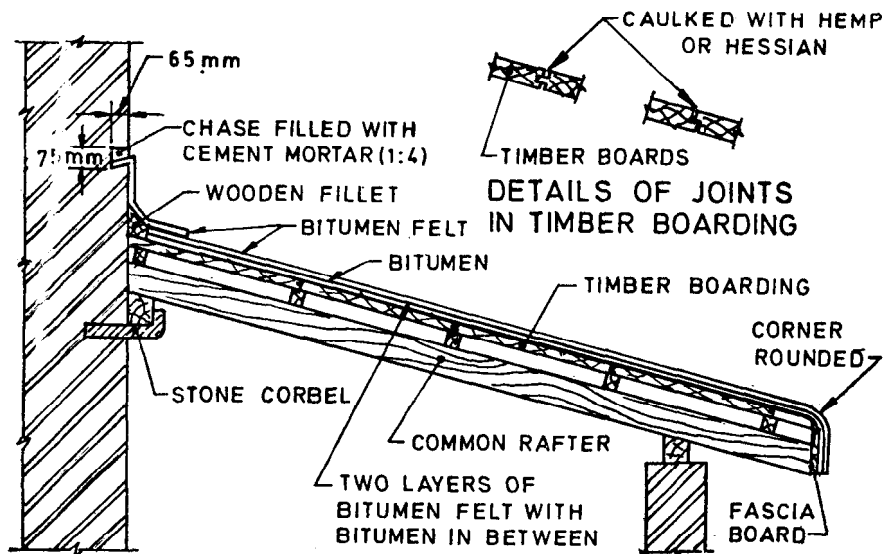


FIG. 11 WATER-PROOFING TREATMENT OF TIMBER ROOF

sharp edges and corners over which the water-proofing treatment is to be applied, shall be chamfered or rounded.

- c) A wooden angle fillet 75×75 mm shall be provided wherever the timber roof meets a vertical wall in order to avoid sharp corners. For timber walls, wooden moulding

shall be used to secure and seal the top edge of the bitumen felt at a height of 150 mm from the junction of the roof and the wall.

- d) Where a pipe passes through a timber roof, it shall be surrounded with separate metal flanged collar. The flange of the collar shall be 150 mm wide (*see* Fig. 12).

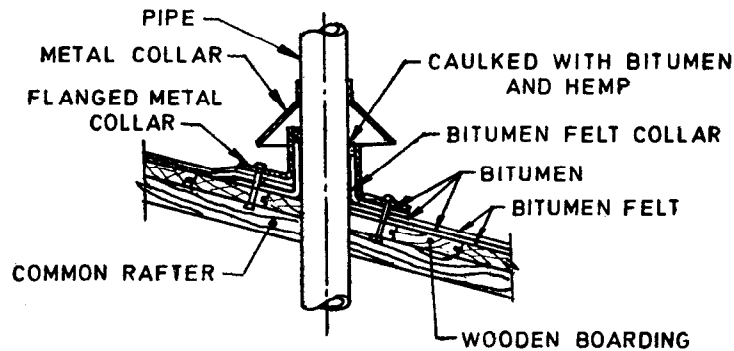


FIG. 12 WATER-PROOFING TREATMENT OF SLOPING TIMBER ROOF WITH PIPE PROJECTING

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