

# Indian Standard

## CODE OF PRACTICE FOR FIXING RAINWATER GUTTERS AND DOWNPIPES FOR ROOF DRAINAGE

( First Revision )

Building Construction Practices Sectional Committee, BDC 13

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*Indian Standard*CODE OF PRACTICE FOR  
FIXING RAINWATER GUTTERS AND  
DOWNPIPES FOR ROOF DRAINAGE*( First Revision )*

## 0. FOREWORD

**0.1** This Indian Standard ( First Revision ) was adopted by the Indian Standards Institution on 14 March 1984, after the draft finalized by the Building Construction Practices Sectional Committee had been approved by the Civil Engineering Division Council.

**0.2** Rainwater gutters and downpipes are essential for prompt removal of incident rainfall on the roof. Efficient roof drainage is an important prerequisite for the economic maintenance of a building. Installation of rainwater gutters and pipes require careful attention to their capacity, position and alignment, water-tightness, accommodation for expansion, firmness of support, etc. This standard is intended to give guidance with regard to these details of work.

**0.2.1** This standard was first published in 1963. This is being revised to update the methods being followed for installation and efficient functioning of rainwater gutters and pipes. In this revision the use of *in situ* concrete gutters has been discontinued since they are normally not used. Further the fixing details of different types of gutters and pipes has been dealt in detail. The sizing of rainwater pipes has been modified.

**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 constructional details of rainwater gutters and downpipes and their fittings for roof drainage.

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

## 2. MATERIALS

**2.1 Rain-Water Pipes and Fittings** — These shall conform to IS : 1230-1979\* or IS : 1626 ( Part 1 )-1960† or IS : 1239 ( Part 1 )-1979‡.

**2.1.1** Downpipes shall be of cylindrical shape, unless otherwise specified.

**2.1.2** Rainwater gutters may also be constructed in concrete which is lined usually with bituminous material or with burnt clay products. Gutters may also be made of galvanized iron sheets not less than 1.25 mm in thickness and shall conform to IS : 277-1977§. The gutters shall be semicircular in section with a width at top about twice the diameter of the downpipe ( see Fig. 1 ).

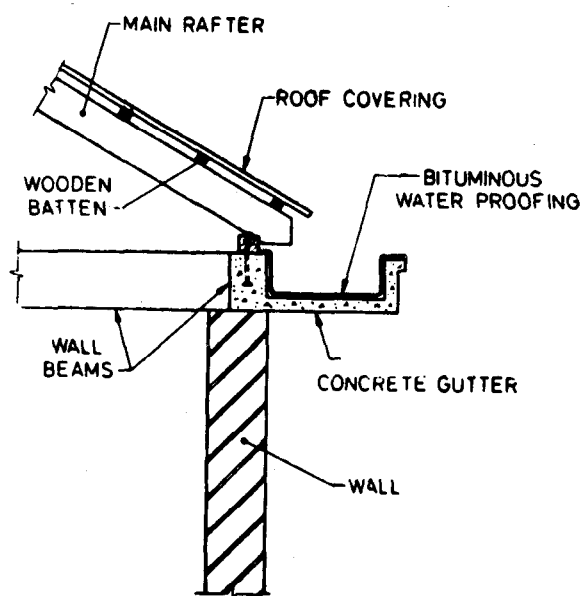


FIG. 1 TYPICAL DETAILS OF CONCRETE GUTTER FOR SLOPED ROOF

\*Specification for cast iron rainwater pipes and fittings ( second revision ).

†Specification for asbestos cement building pipes and pipe fittings, gutters and gutter fittings and roofing fittings: Part 1 Pipes and pipe fittings ( first revision ).

‡Specification for mild steel tubes, tubular and other wrought steel fittings: Part 1 Mild steel tubes ( fourth revision ).

§Specification for galvanized steel sheets ( plain and corrugated ) ( third revision ).

## 2.2 Stays for Sheet Metal Gutters

**2.2.1** Stays shall consist of metal tubes or other equivalent distance-pieces or may be an integral part of the supporting bracket, provided that the gutters is adequately reinforced to withstand all normal conditions of use. The size of stays shall not be less than the following values, and alternative designs shall be of equivalent strength:

- |                                                |                                                                   |
|------------------------------------------------|-------------------------------------------------------------------|
| a) For nominal size of gutter less than 120 mm | 12 mm diameter tube of thickness not less than that of the gutter |
| b) For nominal size of gutter above 120 mm     | 16 mm diameter tube of thickness not less than that of the gutter |

**2.2.2** Stays forming part of the supporting bracket shall be of such design that the assembly of bracket and stay is securely fixed in position. In all cases, the position of the stay shall be such as to interfere as little as practicable with the effective capacity of the gutter.

## 3. NECESSARY INFORMATION

**3.1** For the efficient planning and installation of rainwater pipes and gutters, detailed information with regard to the following is necessary:

- a) The maximum intensity of rainfall for which the roof drainage system is to be designed; and
- b) Local bye-laws, if any, governing house drainage, which will affect the design and installations of rainwater pipes and gutters.

**3.2** All information as in 3.1 shall be made available to those who are responsible for fixing rainwater pipes and gutters. Necessary drawings and instructions shall also be furnished.

## 4. STORAGE AND HANDLING OF MATERIALS

**4.1** The storage and handling of gutters and pipes shall be done in accordance with IS : 4082-1977\*.

## 5. DESIGN CONSIDERATIONS

**5.1 General** — The roof of a building shall be so designed, constructed and framed as to permit effectual drainage of the rainwater by sufficient number of pipes and gutters of adequate size, so arranged, jointed and fixed as to ensure quick carriage of rainwater away from the roof without causing dampness.

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\*Recommendations on stacking and storage of construction materials at site (first revision).

**5.1.1 Capacity** — The gutters of downpipes shall have sufficient cross-sectional area and slope to ensure collection and removal of water even in the case of the heaviest rainfall without risk of dangerous accumulation. The orientation of the building and the exposure of the site may also affect the quantity of rainfall which the roof receives and so attention should also be paid to such factors.

## 5.2 Rainwater Gutters

**5.2.1 Slope** — The slope for the roof gutters shall normally be not less than 1 in 150.

**5.2.2 Flow Capacity** — The flow capacities for gutters with the minimum slope stated in 5.2.1 and with outlet at one end will be as given in Table 1.

**TABLE 1 FLOW CAPACITIES FOR LEVEL GUTTERS  
WITH OUTLET AT ONE END**

| SIZE | FLOW IN LITRES PER MINUTE IN VARIOUS TYPES OF GUTTERS |                           |                                             |                     |
|------|-------------------------------------------------------|---------------------------|---------------------------------------------|---------------------|
|      | Sheet Steel<br>or Asbestos<br>Cement — Half<br>Round  | Cast Iron — Half<br>Round | Sheet Steel<br>or Asbestos<br>Cement — Ogee | Cast Iron —<br>Ogee |
| (1)  | (2)                                                   | (3)                       | (4)                                         | (5)                 |
| mm   |                                                       |                           |                                             |                     |
| 75   | 35                                                    | 25                        | —                                           | —                   |
| 100  | 70                                                    | 55                        | 90                                          | 75                  |
| 115  | 95                                                    | 70                        | 125                                         | 115                 |
| 125  | 125                                                   | 90                        | 150                                         | 145                 |
| 150  | 195                                                   | 150                       | 240                                         | 220                 |

**5.2.2.1 Effect of bends** — Where gutters have bends, the flow capacity will be reduced. In the case of right-angled bend the reduction of flow capacity will be about 25 percent.

**5.2.2.2 Effect of outlets and downpipes** — The shape, size and position of the outlet and downpipe will affect the flow capacity of the gutter. Round-cornered outlet will give a smoother flow than sharp-cornered ones. The position of the outlet will also affect the flow capacity of the gutter but in deciding the location of the outlet, several factors, such as ease of connection to the disposal system and the appearance, have also to be considered. When the outlet is placed centrally in the length of a gutter, capacity required will be one-half of that needed for an end-outlet.

**5.2.2.3 Effect of roof edge in discharging the water into the gutter**— The manner in which the water leaves the edge of a roof varies with the kind of roof covering used, and this will influence the location at which the gutters shall be fixed. Where, as for instance in a slate roof, the water leaves the edge with very little spread to front or rear, the position of the gutter may be centrally under the edge, on the other hand where the water leaves the edge with a wide spread; such as in the case of clay pantiles (with sharp upper corner to the edge), the gutter shall be close to the edge with its centre slightly forward to the under edge of the roof. Where the lower corner of the roof edge is rounded, the water may be deflected more to the rear, and the centre of the gutter may preferably also than be placed slightly to the rear. The most satisfactory roof edge will be one with the upper corner round and the lower corner sharp.

### 5.3 Sizes of Rainwater Pipes

**5.3.1** The sizes of downpipes suitable for variable gutters shall be as given in Table 2 with a variation of  $\pm 5$  mm.

**TABLE 2 SIZES OF DOWNPIPES SUITABLE FOR VARIOUS SIZES OR HALF-ROUND GUTTERS**

| SIZE OF GUTTER | SIZE OF PIPE              |                                                                |                           |                                                                |
|----------------|---------------------------|----------------------------------------------------------------|---------------------------|----------------------------------------------------------------|
|                | For Sharp Cornered Outlet |                                                                | For Round Cornered Outlet |                                                                |
|                | With outlet at one end    | With outlet at any intermediate position in the length of pipe | With outlet at one end    | With outlet at any intermediate position in the length of pipe |
| mm             | mm                        | mm                                                             | mm                        | mm                                                             |
| 75             | 50                        | 50                                                             | 50                        | 50                                                             |
| 100            | 65                        | 65                                                             | 50                        | 50                                                             |
| 115            | 65                        | 75                                                             | 50                        | 65                                                             |
| 125            | 75                        | 90                                                             | 65                        | 75                                                             |
| 150            | 90                        | 100                                                            | 75                        | 100                                                            |

NOTE — Sizes other than those specified in the table may be adopted, if specific calculations for flow prove their suitability.

**5.3.2 Rainwater Pipe**— Sizes of rainwater pipes shall be in accordance with Table 3.

**5.3.3** The pipes shall be so designed as to give a velocity of flow not less than 1 m/s where running half full. The maximum velocity shall not exceed 2.5 m/s.

TABLE 3 SIZES OF RAINWATER PIPES FOR ROOF DRAINAGE

| SL No. | DIA OF PIPE<br>mm | AVERAGE RATE OF RAINFALL IN mm/h |      |      |      |      |      |
|--------|-------------------|----------------------------------|------|------|------|------|------|
|        |                   | 50                               | 75   | 100  | 125  | 150  | 200  |
|        |                   | Roof Areas, m <sup>2</sup>       |      |      |      |      |      |
| i)     | 50                | 13.4                             | 8.7  | 6.6  | 5.3  | 4.4  | 3.3  |
| ii)    | 65                | 24.1                             | 16.0 | 12.0 | 9.6  | 8.0  | 6.0  |
| iii)   | 75                | 40.8                             | 27.0 | 20.4 | 16.3 | 13.6 | 10.2 |
| iv)    | 100               | 85.4                             | 57.0 | 42.7 | 34.2 | 28.5 | 21.3 |
| v)     | 125               | —                                | —    | 80.5 | 64.3 | 53.5 | 40.0 |
| vi)    | 150               | —                                | —    | —    | —    | 83.6 | 62.7 |

**5.3.4** A bell mouth inlet at the roof surface is found to give better drainage effect provided proper slopes are given to the roof surface. The spacing of pipes depends on the position of windows and openings but 6 m apart is a reasonable distance.

**5.4 Water-Tightness** — All junctions and joints shall be thoroughly water-tight, riveted, belted and soldered. Joints between successive length of gutters shall have an overlap of at least 50 mm. The drop in the overlap of the gutter shall always be in the direction of the fall. Ends of guttering shall be closed with galvanized sheets not less than 1.215 mm in thickness to fit the section and made water-tight. Junctions with downwater pipes shall be made water-tight.

### 5.5 Strength and Stability

**5.5.1** Gutters if located at the exterior like the eaves and roof edges will be subject to high wind velocities. The effect of zones of very low pressure for certain angles of incidence of the wind shall, therefore be taken into account in the design and reference may be made to IS : 875-1964\*. Gutters shall be fixed 25 mm below the edges of the roof supported with brackets at about 1.25 m intervals. Roof gutters if required may also be designed for occasional live loads which are likely to occur during erection and other operations.

### 5.6 Allowance for Expansion of Shrinkage

**5.6.1** Variations in temperature, and for materials other than metal, differences in relative humidity, will cause linear changes resulting in displacements of gutters and pipes in relation to the building, and necessary allowance shall be made for free expansion to prevent any undue stresses in them or blistering and cracking of the outer finish.

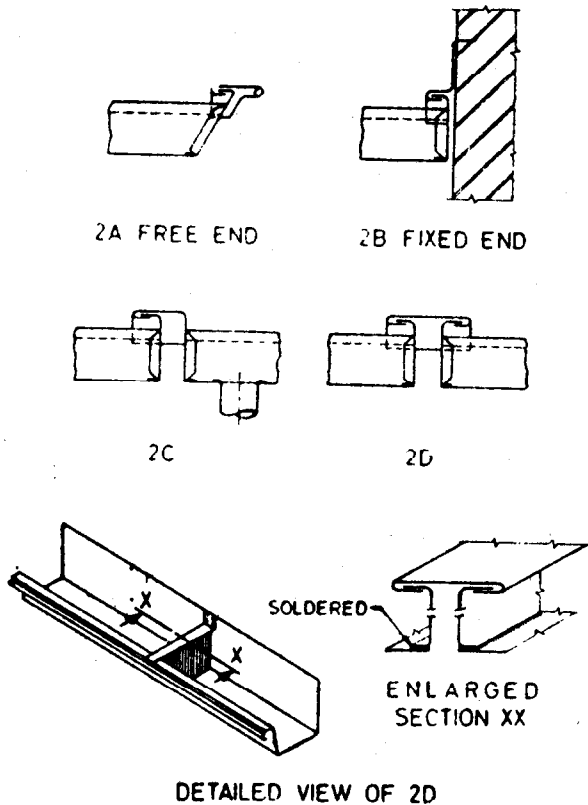
\*Code of practice for structural safety of buildings: Loading standards (revised).



**5.6.1.1** Provision made for expansion of gutters (*see* 5.6.1.2) shall accommodate their linear changes. Where the expansion accommodated is less than 20 mm, the length of the gutter between the expansion joints shall not exceed 30 m for sheet steel, asbestos cement or cast iron gutters.

**5.6.1.2** The expansion devices for gutters may be provided as follows:

- a) For sheet metal gutters the expansion joints shall be provided as in Fig. 2;



**FIG. 2** TYPICAL DETAILS OF EXPANSION JOINT FOR SHEET METAL GUTTER LINING

- b) For bituminous lining over wooden or similar backing, joint shall also be provided for lateral expansion as in Fig. 3; and
- c) For concrete gutters expansion joints shall be provided in the same manner as for reinforced concrete slabs.

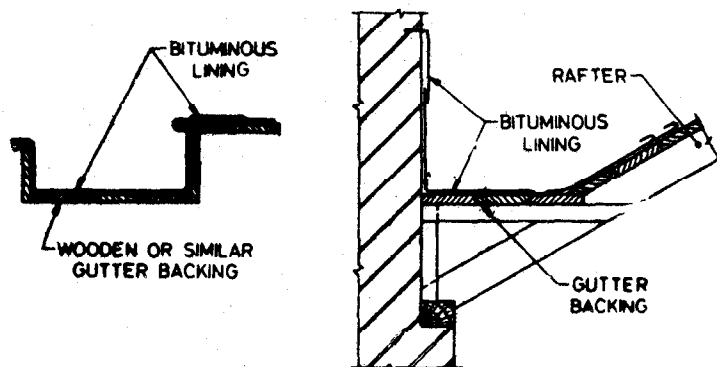


FIG. 3 TYPICAL DETAILS FOR ACCOMMODATION OF LATERAL EXPANSION IN FLEXIBLE LINING IN GUTTERS

## 6. PROGRAMMING OF THE WORK

6.1 The rainwater pipes shall be fixed to the outside of the external walls of the building or in recesses or chases cut or frame in such external wall. Work to the extent necessary for supporting the rainwater fittings properly in position shall be completed before the person entrusted with the job of fixing rainwater gutters and pipes starts his work. Any plaster finish in building work near the location of the downpipe shall be completed before fixing of the downpipe. Hold fasts and clamps for the pipes may also preferably be fixed to the wall before plastering, so as to avoid disturbing the plaster finish later.

## 7. FIXING DETAILS

### 7.1 Rainwater Gutters

7.1.1 *Asbestos Cement Gutters* — Gutters shall be laid with a minimum fall of 1 in 150 which should be increased where possible. Gutters shall be true to line and slope and shall be laid with the requisite accessories such as drop ends, stop ends, nozzles, angles and union clips as directed. The size of outlet of drops ends and nozzles shall be same as the size of the rainwater pipes into which they discharge water. The requisite slope

in the gutter shall be given in the line of brackets. The brackets shall be placed at not more than 900 mm centre.

**7.1.1.1** Socketed gutters shall be supported with a bracket close to the socket and another in the centre of the gutter. Plain-ended gutters shall be supported with a bracket on either side of each joint; and for gutters of large size, one extra supporting bracket in the centre of the gutter shall be fixed.

**7.1.1.2** Brackets shall be fabricated from mild steel flats and mild steel rods (see Fig. 4). All brackets shall be provided with a suitable means of securing the gutters in position at the back.

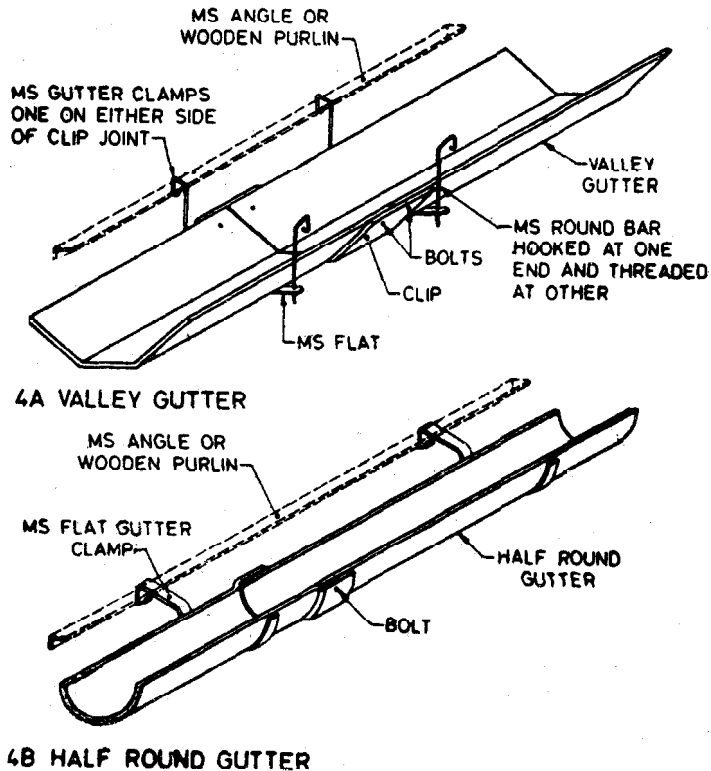


FIG. 4 FIXING OF ASBESTOS CEMENT GUTTERS

**7.1.1.3** The angular space between the socket and the spigot shall be filled with a few turns of spun yarn soaked in bitumastic jointing compound. It shall be pressed home by means of a caulking tool. More

skeins of yarn shall be wrapped, if necessary, and well rammed home. The joint shall then be finished with bitumastic compound at an angle of 45°.

**7.1.2 Sheet Metal Gutters** — These gutters shall be fabricated from galvanized iron sheets not less than 1.25 mm in thickness and may be stiffened with stays where necessary. The spacing of stays should not exceed 400 mm. Stays of the tubular pattern shall be soldered in position in the gutter.

**7.1.2.1 Jointing** — All joints shall be lapped and soldered for at least 40 mm in the direction of flow. In case where the joints are soldered, the jointing faces of sheet metal gutters shall be primed with solder to ensure running of the jointing metal. Soldering of the resulting joint throughout the full girth of the gutter and to the full extent in the lap shall be ensured. Jointing may also be done by press-folding of the jointing faces.

**7.1.2.2 Fixing** — Gutter shall be laid with a minimum fall of 1 in 150. All gutters shall be supported at centres not exceeding 750 mm and supporting brackets or screws shall normally coincide with alternate stays. Where brackets are to be fixed to the side of rafters, they shall be bent to shape and fixed rigidly to the sides of rafter with 10 mm dia bolt. The brackets shall lap with rafter not less than 300 mm and connecting bolts shall be at 120 mm centres. Where the brackets are to be fixed to the purlins the brackets shall be bent to shape with one end turned at right angle and fixed to the purlin face with 10 mm dia bolt, nut and washer. The perpendicular over hung portion of the bent to shape shall be fixed to the brackets with 2 No. 6 mm dia bolt. The requisite slope in the gutter shall be given in the line bracket. The brackets shall be placed at not more than 1 200 mm. For connection to down take pipes, a proper drop end or funnel shaped connecting piece shall be made out of sheet of the same thickness as the gutter and riveted to the gutter the other end tailing into the socket of the rainwater pipe. The gutter when fixed shall be true to line and slope and shall be water-tight.

## 7.2 Rainwater Pipes

**7.2.1 Cast Iron Pipes** — The pipes and fittings shall be fixed in vertical alignment unless otherwise specified. The pipe and fittings shall be secured to the walls. Wooden cleats shall be inserted so that the pipes and fittings are kept at a distance of not less than 30 mm from the wall to facilitate cleaning, painting, etc. If not provided with lugs, the pipes shall be secured to the wall at all joints by means of mild steel or cast iron holder bat clamp (*see* IS : 1230-1979\*). Pipes which are provided

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\*Specification for cast iron rainwater pipes and fittings (*second revision*).

with suitable lugs may be directly fixed to the wall by means of screws inserted into suitable wall plugs (see Fig. 5).

**7.2.2 Asbestos Cement Pipes** — The pipe and fittings shall be fixed in vertical alignment unless otherwise specified. The pipe and fittings shall be secured to the walls with mild steel holder bat clamps in the same manner as given in 7.2.1 for cast iron pipes.

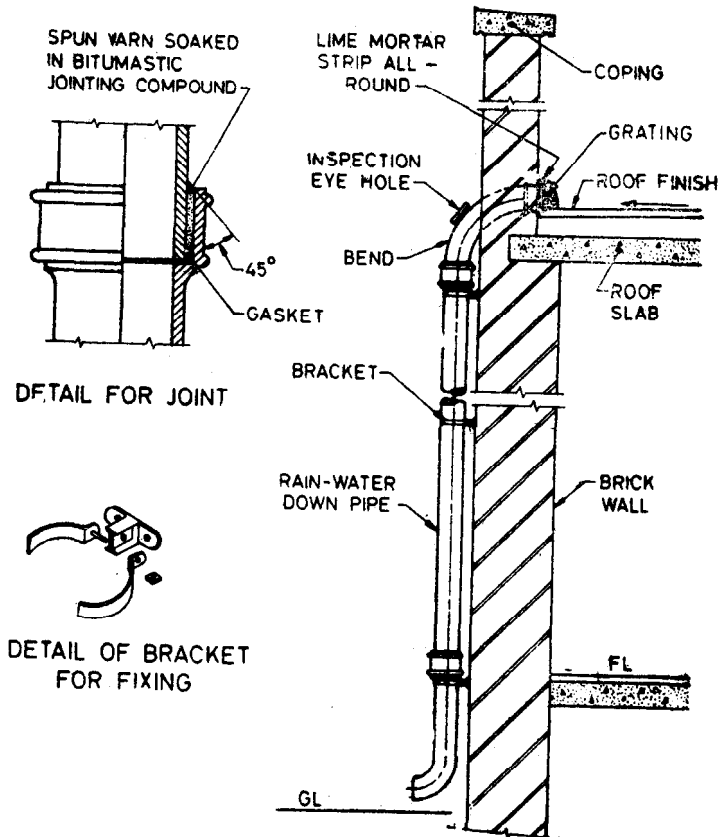


FIG. 5 A TYPICAL DETAIL SHOWING FIXING OF DOWNPIPES TO WALL FOR ROOF DRAINAGE

**7.2.2.1 Jointing** — The annular space between the socket and the spigot shall be filled with spun yarn soaked in bitumastic jointing compound. It shall be pressed home by means of a caulking tool. More skeins of yarn shall be wrapped, if necessary, and well rammed home

The joint shall then be finished with bitumastic compound at an angle of  $45^\circ$ .

**7.2.3 Sheet Metal Pipes** — The pipes shall be held by clamps fixed to the structure by means of wood screw inserted into suitable wall plugs. Where it is required to fix the pipe clear of the wall, a hardwood block shall be used and shall be secured in place by screws inserted into suitable wall plugs. The overall size of the block shall be the same as that of the 'ears' of the pipe so as to afford full support to their entire surface (see Fig 6)

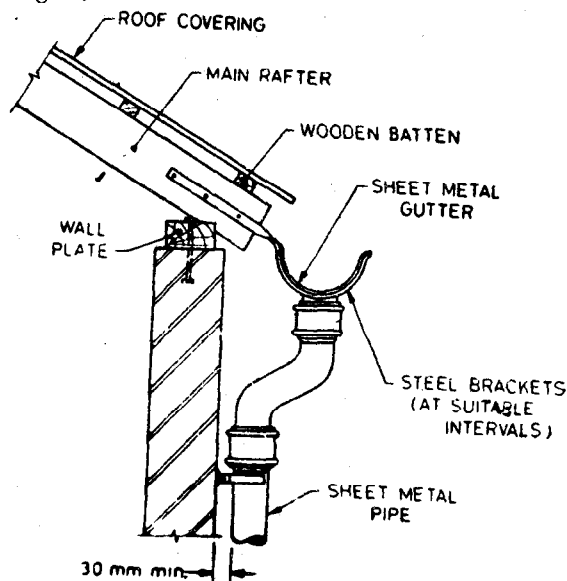


FIG. 6 A TYPICAL DETAIL OF FIXING OF SHEET METAL GUTTERS AND DOWNPIPES FOR SLOPED ROOF

## 8. INSPECTION AND MAINTENANCE

**8.1** All gutter pipes and sockets shall be carefully examined for defects before they are installed and also on completion of the work. Each pipe shall be rung with a hammer or mallet and those that do not ring true and clear be rejected. Sound pipes shall be carefully stored to prevent damage and blockage. Cast iron pipes shall be carefully examined for damage of protective coating.

**8.2** The gutters and pipe shall be inspected at regular intervals and any defect discovered shall be made good.

( Continued from page 2 )

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IS:

- 1414-1962 Code of practice for fixing wall coverings
- 1649-1962 Code of practice for design and construction of flues and chimneys for domestic heating appliances (*first revision*)
- 1946-1961 Code of practice for use of fixing devices in walls, ceilings and floors of solid construction
- 2441-1963 Code of practice for fixing ceiling covering
- 2527-1984 Code of practice for fixing rainwater gutters and downpipes for roof drainage (*first revision*)
- 3548-1966 Code of practice for glazing in buildings
- 4101 (Part 1)-1967 Code of practice for external facing and veneers: Part 1 Stone facing
- 1401 (Part 2)-1967 Code of practice for external facing and veneers: Part 2 Cement concrete facing
- 4101 (Part 3)-1968 Code of practice for external facing and veneers: Part 3 Wall tiling and mosaics
- 4407-1967 Code of practice for reed walling
- 5119 (Part 1)-1968 Code of practice for laying and fixing of slopped roof coverings: Part 1 Slating
- 10439-1983 Code of practice for patent glazing



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| †Eastern : 1/14 C. I. T. Scheme VII M<br>V.J.P. Road, Manikata<br>CALCUTTA 700054 | 36 24 99                           |
| Northern : SCD 445-446, Sector 35-C<br>CHANDIGARH 160036                          | { 2 18 43<br>3 16 41               |
| Southern : C. I. T. Campus<br>MADRAS 600113                                       | { 41 24 42<br>41 25 19<br>41 29 16 |

## Branch Offices:

|                                                                           |                        |
|---------------------------------------------------------------------------|------------------------|
| 'Pushpak', Nurmohamed Shaikh Marg, Khanpur<br>AHMADABAD 380001            | { 2 63 48<br>2 63 49   |
| F' Block, Unity Bldg. Narasimharaja Square<br>BANGALORE 560002            | 22 48 05               |
| Gangotri Complex, 5th Floor, Bhadbhada Road, T. T. Nagar<br>BHOPAL 462003 | 6 67 16                |
| Plot No. 82/83, Lewis Road, BHUBANESHWAR 751002                           | 5 36 27                |
| 53/5 Ward No. 29, R. G. Barua Road, 5th Byelane<br>GUWAHATI 781003        | —                      |
| 5-8-56C L. N. Gupta Marg, HYDERABAD 500001                                | 22 10 83               |
| R14 Yudhistar Marg, C Scheme, JAIPUR 302005                               | { 6 34 71<br>6 98 32   |
| 117/416 B Sarvodaya Nagar, KANPUR 208005                                  | { 21 68 76<br>21 82 92 |
| Pailiputra Industrial Estate, PATNA 800013                                | 6 23 05                |
| Hantex Bldg (2nd Floor), Rly Station Road, TRIVANDRUM 695001              | 52 27                  |

## Inspection Office (With Sale Point):

|                                                                                |         |
|--------------------------------------------------------------------------------|---------|
| Institution of Engineers ( India ) Building, 1332 Shivaji Nagar<br>PUNE 411005 | 5 24 35 |
|--------------------------------------------------------------------------------|---------|

\*Sales Office in Bombay is at Novelty Chambers, Grant Road.  
BOMBAY 400007 89 65 28

†Sales Office in Calcutta is at 5 Chowringhee Approach,  
P.O. Princep Street, CALCUTTA 700072 27 68 00