SRI LANKA STANDARD 876 : Part 2 : 1999

UDC 691.424 : 666.961

CODE OF PRACTICE FOR INSTALLATION OF ASBESTOS-CEMENT CORRUGATED SHEETS AND FIXING ACCESSORIES

PART 2 : INSTALLATION AND MAINTENANCE

SRI LANKA STANDARDS INSTITUTION

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CODE OF PRACTICE FOR INSTALLATION OF ASBESTOS - CEMENT CORRUGATED SHEETS AND FIXING ACCESSORIES PART 2 INSTALLATION AND MAINTENANCE

SLS 876 : Part 2 : 1999

Gr. 14

SRI LANKA STANDARDS INSTITUTION
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SRI LANKA

Sri Lanka Standards are subject to periodical revision in order to accommodate the progress made by industry. Suggestions for improvement will be recorded and brought to the notice of the Committees to which the revisions are entrusted.

This standard does not purport to include all the necessary provisions of a contract.

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FIGURES (*CONT.....*)

SRI LANKA STANDARD
CODE OF PRACTICE FOR INSTALLATION OF ASBESTOS-CEMENT CORRUGATED SHEETS AND FIXING ACCESSORIES. PART 2 INSTALLATION AND MAINTENANCE

FOREWORD

This code of practice was approved by the Sectoral Committee on Building and Construction Materials and was authorized for adoption and publication as a Sri Lanka Standard by the Council of the Sri Lanka Standards Institution on 1999-02-11.

Asbestos-cement corrugated sheets are commonly used in Sri Lanka for providing surfaces exposed to weather, such as roofs of industrial, institutional, commercial, temporary and residential buildings and walls of industrial and temporary buildings. Asbestos - cement corrugated sheets have many advantages, such as lightness, ease and quickness of construction, durability, long maintenance free service life, better security and greater economy. During construction it is also necessary to exercise caution in drilling., cutting and handling these sheets. Thus to realize the full potential of this type of covering, proper selection of various accessories, sound design and good workmanship are essential. This code is intended to give necessary guidance on those aspects to obtain optimum performance in the use of asbestos-cement corrugated sheets.

The information given in the Appendix of the now superseded **CS 9 : 1967** served as a nucleus in developing this standard. This information was suitably modified and was considerably enlarged to bring in line with the latest developments before incorporation herein.

This part of the standard deals with precautionary measures, tools and equipment for installation, installation and maintenance of roofs or wall clads with asbestos-cement corrugated sheets. Part 1 of this standard covers components and design considerations.

The Sri Lanka Standards institution gratefully acknowledges the use of the following standards as guidance documents in the preparation of this standard:

ISO 8108	: 1986 -	Directive for fixing asbestos-cement corrugated and asymmetrical section sheets and fittings for roofing
BS 5247	: 1975 -	Code of practice for sheets roof and wall coverings Part 14 - Corrugated asbestos -cement
IS 3007	: 1964 -	Code of practice for laying of asbestos sheets Part 1 - Corrugated sheets

1 SCOPE

This part of the standard deals with precautionary measures, tools and equipments for installation, installation inspection and maintenance of roofs or wall clads with asbestos-cement corrugated sheets.

2 REFERENCES

SLS 876 Installation of asbestos-cement corrugated sheets and fixing accessories Part 1: components and design considerations.

3 DEFINITIONS

For the purpose of this part of the standard definitions given in part 1 and the following shall apply.

3.1 sward : Chips or filings of asbestos -cement, wood, metal etc.

4. PRECAUTIONARY MEASURES

4.1 General

Any dust liberated during the handling and working of these products should be maintained at a low level. Asbestos-cement products normally contain only a small percentage of asbestos and are safe to handle. Where a limited amount of cutting, such as mitring, is done in the open air, the dust level is generally low.

Where possible non-powered hand tools shall be used. The majority of these tools produce a small quantity of predominantly coarser dust or waste chips. Wetting the asbestos-cement sheets, further reduces the release of dust when cutting. Abrasive disc tools shall not be used for high speed cutting. Dry cutting with these tools generates an accepted high speed method and water cooled diamond tipped portable power saws are available. Work with asbestos-cement products shall be carried out in well ventilated areas and, where possible, in the open air. When it is necessary to sweep floors, the area involved shall be wetted to suppress the dust. Approved respiratory equipment shall be used when required.

An important aspect of dust control is constant attention to good housekeeping on the job with regular clean-ups to ensure that there is minimal dust dispersion from dust and swarf around the work operation or from disturbance of waste off-cuts. Dust and swarf should be swept after wetting.

Where damaged and unusable asbestos-cement sheets and pieces are to be disposed, it shall be transported in a wet condition and buried in a pit.

4.2 Transport, handling and storage

Care shall be taken that sheets and accessories are not damaged during transport and handling, and they should be protected from damage while stored on site. Avoid, as much as possible, dragging sheets from stacks or dropping sheets onto stacks which could release dust into the working environment. Materials shall be carefully stacked in the sheltered positions preferably near to the parts of the building on which they will be fixed, so that sheets are clean and dry. Any material that is damaged shall not be fixed.

All stacking, handling and working of asbestos-cement materials where practicable shall be carried out within a designated work area in the site and this area shall be cleaned regularly. Damaged materials shall not be stacked.

Sheets shall be stacked to a height of not more than 1 m on firm and level ground, with timber or other packing beneath them. It is advisable to stack the sheets on a platform of 50 mm x 100 mm timber set at not more than 450 mm centres. Never stack the sheets on end or edge. Sheets shall be lifted by the ends only.

If stacks are placed in an exposed position, they shall be protected from damage by the wind.

All sheets and fittings, including gutters and downpipes, brackets, fixing bolts or screws and any accessories required for a particular sheeted area, shall be available at site before the work is commenced.

4.3 Walkways and roof boards

For occasional access a worker may be permitted to walk barefooted or crawl (when too steep for walking) carefully on an asbestos-sheeted roof. Where it is necessary to give regular access to rooflights or other places likely to need periodical attention, permanent walkways or roof boards should be provided.

Permanent walkways should be securely fixed to the roof supporting structure and should be clear of the sheeting. Where supports penetrate the roof covering, the apertures so formed should be properly protected from weather by the use of a glavanized iron or aluminium or bituminous sheet flashing dressed over them.

If permanent walkways are not provided, roof boards should be available for use at any time that inspection or repairs to the roof are necessary. Roof boards should be designed and placed so that there is no risk of sliding, rocking or displacement. Roof board shall not be less than 375 mm wide. The battens or cross pieces of roof board shall not project beyond the edges of the board and shall be properly secured to the board. For steeper roof slopes, tied or anchored cat ladders are preferred.

5 INSTALLATION

5.1 Tools and equipment for installation.

The usual carpenter's hand tools are all that are necessary to install asbestos-cement sheets, but the following additional equipment will expedite cutting and drilling operations:

a) Drilling - A hand-drill with correct size bits, shall be used for drilling the holes.

b) Sawing - A carpenter's hand saw may be used where excessive cutting is not required. Where considerable cutting is required, a wet cutting power saw equipped with a tungsten carbide tipped blade is recommended.

c) Scoring and snapping - Corrugated asbestos-cement sheets can be cut along a longitudinal direction by scoring them deeply with a pointed tool and breaking along the scored line over the edge of a timber board. The edges may be smoothed down with a file.

d) Cutting jigs and tables - Various shearing and cutting tools, jigs and tables may be used for large jobs and will expedite cutting.

5.2 Cutting and drilling

Asbestos-cement sheet may be cut and drilled as necessary but holes shall not be punched. Punching not only splays an aperture, thus weakening the material at vulnerable points, but is also likely to commence a fracture of the sheet which will ultimately open out in weathering.

When cutting sheets with hand operated tools in the open air (i.e. a scoring knife for score-and-snap cutting, a 'fibre cutter' for guillotine cutting and large tooth handsaw or wood saw) special precautions other than clean-up of waste and removal of dust from clothes, are not required. Greater care to suppress dust is required when working indoors, particularly in confined spaces. Avoid using power tools with abrasive or masonry discs to cut any form of asbestos material. It is preferable to cut corrugated asbestos-cement sheets singly with a large handsaw. When cutting with power tools, and approved respirator must be worn.

Avoid sheet drilling on sheet, edge trimming, or rasping overhead. Where this work is necessary an approved respirator shall be worn. Wherever possible, pre-drill the sheets and rasp the edges (underhand) before fixing sheet in any overhead situation.

Wherever possible, use a hammer and punch to remove waste and form cut-out holes through sheets for services etc. Only use a power drill (underhand) when hammer and punch is unsuitable.

The holes for fixings should be 2 mm larger in diameter than that of the bolt or fixing screw used and roof sheeting shall always be drilled through the crown of the corrugation.

Holes for fixing the sheeting shall be drilled in exact positions to suit the purlins or rails, i.e. on the centre line of timber supports when screw are used or as close as possible to the back of metal, timber or concrete support where hook bolts are used. It is usual, therefore, to drill the holes on the roof with the sheeting in position. With cold rolled purlins it is advisable to pre-drill the bolt holes in the tail of the sheets, at a pre-determined and constant distance before fixing, whilst maintaining a constant spacing of purlins. No hole shall be nearer than 40 mm to any edge of a sheet.

5.3 Laying the sheeting

The purlin spacing and the length of the sheets shall first be checked to see that the arrangement will provide the laps required and the specified overhang at the eaves. The corrugated sheets shall be laid with the smooth side upwards and with the side and end laps specified in Clause **5.2.2 of SLS 876 : Part 1 : 1999**, the courses of sheets shall be so laid that the corrugations run in continuous straight lines.

The corrugated sheets shall be placed either after cutting the corners (see Figure **1**) (this is called "Laying sheets with mitred corners"), or without cutting the corners (see Figure **2**) (this is called laying sheets with staggered junctions).

In the case of laying sheets with mitred corners, the sheets shall be placed from the eave towards the ridge in rows perpendicular to the eave.

In the case of laying sheets with staggered junctions, the sheets shall be placed from the eave towards the ridge in rows parallel to the eave, and the corresponding longitudinal overlap of two adjacent rows shall be staggered by one corrugation. Width of a corner sheet may vary from normal width to a minimum width of 3 corrugations, and this method has not found favour in Sri Lanka yet.

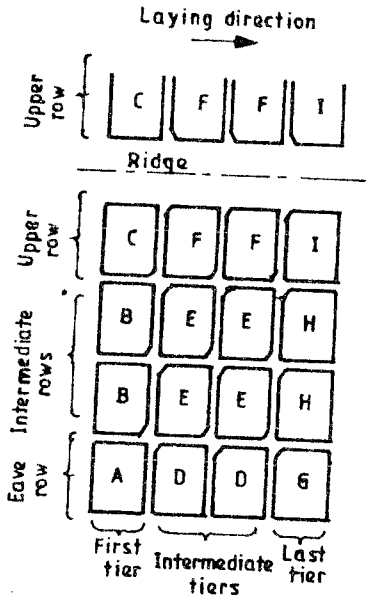


FIGURE 1 – Laying sheets with mitred corners

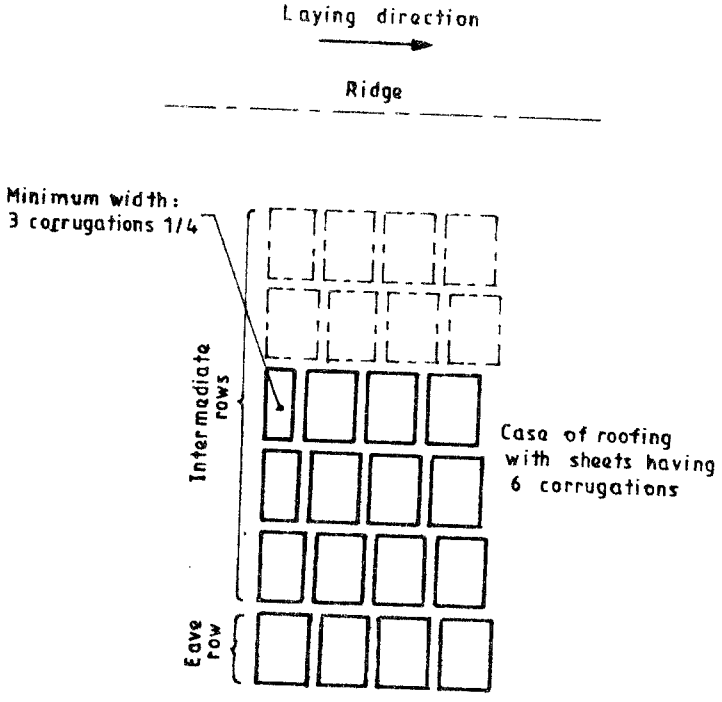


FIGURE 2 – Laying sheets with staggered junctions

If a building is in an exposed position and is subject to driving winds and rain, it is advisable to commence laying the sheets from the end opposite to the direction of prevailing winds.

The free overhang at eaves should not be more than 150 mm. The longer sheets should be placed over the eaves overhang.

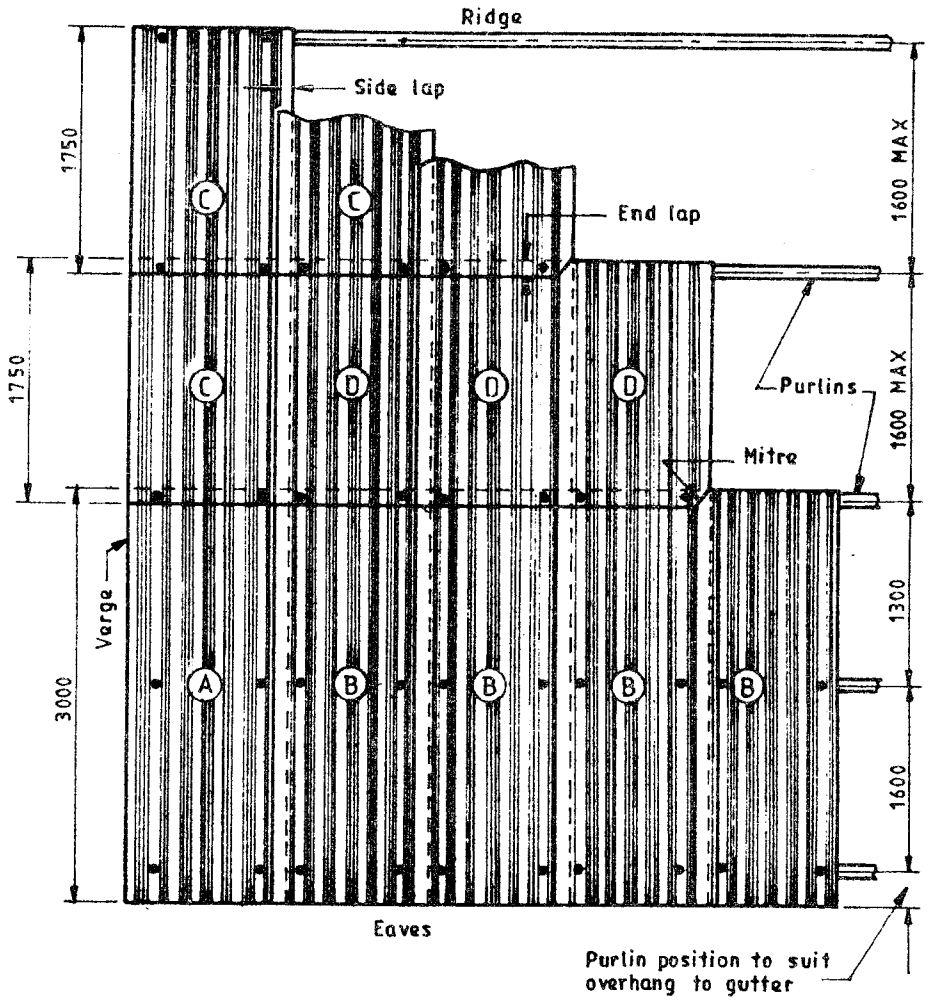
Asbestos-cement corrugated sheets shall be laid, starting at the eaves either from left to right or from right to left depending upon the prevailing direction of the wind. If laid from left to right (see Figure 3) the first sheet shall be laid uncut, but the remaining sheets in the bottom row shall have the top left hand corners cut or mitred. The sheets in the second and other intermediate rows shall have the bottom right-hand corner of the first sheet cut, all other sheets except the last sheet shall have both the bottom right-hand corner and top left-hand corner cut; the last sheet shall have only the top left-hand corner cut. The last or the top row sheets shall all have the bottom right-hand corner cut with the exception of the last sheet which shall be laid uncut.

If the sheets are laid from right to left, the first sheet shall be laid uncut and remaining procedure shall be reversed. The mitre or cut described above is necessary to provide a snug fit where four sheets meet at a lap. This is formed with a cut from a point approximately 150 mm (or whatever the length of the end lap may be) up the vertical side of the sheet to a point 45 mm along the horizontal edge. This cutting shall be done with an ordinary wood saw at site.

The top end of each sheet shall extend a minimum of 50 mm above the fixing position. (This dimension may be increased to accommodate standard sheet lengths and where the tail of the sheet cannot be extended.) The remainder, and majority, of the sheet end laps should be downslope below the fixing accessory extending 100 mm below the fixing point (two third the lap length) for 150 mm laps and 250 mm below the fixing point for 300 mm laps.

Close laying of the sheets at the junction of side and end laps is essential. This is obtained where four sheets intersect by diagonally mitring, as explained above, the two intermediate sheets where they overlap at the corners so that they lie in one plane. The mitred joint is covered top and bottom by the other two sheets and is unseen.

Care shall be taken when mitring sheets to ensure that the gap left between the two sheets is not too large. A minimum gap of 3 mm and a maximum gap of 6 mm between the edges of the two mitred sheets shall be maintained if possible. Open mitres will affect the weathertightness of the roof, especially on low pitched roofs. Notching of sheets at right angles to the edges prior to mitring will make box or check mitres which are not recommended as they reduce the weathering performance of the sheeting.



Dimensions in millimetres

A – Uncut sheet
B – Top left-hand corner cut
C – Bottom right-hand corner cut
D – Top left-hand corner and bottom right-hand corner cut

FIGURE 3 – Laying of sheets from left

When it has been ascertained that the sheet lengths and the purlin spacing are in order, it is usually convenient to saw off the mitred corner of the sheeting on the ground. Continual checks shall be made that gaps between mitres, and end overlaps, remain constant and adjustments made as necessary as the sheeting is being laid.

At the apex, the sheets of the adjacent slopes, shall be as close as possible. Curved sheets shall be laid in a similar manner but on the upper and flatter parts of the roof where the pitch is less than 22 1/2 degrees, end laps shall be increased.

5.4 Fixing the sheets

The satisfactory service of the roofing depends to a great extent upon the efficiency of fixing accessories. It is, therefore, important that particular attention is paid to the proper selection and use of fixing accessories.

Galvanized iron J-type hook bolts or cranked hook bolts (see Figures **4 a** and **4 b**), and nuts bearing on diamond shaped galvenized iron washers and bitumen washers shall be used for fixing sheets on angle iron purlins or Z purlins.

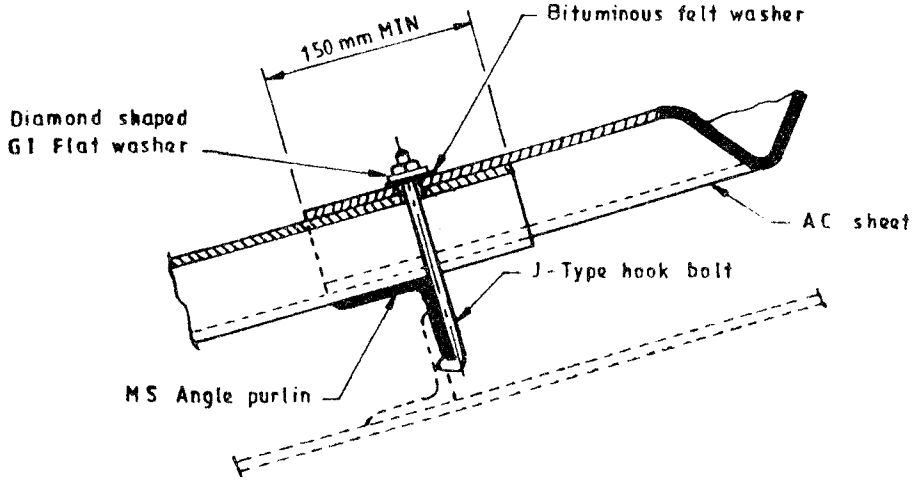


FIGURE 4a - Fixing to angle iron purlin with J-type hook bolts

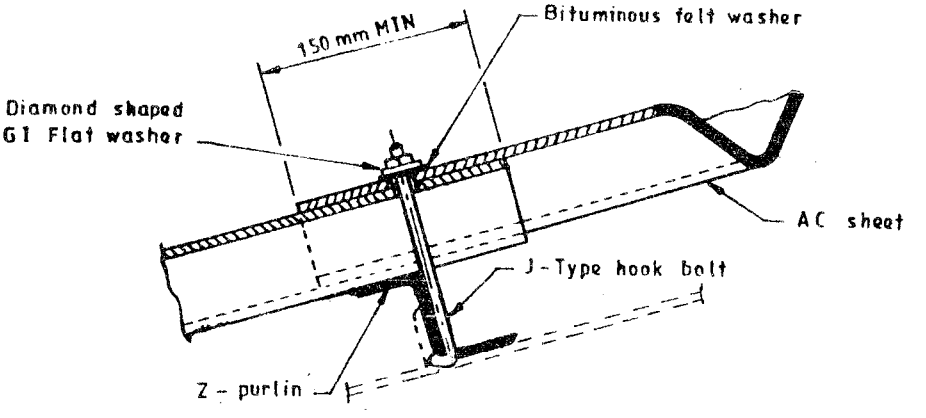


FIGURE 4b - Fixing to Z-purlin with J-type hook bolts

Galvanized iron L-type hook bolts (see Figures **5 a** and **5 b**), and nuts bearing on diamond shaped galvanized iron washers and bitumen washers shall be used for fixing sheets on rolled steel joists, C purlins, precast concrete purlins or timber purlins.

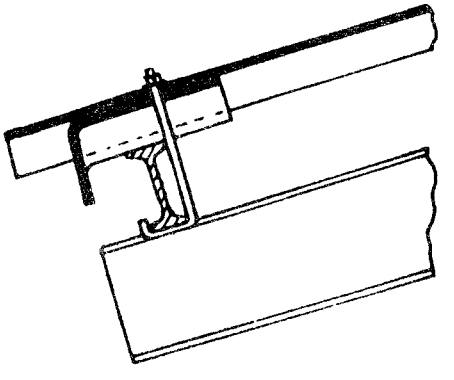


FIGURE 5a - Fixing to RSJ with L-type hook bolts

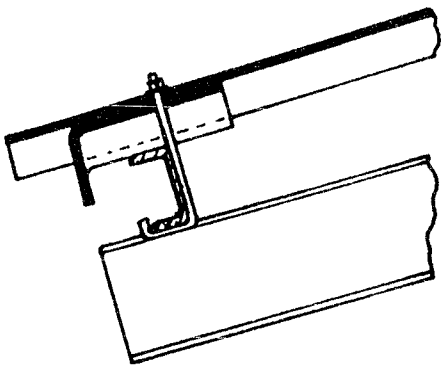


FIGURE 5b - Fixing to C-purlin with L-type hook bolts

Galvernized iron coach screws (see Figure **6**) bearing on diamond shaped galvanized iron washers and bituminous washers shall be used for fixing sheets on timber purlins, where access is difficult.

Galvernized iron roof bolts and nuts bearing on diamond shaped galvanized iron flat washers and bitumen washers shall be used for stitching on the sheets, fixtures like ridge capping, corner pieces, ventilators, northlight curves, etc.

Where sheets are laid on tubular purlins, the fixing bolt should be designed to encompass at least half the tube periphery and precautions should be taken to prevent its rotation. Sections other than angles and tubes may require an adapted form of hook bolt.

Direct fixing of sheets to drilled metal framework or by stud welding is undesirable as it tends to restrain movement of sheets.

Precast concrete purlins and rails may incorporate wood inserts, to which the sheets may be screwed. Alternatively, the sheets may be fixed by means of hook bolts or straight bolts with specially formed attachments to nibs designed to accommodate the fixing bolt.

It is essential that the bolt holes are made watertight by the use of bituminous felt washers in conjunction with suitable galvanized iron washers. These form essential components to good fixing work. Fixing bolts and screws shall be 6 mm or more in diameter and the nuts of the fixing bolts (or heads of coach screws) shall bear on diamond shaped galvanized iron washers, which in turn shall be embedded on bituminous felt washers (diamond pattern which corresponds to the shape of galvanized iron washers).

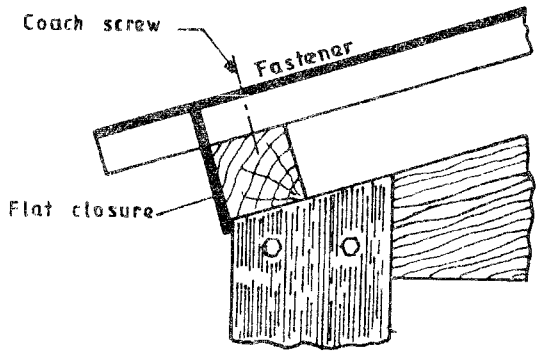


FIGURE 6(a) - Fixing to timber purlins when access is difficult

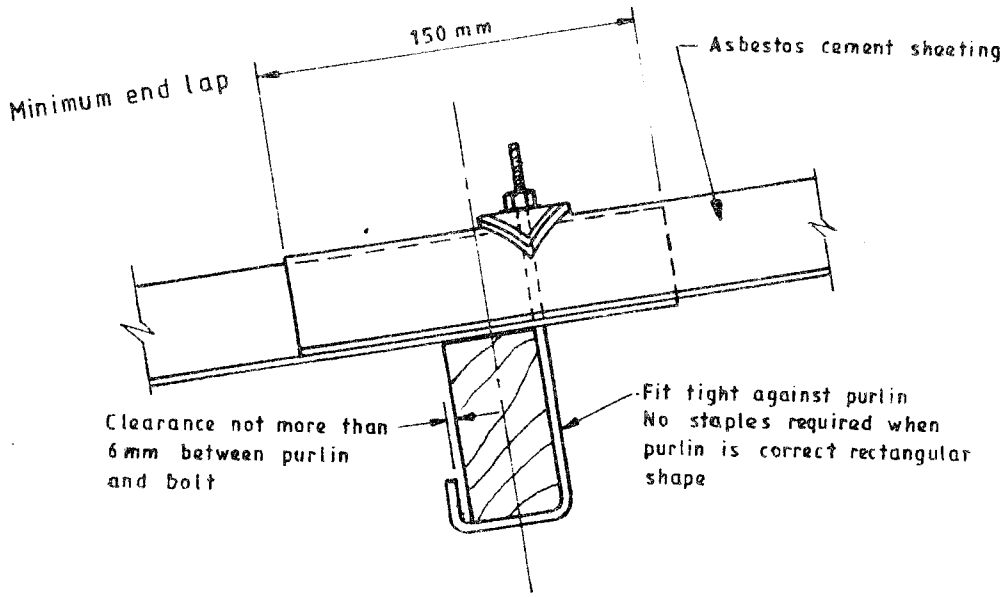


FIGURE 6(b) - Fixing to timber purlins with good access

The fixings should be inserted through holes of corresponding size drilled in the crown of a corrugation. Holes should be drilled in exact position to suit the purlins. It is therefore, advisable to drill holes with the sheeting in position. Care should be taken to see that fixing bolts or screws are normal to the sheets.

Nuts or screws shall be tightened lightly at first, and then further tightened when a dozen or more sheets have been laid. On no account shall the fixing screws or the nuts on fixing hook bolts, L - bolts or J - bolts be screwed down too tightly, and care shall be taken not to deflect sheets at the intermediate purlins in an attempt to make the sheets bear on such purlins. Amount of tightening shall be sufficient only to seat the bitumen washers over the corrugations, so that natural movements in the substructure of the roof may not damage the sheeting. In certain cases, the fixing of a sheet to an intermediate purlin may require a thickness timber spacer at the level of the purlin.

5.5 Fixing the accessories

5.5.1 *General*

Moulded asbestos-cement accessories should be selected as far as possible from the range of standard patterns. Special fittings if required, should be designed to conform closely to the sheet profile. When the use of moulded accessories is impracticable, other methods (eg. calicut ridge tiles) as approved by the engineer-in-charge may be employed.

Roofing accessories should be secured to the roof or wall cladding, as far as possible, by the same bolts which secure the sheets.

5.5.2 *Ridge Capping*

Ridge capping should also be secured to the ridge purlins, as far as possible, by the same bolts which secure the sheets. Where this is not possible, each wing of ridge capping should be adequately secured to the sheets by roofing bolts.

5.5.2.1 Close fitting adjustable ridge capping.

The close fitting adjustable ridge capping should be designed to fit the corrugations of standard sheets laid with a side lap of one corrugation, and shall be secured with the fixing accessories used to fasten the sheets to the ridge purlins (see Figure **7**). Correct positioning of the sheets is necessary, and Figure **8** illustrates how to fit each wing of the ridge when sheets are laid either from left to right or from right to left.

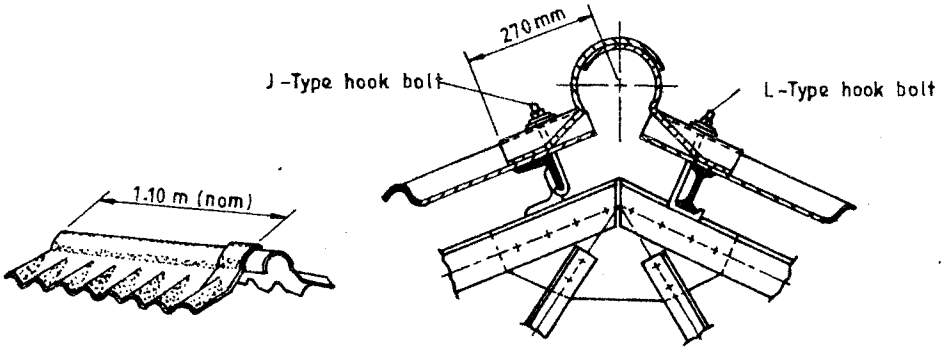


FIGURE 7 – Typical close fitting adjustable ridges

The work may be started from the left hand verge, placing first small roll wing (inner) and positioning it in such a way that the first valley on the right-hand side of the ridge wing fits into the valley at side lap of roof sheeting. It may be necessary to let a piece of ridge project beyond the verge whilst fitting and cut-off the unrequired portion afterwards. In the case of large roll wing, the wing shall be positioned so that the first valley or the left-hand side of the ridge wing fits into the valley at the side lap of the roof sheeting. The ridge wing shall be trimmed at verge to suit requirements.

5.5.2.2 Serrated adjustable ridge capping

Serrated adjustable type ridge cappings are supplied in pairs, the inner and the outer are being made easily distinguishable (see Figure **9**). These ridges have certain serrations suitably painted for distinction and when fixing, these serrations shall be arranged at side lap joint of the sheets, in which case the stagger-lapping of the two wings of this ridge will be automatic. The Figure **10** indicates the methods of laying and fixing these ridges.

5.5.2.3 North -light adjustable ridge

Fixture with a typical north-light two piece adjustable ridge is illustrated in **Figure 11.**

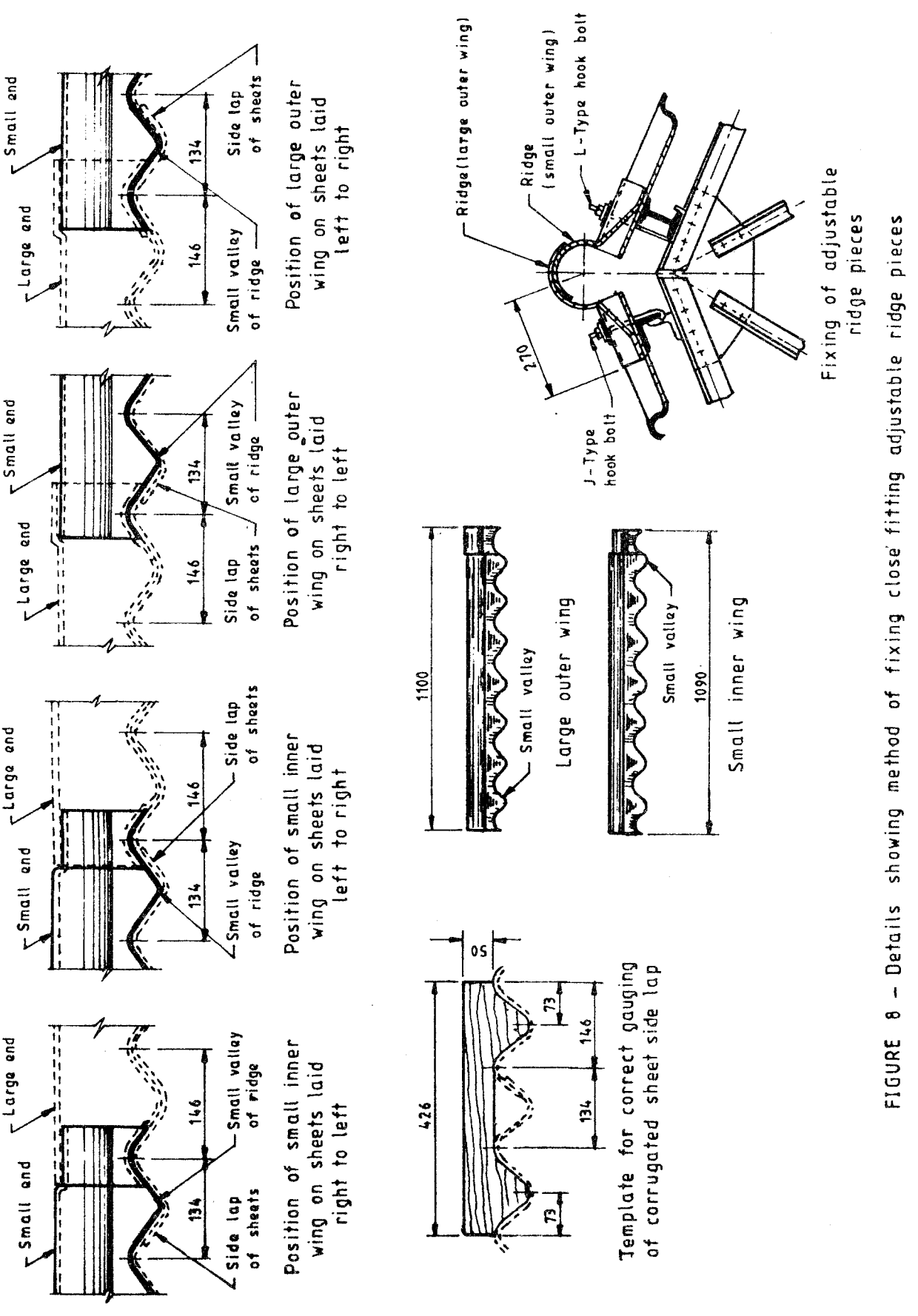


FIGURE 8 – Details showing method of fixing close fitting adjustable ridge pieces

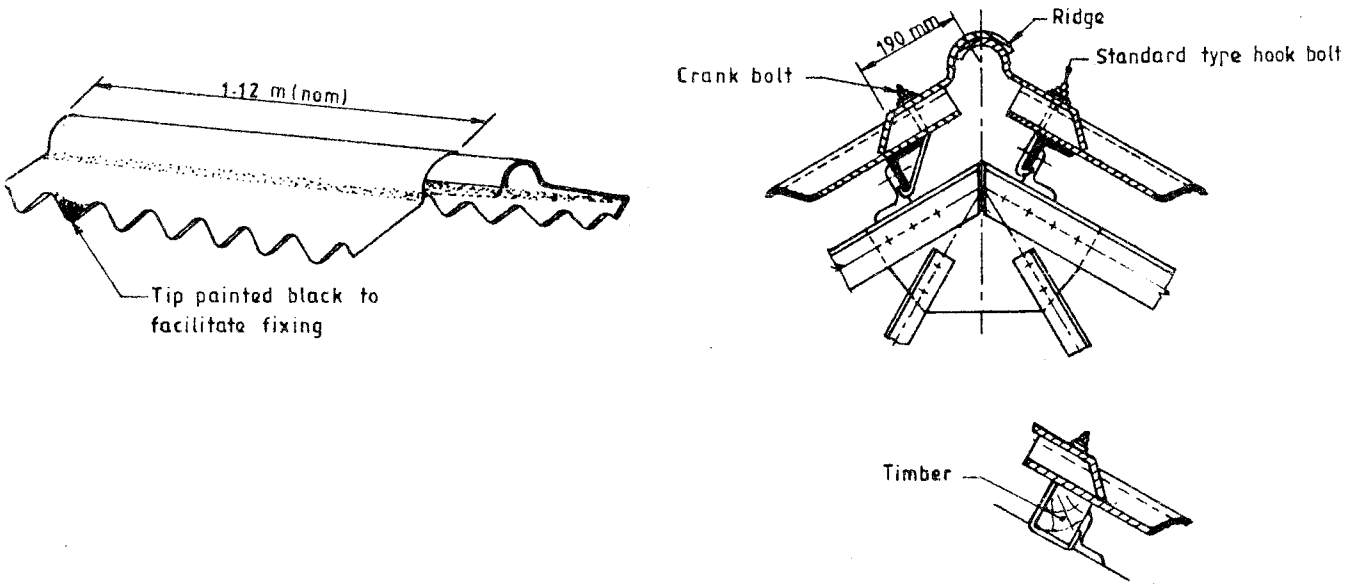


FIGURE 9 – Typical serrated adjustable ridges

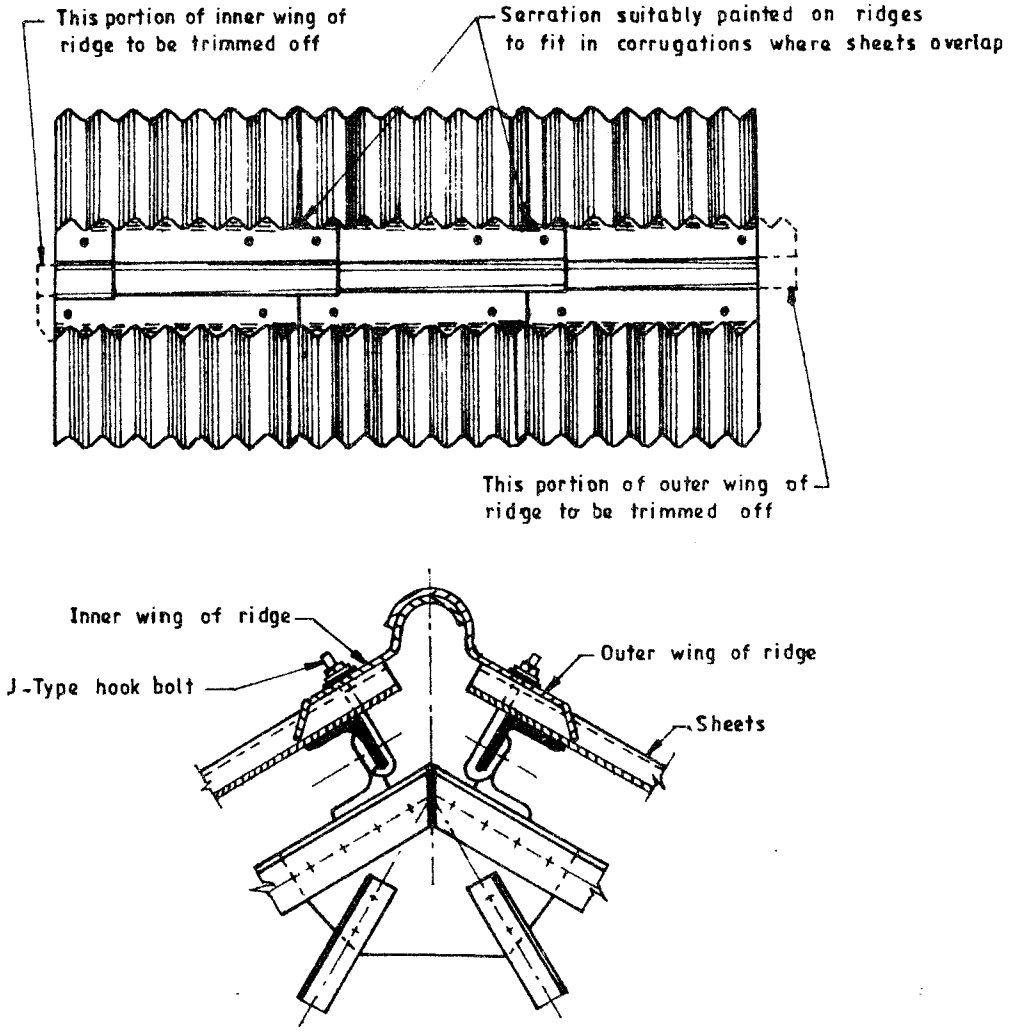


FIGURE 10 – Details showing fixing of serrated adjustable ridges with sheets laid from left to right

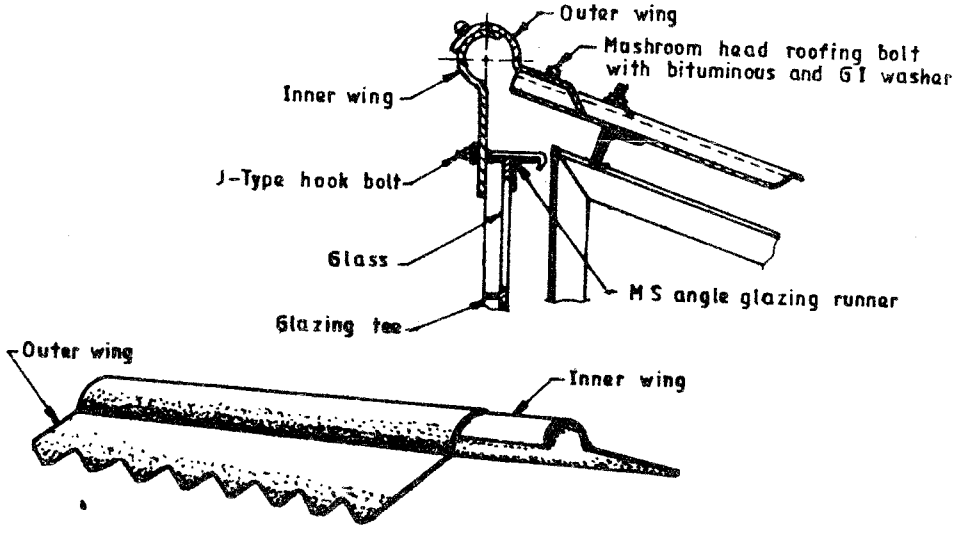


FIGURE 11 - Typical northlight two-piece adjustable ridge

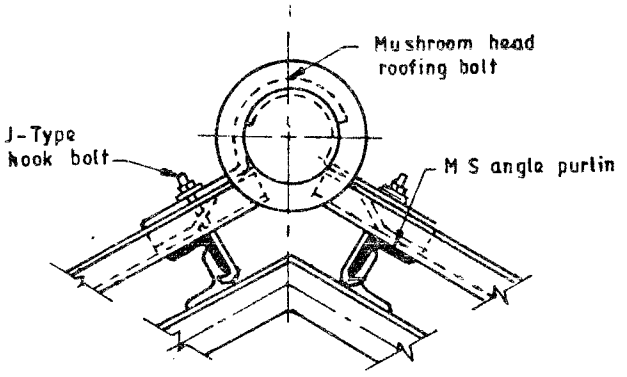
5.5.3 *Ridge Finial*

One-piece ridge finial should be secured by one roofing bolt through the crown. Two-piece ridge finial should be secured to the ridge capping and roof sheeting by one bolt through each wing of the fitting. In addition, they should be secured to the ridge capping by one roofing bolt at the crown (see Figure **12**).

5.5.4 *Calicut tile ridge capping or hip capping*

Calicut tiles should be bedded in 1 lime : 1 cement : 5 sand mortar and pointed with 1 cement : 3 sand mortar coloured to match the colour of the tiles. Starting proportion is 1 red oxide of iron pigment : 20 cement by weight. Pointing ensures that lime is notwashed away by rain water.

When the mortar is filled over the valleys of corrugations, holes of 13 mm diameter shall be made with their centres at 25 mm above the lowest point of the upper surface of the valleys, to prevent seepage of rain-water due to capillary action through the ridge capping as well as to enhance removal of hot air.



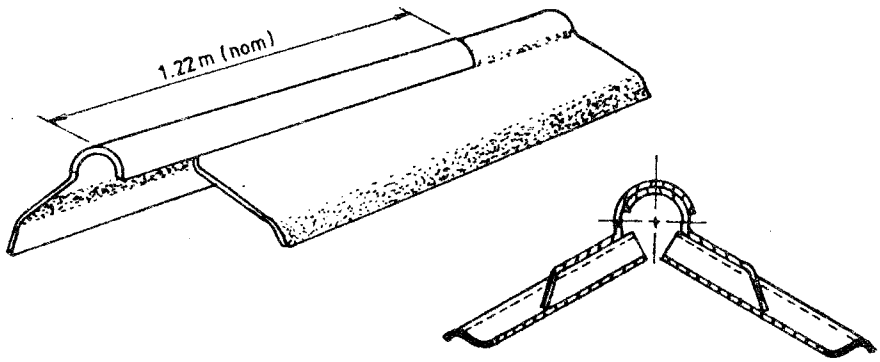
ELEVATION
(Barge board removed)

FIGURE 12 - Typical ridge finial

5.5.5 *Hip Capping or hip tile*

The roof sheeting at hips should be cut to the required mitre and close butted. The hip joint may be covered with two-piece plain wing hip tiles (see Figure 13), one-piece socketed plain wing angular hip tiles, or heavy half-round hip tiles. Alternatively an apron type of capping may be used for scribing on site, over the corrugations. When the roof structure is of metal or concrete, the plain wing ridge should be secured through the roof sheets to the hip runners by one bolt on each side immediately above the socket. Each half round hip tile should be secured with a single bolt at the centre, the bolt being secured at its lower end by a metal bridging plate whose ends bear on the underside of the sheeting. On a timber roof, the hip tile should be fixed to the rafter by means of coach screws.

A neat three way mitre should be made at the intersection of the two hips with the ridge and the joint made waterproof by the provision of a lead as galvanized iron saddle.

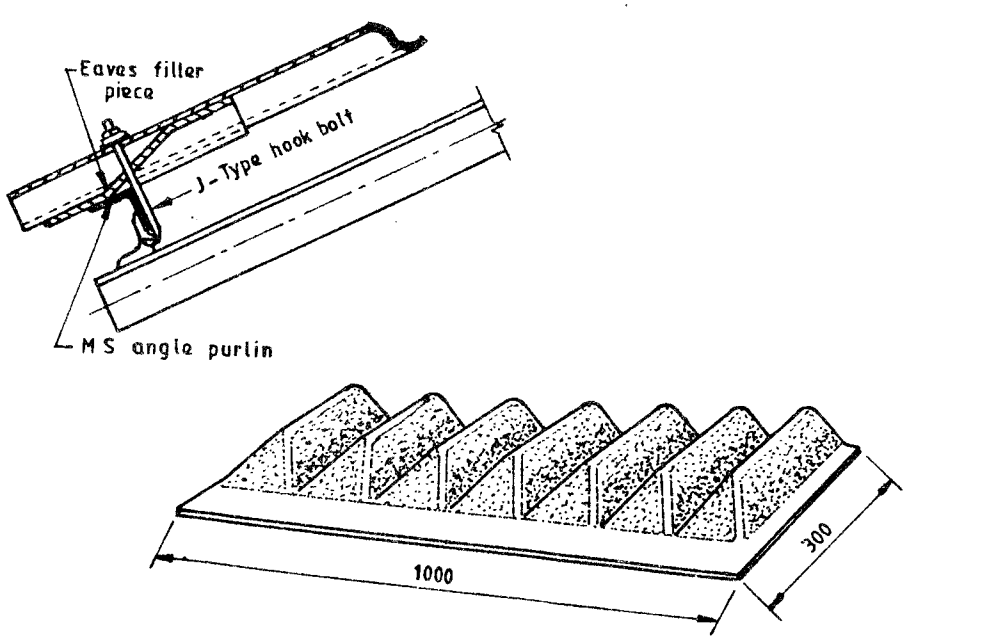


Note - Serrations as desired should be cut at site to fit corrugations at hip slopes

FIGURE 13 – Typical unserrated adjustable ridges for hips

5.5.6 *Eaves, Verges and gable ends.*

Asbestos-cement accessories may be used to close the corrugations at eaves (see Figure **14**) above glazing and at the bottom of vertical sheeting. Alternatively, sheeting at the eaves may be bedded in mortar if the walls of the building are of brick, block or similar constructions.



Dimensions in millimetres

FIGURE 14 - Typical eaves filler piece

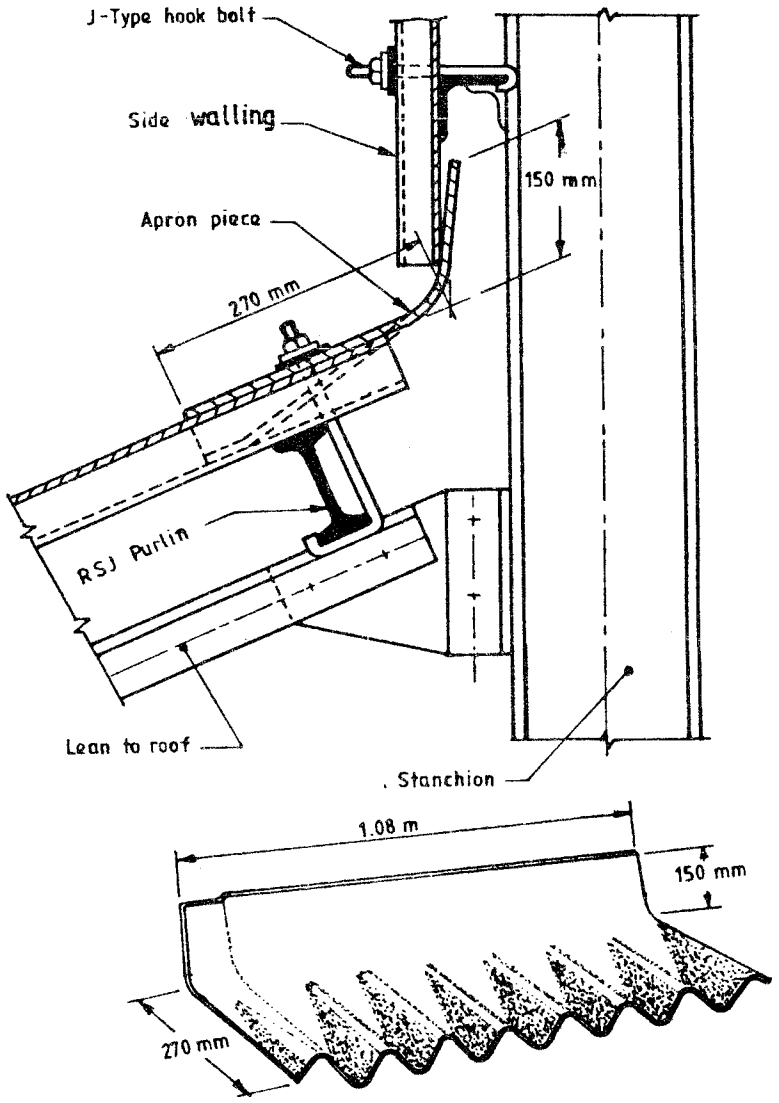


FIGURE 15 - Typical apron piece

5.5.7 *Top edges and abutments*

At top edges against walling, asbestos-cement apron flashing pieces should generally be used (see Figure **15**). If the wall consists of vertical sheeting, it should lap over the upstand of the flashing piece, and the apron should lap over the roof sheeting; no metal flashing is required. If, however, the wall is of brick or masonry, the apron should be secured to the sheeting, and metal or felt cover flashing should be used over the upstand of the flashing piece.

At a sloping abutment, if the direction of corrugations, is parallel to or running away from the wall face, metal or felt flashing may be used. The flashing should be dressed as an apron over the roof sheeting to cover at least the first two full corrugations of the sheeting and should be not less than 150 mm wide; the upstand should be provided with cover flashings or should be turned into and secured to the wall. If the corrugations run into the wall face, the edge of the sheeting should be kept back at least 125 mm clear of the wall face and a suitable gutter should be provided.

5.5.8 *Ventilators and Lights*

Permanent ventilation through roofs and walls may be affected by the use of specially moulded asbestos-cement accessories which include continuous ridge ventilators, wing type ventilating ridge capping louvres, louvre ventilators, purpose made ventilators and extractors (see Figures **16, 17**, and **18**).

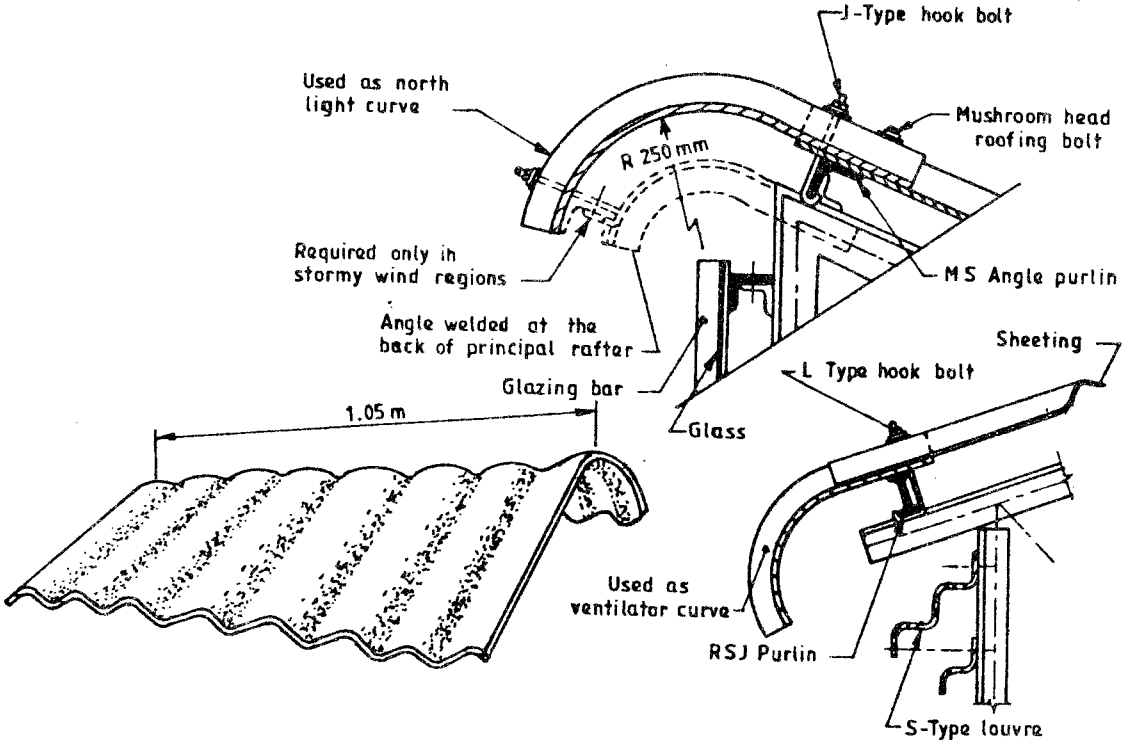


FIGURE 16 - Typical northlight curves

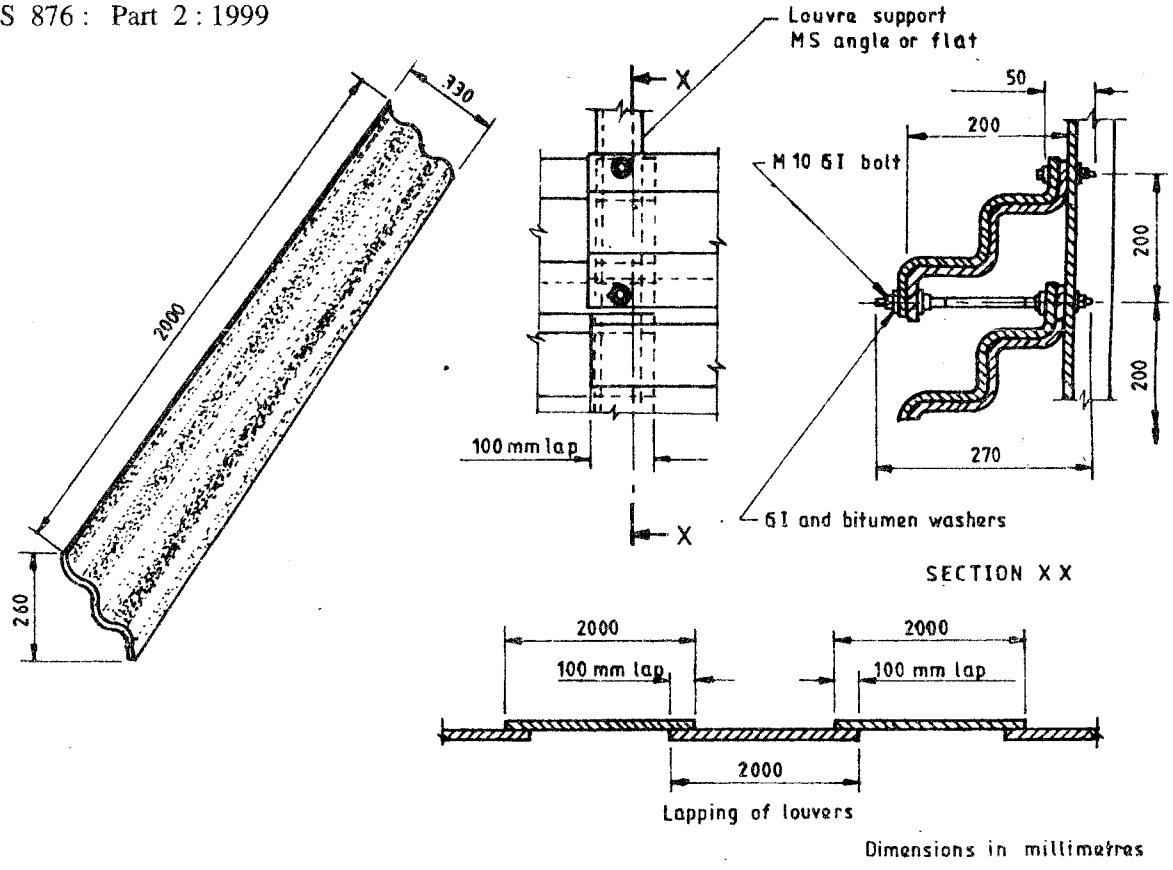


FIGURE 17 – Typical 'S' type louvers

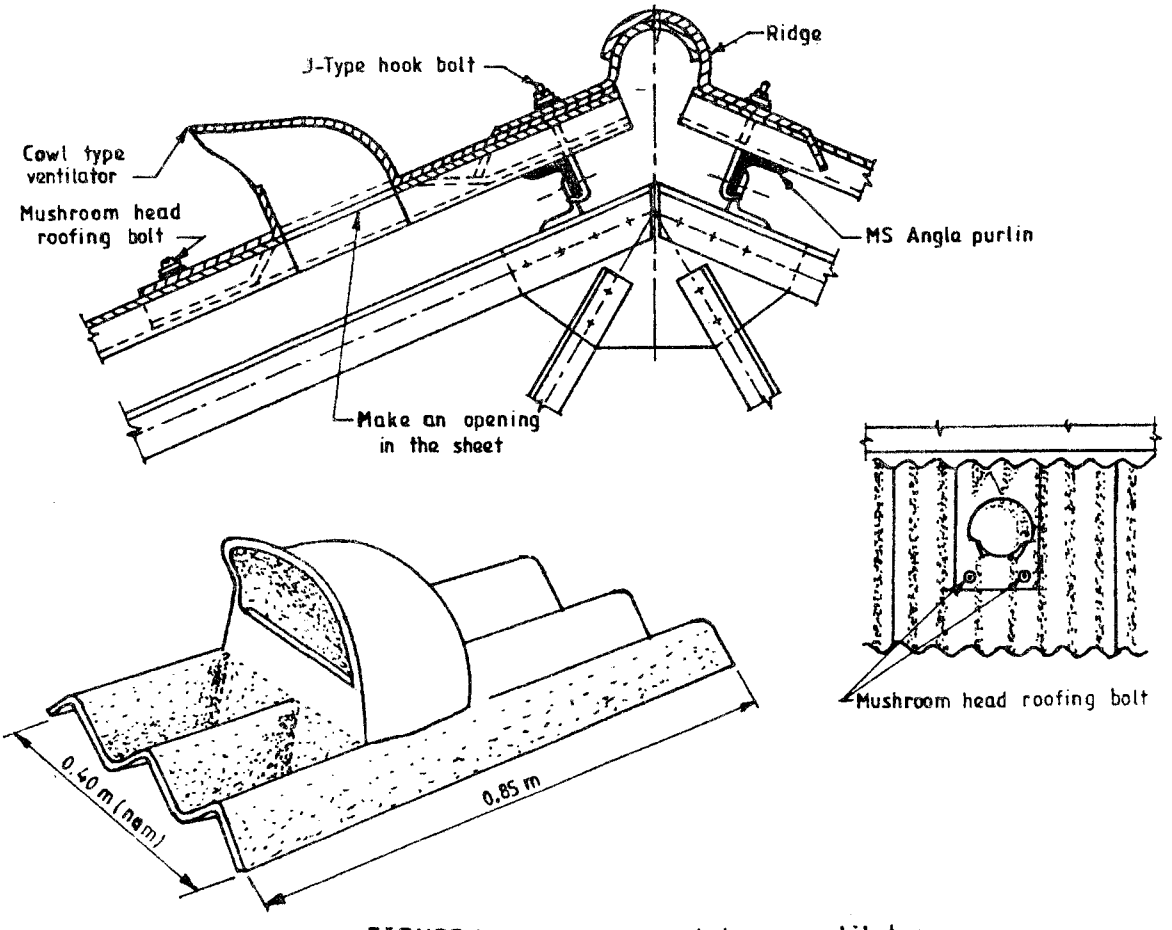


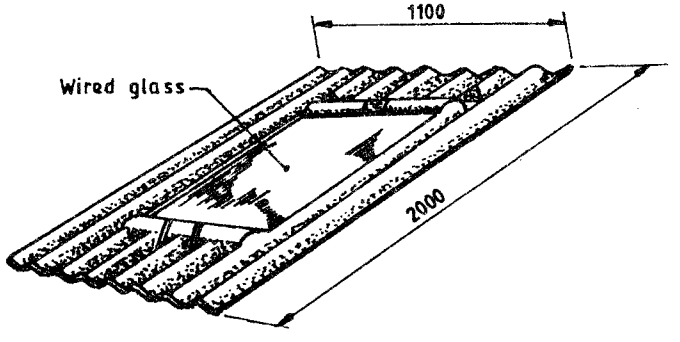
FIGURE 18 – Typical cowl type ventilator

Alternatively, if a wide continuous ventilating space at the ridge is required, the normal type of ridge capping may be omitted, the upper course of roof sheets on each slope may have up-turned ends and the gap at the ridge may be roofed over at a higher level with segmentel or down curved sheets.

If rooflights are required, purpose-made rooflights integral with standard size sheets may be used and are available as fixed skylights or as adjustable skylights (see Figures **19** and **20**). Alternatively, corrugated glass or fibreglass sheets of the same profile, as asbestos sheets may be used.

5.5.9 *Other fittings*

Other asbestos-cement accessories, such as corner rails and barge boards (see Figure **21**) should be secured either to the structure or to the sheeting with the help of roofing bolts.



Dimensions in millimetres

FIGURE 19 – Typical rooflight

It is important to bed to external accessories in mastic in a similar manner to the sheeting, when sheet side and /or end laps should be sealed. Sheets should project to maximum distance under external flashings to give necessary weather protection.

5.6 Safety rules

The following safety rules should be observed :

a) During laying, the workers should work or walk on planks or ladders, avoiding the need to step directly on the sheets. The planks and ladders may be fastened in place by

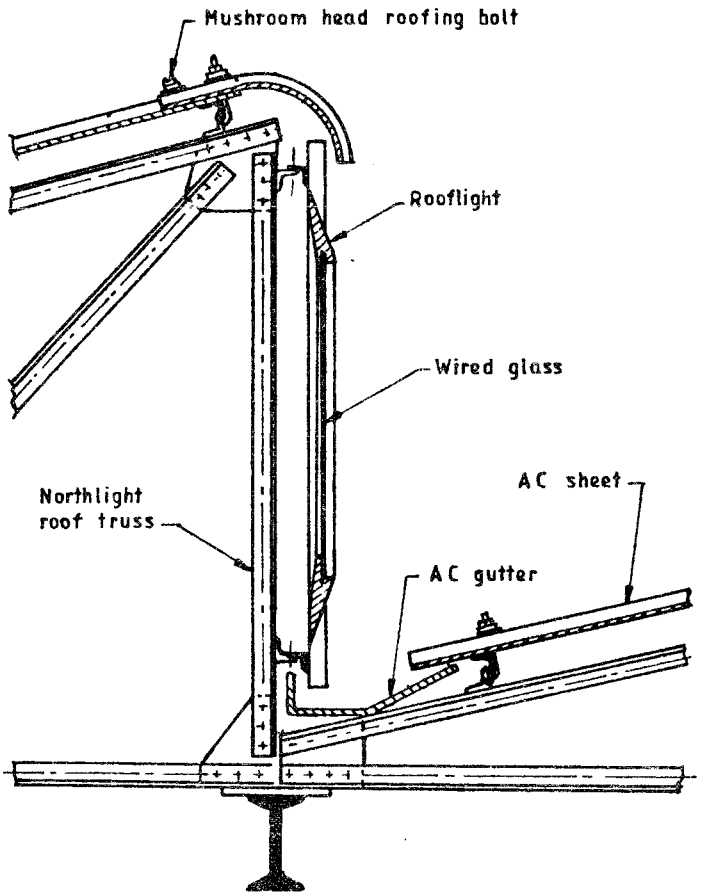


FIGURE 20 - Typical rooflight used as northlight glazing

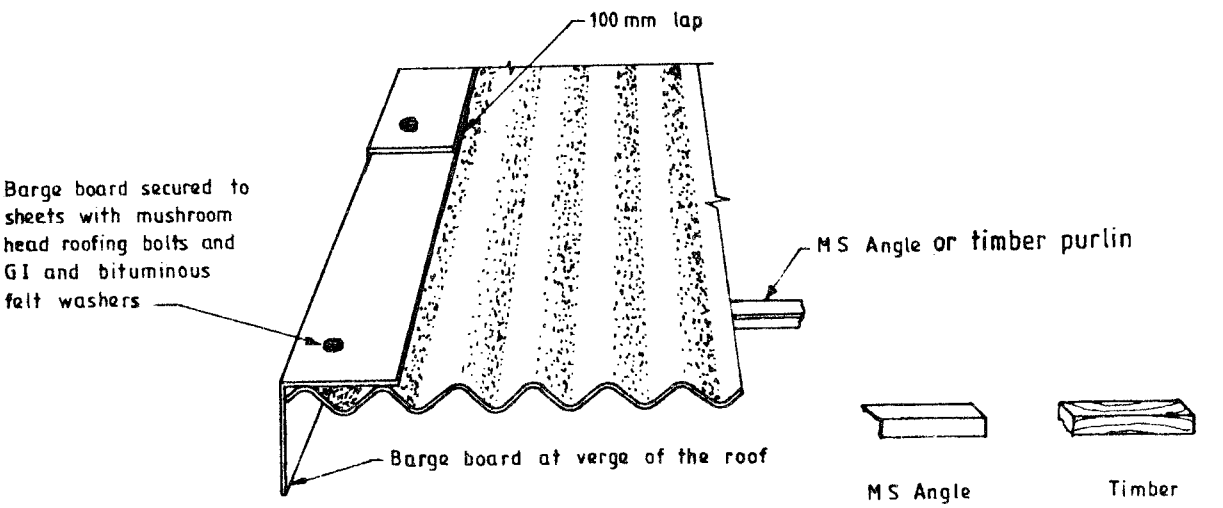


FIGURE 21 - Typical details of bargeboard or corner piece (view from eaves)

steel service hooks (see Figure 22) with the same fastners on the sheets, after placing a wooden wedges 200 mm long, under the sheet profile, between the crown of the corrugation and the purlin;

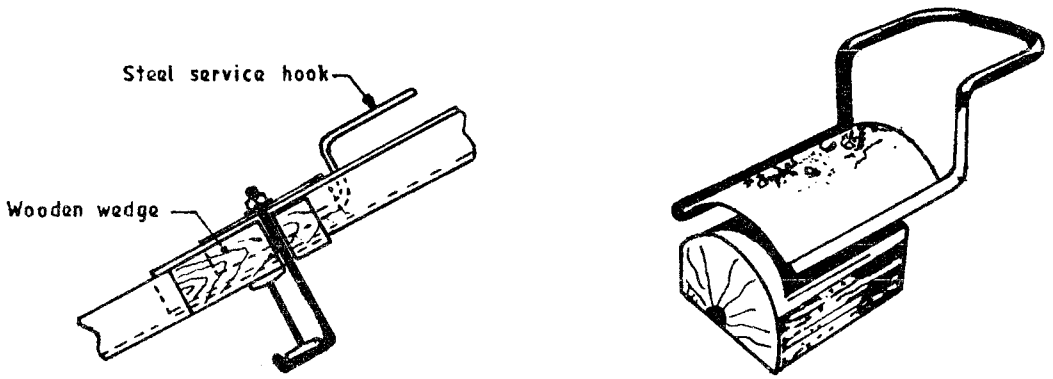


FIGURE 22 - Steel service hook details

b) Supervisors should ensure the proper distribution and use by workers of such safety devices as access ladders, safety harnesses, helmets, tool containers, gloves etc., as are necessary for the safety;

c) the workers should not use shoes with slippery soles or slippers in laying or fixing roof sheets;

d) Before leaving the site, all sheets on the roof should be fixed and no loose tools, fastners or sheets should be left on the roof; and

e) Sheets should not generally be laid when there are high winds.

6 INSPECTION AND MAINTENANCE

6.1 Inspection at site

Before the sheeting is commenced, the structure shall be inspected by those responsible to check that all purlins and rails are in a true plane, correctly spaced securely fixed and that all relevant parts of the framework had been painted or otherwise protected.

As the installation is in progress, the work should be inspected to see that all sheets and asbestos-cement accessories are free from cracks or breakages when fixed, that when laid they bear correctly on their supports and the required laps are provided as specified. All fixing bolts, screws and washers shall be of the specified type and size, correctly positioned and secured.

The edges, eaves and verges shall be checked for alignment. Corrugations of the sheeting shall be in line from the eaves to the ridge with correctly mitred corners. All flashings shall be secure and close fitting with ample lap.

Careful inspection shall be made on completion of the work to see that all units and accessories are not damaged. Following this inspection, traffic over the sheeted areas shall be limited to an absolute minimum.

6.2 Maintenance

Durability requirements can only be fully satisfied if the roofing is fully maintained and if its use does not lead to service conditions outside the design specifications.

Maintenance of these roofs includes:

a) Removal of moss;

b) Maintenance in good condition of rain water discharge elements and supplementary fittings, such as gutters, chimneys etc; and

c) Maintenance in good condition of the roof supports and ventilation of the roof.

The roof covering shall be periodically examined. Any broken units shall be replaced promptly and flashings redressed, if necessary. Roof coverings which have been painted or coated to protect them from chemically laden atmosphere shall be repainted from time to time. Fixing accessories may deteriorate and should be inspected at intervals of time dependent on type and degree of exposure. Replacement of deteriorated fixing accessories in roofs with sloping ceiling very close to roofing sheets require careful thought with respect to accessibility.

6.3 Walkways

Access to roofs shall be restricted to authorized persons carrying out inspection maintenance for whose use walkways or roof boards shall be provided, and at no time shall a person be allowed on the roof without the use of roof boards.

Permanent walkways shall be examined periodically and shall be kept in good repair.

6.4 Painting of asbestos-cement sheeting

Paint for site use on asbestos-cement sheeting shall be preferably alkali-resistant such as cement-based paints or chlorinated rubber -based paints. But paints not specially resistant to alkali may be used over two coats of alkali-resistant primer.

The sheeting shall be cleaned and as dry as possible at the time the paint is applied. The surface shall be free from any loose powdery material which will interfere with the adhesion of the paint.

If an impervious paint, such as chlorinated rubber-based paint, is to be used externally, on the sheets with large flat areas, back painting is recommended, but this is not necessary if a porous finish such as cement paint is used. Back painting shall be done before the sheets are fixed. The backs and edges shall be treated with at least one coat of alkali-resistant primer, bitumen paint or colourless waterproofer.

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