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Indian Standard

CODE OF PRACTICE FOR *IN-SITU* WATERPROOFING AND DAMP-PROOFING TREATMENT WITH GLASS FIBRE TISSUE REINFORCED BITUMEN

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CODE OF PRACTICE FOR *IN-SITU* WATERPROOFING AND DAMP-PROOFING TREATMENT WITH GLASS FIBRE TISSUE REINFORCED BITUMEN

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 18 August 1981, after the draft finalized by the Waterproofing and Damp-Proofing Sectional Committee had been approved by the Civil Engineering Division Council.

0.2 Glass fibre being more resistant to weathering is coming into greater use for waterproofing and damp-proofing of buildings. General features relating to waterproofing and damp-proofing with regard to design details, surface preparation, drainage, etc, are covered in IS : 3067-1966*. This standard is intended to cover only the execution part of the work relating to *in-situ* application of reinforced glass fibre tissue and bitumen for waterproofing and damp-proofing.

0.3 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 method of *in-situ* waterproofing and damp-proofing of buildings and other structures using reinforced glass fibre tissue and bitumen.

2. TERMINOLOGY

2.0 For the purpose of this standard, the following definitions shall apply.

*Code of practice for general design, details and preparatory work for damp-proofing and waterproofing of buildings.

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

2.1 Waterproofing and Damp-Proofing Medium — Bitumen or suitable bituminous compounds which:

a) by embedding into the glass fibre reinforcement tissue membrane forms a monolithic mass;

b) prevents the penetration of water or moisture; and

c) acts as a top dressing.

2.2 Layer — A single thickness of glass fibre tissue membrane embedded with bitumen.

2.3 Multiple Layer — Two or more layers of glass fibre tissue membranes laid consecutively with overlapping joints and embedded with bitumen.

3. PREPARATION OF THE SURFACE

3.1 Regrading shall be carried out with a suitable cement mortar incorporating a clean, medium-coarse sand or with a lime-*surkhi* mortar or any other suitable material. Old surfaces intended for waterproofing and damp-proofing treatment shall be renewed suitably.

4. MATERIAL

4.1 Bitumen Primer — Primer shall conform to the requirements laid down in IS : 3384-1965*.

4.2 Glass Fibre Tissue — The glass fibre tissue shall be thin, flexible, uniformly bonded mat composed of chemically resistant borosilicate staple glass fibres distributed in a random open porous structure, bonded together with a thermosetting resin (phenolic type). The minimum weight of the tissue shall be 40 g/m^2 and the nominal thickness shall be 0·50 $\pm$ 0·1 mm. Other physical properties of the tissue shall conform to Appendix A of IS : 7193-1974†.

4.3 Bonding Material — These shall consist of blown type bitumen conforming to IS : 702-1961‡ or residual bitumen conforming to IS : 73-1961§ or a mixture thereof selected to withstand local conditions of prevailing temperature and surface gradient and shall be prepared by heating to the correct working temperature. The penetration of bitumen shall not be more than 40 when tested in accordance with IS : 1203-1958‖.

5. SURFACE FINISH

5.1 Pea-Sized Gravel/Grit — Recommended for concrete and masonry roofs, flat or sloping.

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*Specification for bitumen primer for use in waterproofing and damp-proofing.
†Specification for glass fibre base coal tar pitch and bitumen felts.
‡Specification for industrial bitumen (*revised*).
§Specification for paving bitumen (*revised*).
‖Specification for determination of penetration (*first revision*).

5.2 Bitumen Based Aluminium Mastics — Recommended for providing a heat reflective surface and for aesthetic appearance.

5.3 Cement Concrete, Flooring Tiles, Mosaic Tiles, Burnt-Clay Tiles, Flat-Terracing Tiles — On roof surfaces subject to foot-traffic.

6. *IN-SITU* WATERPROOFING TREATMENT FOR ROOFS

6.1 In selecting the combinations of layers of glass fibre tissue membrane, consideration shall be given to the type and construction of buildings, climatic and atmospheric conditions and the degree of permanence required.

6.2 For concrete, masonry and metallic roofs, flat or sloping, the following treatments are recommended.

a) *Normal Duty Treatment*

1) Clean and prime the surface with bitumen primer at the rate of 0·4 kg/m^2. This should properly embed the surface and should be left till the time it is touch dry.

2) Apply first coat of hot bitumen at the rate of 1·6 kg/m^2, *Min.*

3) Apply first layer of glass fibre tissue, overlap shall be 100 mm between layers in either direction.

4) Apply second coat of hot bitumen at the rate of 1·6 kg/m^2, *Min.*

5) Apply finishing by pea gravel or grit at the rate of 0·006 m^3/m^2 or by tiles, patent stone or cement concrete and other finishing materials.

b) *Heavy Duty Treatment*

1) Same as in **6.2**(a), items (1) to (4).

2) Apply second layer of glass fibre tissue. This layer of glass fibre tissue shall be embedded perpendicular to the earlier layer.

3) Apply third coat of hot bitumen at the rate of 1·6 kg/m^2, *Min.*

4) Finishing same as in **6.2**(a), item (5).

c) *Extra Heavy Duty Treatment*

1) Same as in **6.2**(b), items (1) to (6).

2) Apply third layer of glass fibre tissue. This layer of glass fibre tissue shall be embedded perpendicular to the earlier layer.

3) Apply fourth coat of hot bitumen at the rate of 1·6 kg/m^2, *Min.*

4) Finishing same as **6.2**(a), item (5).

NOTE 1 — Five-course treatment is recommended for moderate conditions of rainfall. A typical sketch showing the five course treatment is given in Fig. 1.

NOTE 2 — Seven-course treatment is suggested for severe conditions of rainfall.

NOTE 3 — Nine-course treatment is recommended for very severe conditions of rainfall.

Note 4 — Where pea-sized gravel or grit is not available, course sand may be used.

NOTE 5 — The conditions specified in Notes 1 to 3 are based on rainfall as follows:

Moderate	—	Less than 50 cm;
Severe	—	50 to 150 cm; and
Very severe	—	More than 150 cm.

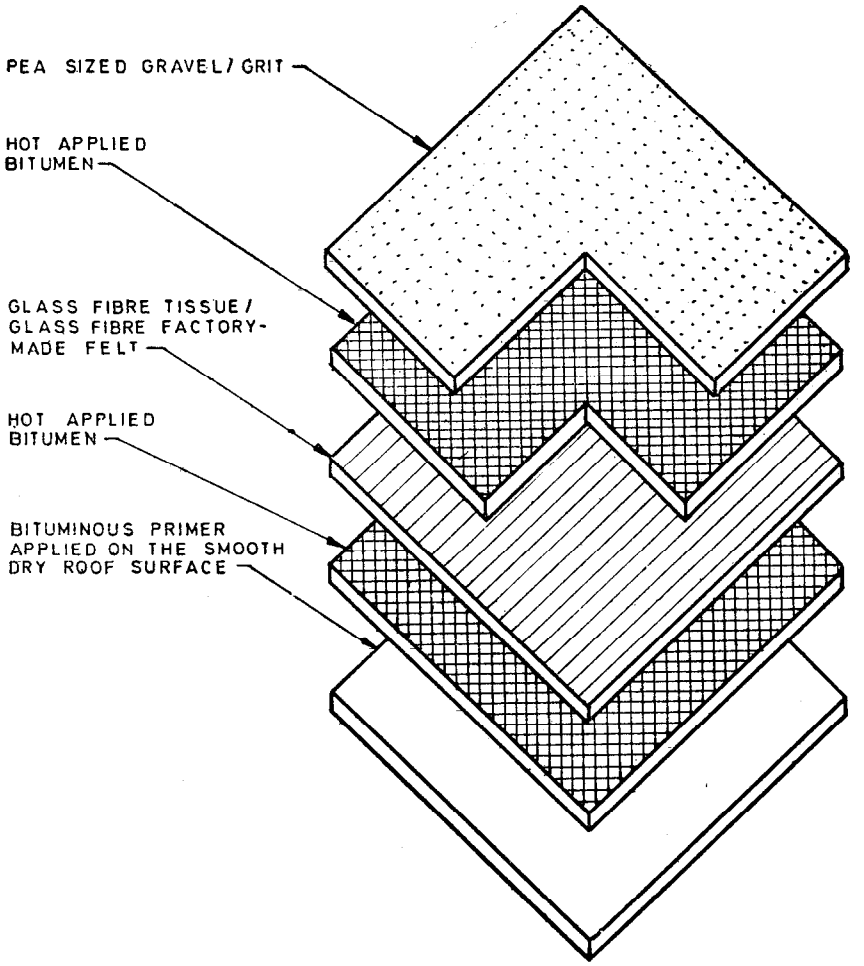


FIG. 1 A TYPICAL FIVE-COURSE WATERPROOFING TREATMENT WITH IN-SITU GLASS FIBRE TISSUE

6.3 Junction of Parapet, Wall and Roof — Glass fibre *in-situ* treatment shall be applied as flashings wherever junctions of vertical and horizontal structures occur with minimum overlap of 100 mm. Glass fibre tissue shall be cut to the required size and hot bitumen poured on the surface to the extent required and simultaneously embed the glass fibre tissue into it. The lower edge of the flashing shall overlap the *in-situ* treatment laid on the horizontal surface of the roof and the upper edge of the flashing shall be tucked into the chase (50 mm wide and 50 mm deep) 150 mm above the finished roof level on the vertical face of the wall. In case of multi-layer treatments, the joints in the glass fibre tissue between successive layers are staggered with those of the layer beneath it. After the flashings are properly bonded, the chase shall be filled up with cement mortar (normally 1 : 4) or lime mortar (1 : 3) or cement concrete (1 : 3 : 6) which when set will satisfactorily secure the treatment to the wall. The chase when filled shall be cured by watering for at least 4 days after filling to ensure satisfactory strength and to avoid shrinkage cracks. Figures 2 and 3 give typical details of joint between junction of masonry and RCC parapet and flat roof respectively.

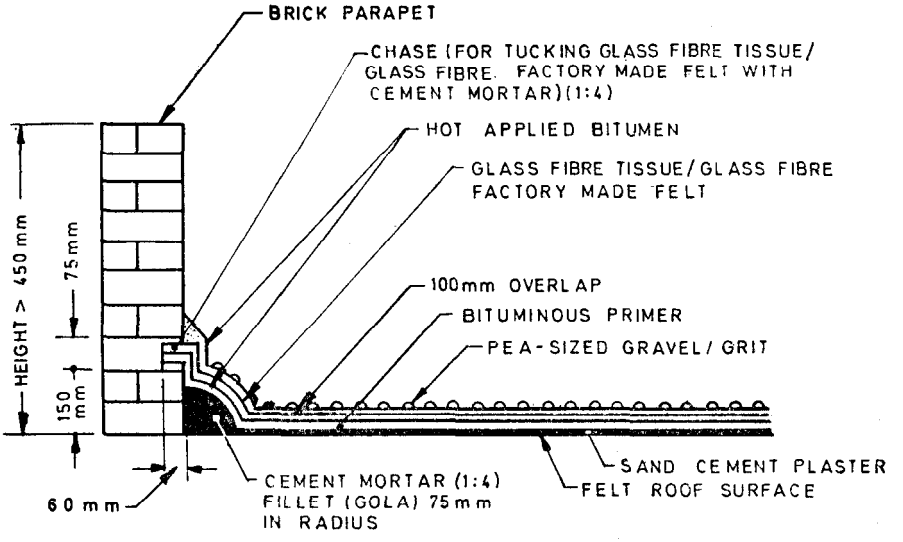


FIG. 2 WATERPROOFING ON A FLAT ROOF WITH BRICK PARAPET OVER 450 mm IN HEIGHT-TYPICAL DETAILS

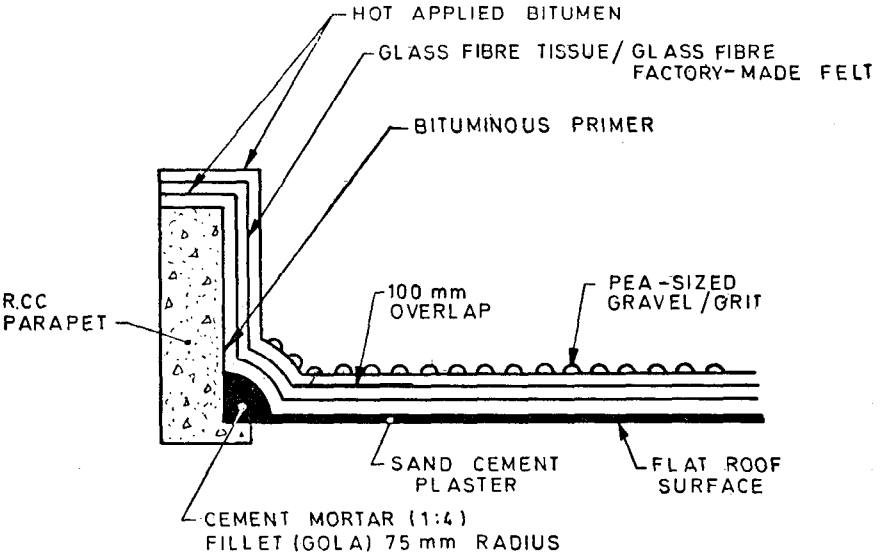


FIG. 3 WATERPROOFING ON A FLAT ROOF WITH RCC PARAPET 450 mm OR LESS IN HEIGHT-TYPICAL DETAILS

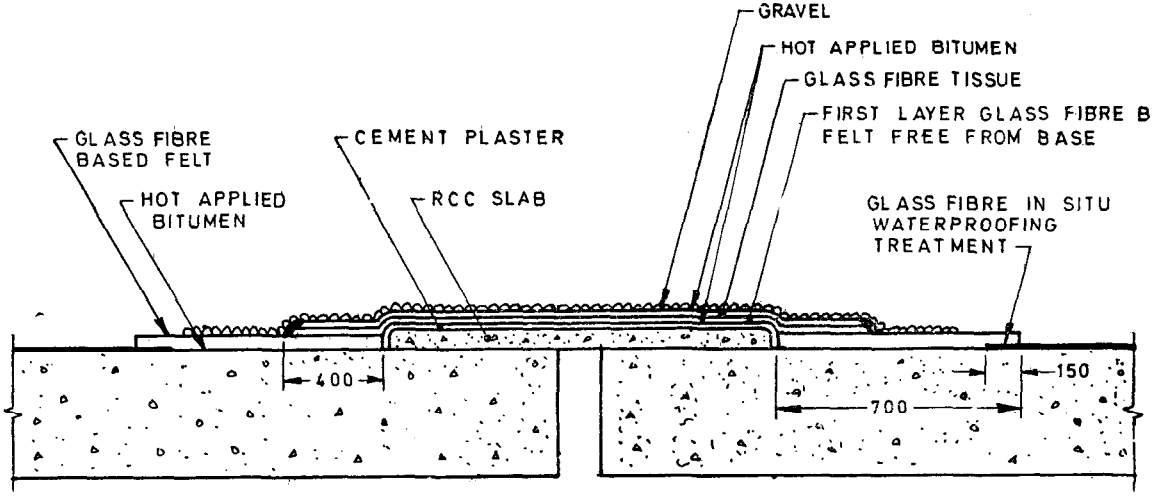
6.4 Precast Slab — In case of precast roofs, where the roofs have been graded with lime concrete and surfaces plastered, normal duty treatment with single layer of glass fibre tissue can be adopted as in **6.2**(a).

In case of precast sloping roofs, heavy duty treatment with two layers of glass fibre tissue is recommended as in **6.2**(b).

In case the precast roof is subjected to too much of structural movements of vibrations, then an additional layer of glass fibre tissue embedded in hot bitumen shall be provided over the joints.

6.5 Expansion Joints — In case of expansion joints two layers of glass fibre based felt Type 2 Grade I as per IS : 7193-1974* shall be laid loose overlapping one another with one end of the felt to be stuck with bitumen alternatively and finally covered with a layer of reinforced glass fibre tissue impregnated with hot bitumen. The entire treatment is to be laid as per IS : 1346-1976† with glass fibre base felt Type 2 Grade I. Typical details of waterproofing of expansion joint with glass fibre *in-situ* treatment on RCC roof slab is given in Fig. 4.

*Specification for glass fibre base coal tar pitch and bitumen felts.
†Code of practice for waterproofing of roofs with bitumen felts (*second revision*).



All dimensions in millimetres.

FIG. 4 WATERPROOFING OF EXPANSION JOINT WITH GLASS FIBRE IN-SITU TREATMENT ON RCC ROOF SLAB—TYPICAL DETAILS

6.6 Sloping Roofs — Typical details of special treatment for AC and GI corrugated roofing at joints is given in Fig. 5.

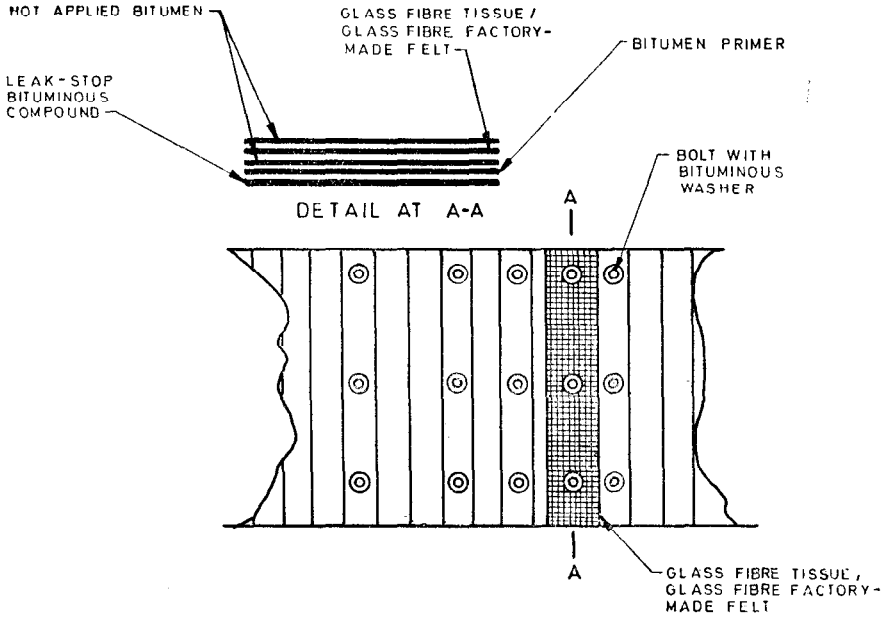


FIG. 5 SPECIAL TREATMENT FOR AC/GI CORRUGATED SURFACE JOINTS—TYPICAL DETAILS

7. *IN-SITU* DAMP-PROOFING TREATMENT FOR BASEMENTS AND STRUCTURES ABOVE AND BELOW GROUND LEVEL

7.1 *In-Situ* Damp-Proofing Treatment for Structures Above Ground Level — The following treatment is recommended:

a) *Normal Duty Treatment*

1) Clean and prime the surface with bitumen primer at the rate of 0·4 kg/m². This should properly embed the surface and should be left till the time it is touch dry.

2) Apply first coat of hot bitumen at the rate of 2·4 kg/m², *Min.*

3) Apply first layer of glass fibre tissue overlap shall be 100 mm between the layers in either direction.

4) Apply second coat of hot bitumen at the rate of 2·4 kg/m², *Min.*

b) *Heavy Duty Treatment*

1) Same as in **7.1**(a), items (1) to (4).

2) Apply second layer of glass fibre tissue. This layer of glass fibre tissue shall be embedded perpendicular to the earlier layer.

3) Apply third coat of hot bitumen at the rate of 2·4 kg/m², *Min*

7.2 *In-Situ* Damp-Proofing Treatment for Basements and Structures Below Ground Level — The following treatment is recommended:

a) *Normal Duty Treatment*

1) Clean and prime the walls with bitumen primer at the rate of 0·4 kg/m². This should properly embed the surface and should be left till the time it is touch dry.

2) Apply first coat of hot bitumen at the rate of 2·4 kg/m², *Min.*

3) Apply first layer of glass fibre tissue, overlap shall be 100 mm between the layers in either direction.

4) Apply second coat of hot bitumen at the rate of 2·4 kg/m², *Min.*

5) Apply second layer of glass fibre tissue. This layer of glass fibre tissue shall be embedded perpendicular to the earlier layer.

6) Apply third coat of hot bitumen at the rate of 2·4 kg/m², *Min.*

b) *Heavy Duty Treatment*

1) Same as in **7.2**(a), items (1) to (6).

2) Apply third layer of glass fibre tissue. This layer of glass fibre tissue shall be embedded perpendicular to the earlier layer.

3) Apply fourth coat of hot bitumen at the rate of 2·4 kg/m², *Min.*

c) *Extra Heavy Duty Treatment*

1) Same as in **7.2**(b), items (1) to (8).

2) Apply fourth layer of glass fibre tissue. This layer of glass fibre tissue shall be embedded perpendicular to the earlier layer.

3) Apply fifth coat of hot bitumen at the rate of 2·4 kg/m², *Min.*

NOTE 1 — Six-course treatment is recommended for normal conditions.

NOTE 2 — Eight-course treatment is recommended for severe conditions.

NOTE 3 — Ten-course treatment is suggested for very severe conditions.

NOTE 4 — A 10/15 mm thick coat of mastic asphalt, conforming to IS : 1195-1978* may be included at the option of the engineer-in-charge, over the basement floor treatment as an added protection to prevent any possible damage to the damp-proofing treatment. Any other suitable protection may also be included at the discretion of the engineer-in-charge concerned.

NOTE 5 — The basement wall treatment should be protected with a suitable lining, as may be suggested by the engineer-in-charge, against any possible damage while backfilling.

8. METHOD OF LAYING *IN-SITU* WATERPROOFING TREATMENT

8.1 Sequence of Operation for all Types of Roofs

a) Prepare the surface according to IS : 3067-1966† for roofs;

b) Clean and brush the surface to remove dirt;

c) Prime the cleaned surface with bitumen primer;

d) Treat the gutters and drain mouths as per IS : 1346-1976‡;

e) Treat the main roof;

f) Treat the protruding pipes;

g) Top dress with pea gravel, grit, heat reflective mastic or tiles, etc; and

h) Clean and remove surplus materials.

8.2 Procedure

a) Clean the surface to be treated with wire brushes;

b) Prime the entire surface with recommended primer;

c) Cut the required length of glass fibre tissue and roll it;

d) Pour hot bitumen on the surface to the extent of the roll width and simultaneously embed the glass fibre tissue into it. Proceed in this manner throughout the length of the roll. Precaution should be taken to ensure adequate sealing with bitumen at subsequent overlap;

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*Specification for bitumen mastic for flooring (*first revision*).

†Code of practice for general design, details and preparatory work for damp-proofing and waterproofing of buildings.

‡Code of practice for waterproofing of roofs with bitumen felts (*second revision*).

e) Apply a second coat of hot bitumen;

f) In case of multi-layer treatments the joints in the glass fibre tissue between successive layers should be staggered midway;

g) The minimum overlapping joints at the ends and sides of the strip of the tissue shall be 100 mm. All overlaps shall be firmly bonded with hot bitumen; and

h) The finishing materials like pea gravel and grit, surface dry free from dust are embedded into the hot bitumen while it is being poured, by applying minimum pressure.

NOTE — A list of equipment and tools required for laying is given in Appendix A.

9. METHOD OF LAYING *IN-SITU* DAMP-PROOFING TREATMENT

9.1 Preparation of Site

a) Prepare the surface according to IS : 3067-1966* and IS : 1609-1976†;

b) The site shall be kept free of water. To ensure good adhesion between structural surface and damp-proofing medium, suitable methods to dry the surface should be adopted wherever necessary; and

c) The wall should normally remain dry so that the first course of bitumen adheres to the wall without difficulty and the glass fibre tissue is properly impregnated by the bitumen.

9.2 Laying of Glass Fibre Tissue

a) Cut the required length of glass fibre tissue and roll it;

b) Pour hot bitumen on the surface to the extent of the roll width and simultaneously embed the glass fibre tissue into it. Proceed in this manner throughout the length of the roll;

c) After the whole floor has been covered in a similar manner and the overlapping joints properly sealed, the glass fibre tissue is laid on walls in the same way.

The roll of the glass fibre tissue is held at floor level and then gradually unrolled up the wall as the hot bitumen is poured between the roll and the wall face;

*Code of practice for general design, details and preparatory work for damp-proofing and waterproofing of buildings.

†Code of practice for laying damp-proofing treatment using bitumen felts (*second revision*).

d) The joints in the glass fibre tissue between successive layers should be staggered midway; and

e) The minimum overlapping joints at sides and ends of the strip of tissue shall be 100 mm. All overlaps shall be firmly bonded with hot bitumen.

NOTE — Care should be taken while laying heavy stone flooring furnish so as to avoid any damage to glass fibre tissue.

APPENDIX A

(*Clause* 8.2)

LIST OF EQUIPMENT AND TOOLS FOR LAYING OF *IN-SITU* GLASS FIBRE TREATMENT FOR WATER-PROOFING AND DAMP-PROOFING

A-1. The equipment needed for both *in-situ* and factory-made glass fibre felt waterproofing and damp-proofing treatments are:

Accessories, such as mineral turpentine, waste cotton, firewood and scaffolding

Axe
Bitumen melting kettle equipped with stirrer
Blow-torch
Cans and ropes
Chisel
Gum boots
Hammer
Hand gloves
Rubber squeegees
Scissors
Soft brushes
Spraying or watering cans
Spring Balance
Thermometers
Trowels
Wire brushes