

AMENDED SPECIFICATION

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PATENT SPECIFICATION

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DRAWINGS ATTACHED

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COMPLETE SPECIFICATION

Improvements in Roof Structures

5 We, CONDER ENGINEERING COMPANY LIMITED, a British Company, of Easton Lane, Winchester, Hampshire, do hereby declare the invention, for which we pray that a Patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

10 The present invention concerns pitched roof structures, and in particular windows or "lights" for same.

15 It is generally accepted that the best natural interior lighting which gives control of sun penetration is provided by the use of what are known as Monitor lights, which in most cases are free from the pronounced directional characteristics inherent to saw-toothed buildings. However, continuous Monitor lighting of conventional form is normally only used on 20 roofs which are effectively flat. In such cases, the main roof members are usually lattice beams or similar members which tend to obstruct light and are unsightly. Also diagonal braced members are costly to maintain, the painting being a lengthy process.

25 By the expression "Monitor lights" as used herein is meant roof lights raised above the general plane of the roof so that the inclination of the glazed surface or surfaces is vertical or at an angle of less than 45° to the vertical plane.

30 By the term "purlin" as used herein is meant a subsidiary structural member which runs parallel to the ridge of the roof in a pitched roof structure.

35 An object of the present invention is to enable Monitor lights to be built into pitched roof structures, enabling a more economical design of structure to be obtained, and allow-

ing the use of cheaper roofing materials which could not be used on flat roofs. Another object is to provide a structure wherein the lights can be nearly unobstructed with the Monitor light completely free from beams or bracings which would obscure light. Another object is to provide a construction in which the Monitor light spacing can be varied to obtain the light factor required largely independently of the main stanchion spacing. Another object is to use Monitor lights on a pitched roof, which greatly reduces the maintenance troubles experienced with felt or asphalt type flat roofs, should this type of roofing be preferred.

40 According to the present invention there is provided a pitched roof structure having purlins extending parallel to the ridge of the roof, the purlins being cranked upwardly at intervals to form frames for supporting Monitor lights with the Monitor lights running up parallel with the roof slope.

45 Thus with the construction of the present invention, the purlins provided a grid work upstanding from the roof to support glazing frames or the lights. Thus according to the present invention there is provided a pitched roof structure wherein the glazing runs up parallel with the roof slope; that is to say, assuming the pitch to run transversely of the building, the glazing also runs transversely.

50 The form of each monitor will be determined by prevailing circumstances; for example, the orientation of the building, and where possible this will be erected with the ridges on a north/south line, or approximately so. The lights can be cuneiform to present a sloping glazed surface on one side, or can have glazed surfaces on each side, united by a plane unglazed top or roof.

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The invention will be described further, by way of example, with reference to the accompanying drawings, in which:—

5 Figure 1 is a fragmentary side elevation of a building having a roof structure in accordance with the present invention,

10 Figure 2 is a fragmentary vertical section taken on the line II—II of Figure 1 showing the portal structure of the building and the pitch of the roof thereof,

15 Figure 3 is a fragmentary section on an enlarged scale taken on the line III—III of Figure 2 showing details of the construction of a Monitor type roof light of the roof structure of Figures 1 and 2,

Figure 4 is a fragmentary diagrammatic side elevation similar to Figure 1 but showing an alternative form of roof light,

20 Figure 5 is a fragmentary vertical section, similar to Figure 2, taken on the line V—V of Figure 4,

Figure 6 is a fragmentary detached section on an enlarged scale, similar to Figure 3, taken on the line VI—VI of Figure 5,

25 Figures 7, 8 and 9 are each views similar to Figure 6 showing alternative embodiments of roof lights,

Figure 10 is an elevation of one end of the roof light shown in Figure 9,

30 Figure 11 is a view, partly in section and with certain parts not shown, taken in the direction of the arrow A in Figure 10, and

35 Figure 12 is a detail on an enlarged scale of the structures shown in Figures 2 and 5 illustrating diagrammatically one way of assuring continuity of the roof lights at the apices of the structures.

Referring particularly to Figures 1 to 3 and Figure 12 which illustrate one embodiment of the invention, a building having a pitched roof constructed in accordance with the present invention comprises uprights or main stanchions 15, at each side of the building spaced apart in pairs longitudinally thereof. Rafters 16 extend transversely of the building between the upper ends of respective pairs of uprights 15. The rafters 16 are given an upward camber (or are joined along the longitudinal central line of the building) to form a conventional portal structure.

The sides and ends of the building are enclosed by panels 17 or brickwork and may be provided with doors 18, as desired.

55 The roof structure is supported upon I-sectioned purlins 19 which extend longitudinally, i.e. parallel to the ridge of the pitched roof of the building, above the rafters 16 where to the purlins 19 are secured.

60 The purlins 19 also provide the frames for the erection of Monitor type lights 20. To this end, each purlin 19 comprises a plurality of horizontal portions 21 spaced apart longitudinally of the roof. The gap between two adjacent horizontal parts 21 of the same purlin 65 19 is equal to the required width of the

Monitor light 20.

The gap between adjacent ends of adjacent horizontal portions 21 is bridged in the following way:—

To one adjacent end, a first limb 22, extending perpendicularly to the respective horizontal portion 21, is secured. 70

To the other adjacent end, a second limb 23, sloping upwardly from the respective adjacent end, is secured. 75

A downwardly-sloping intermediate member 24 connects the tops of the first and second limbs.

The three-sided frame so formed is in a plane perpendicular to the plane of the respective part of the roof and the frames of adjacent purlins 19 extend, in alignment, transversely of the roof. 80

The intermediate members 24 carry angle purlins 25 transversely thereof and, to the angle purlins, a roof surfacing material such as asbestos sheeting 26 is secured. The asbestos sheeting 26 overhangs the Monitor frame at the lower end of the intermediate members 24. 85

Suitable glazing is secured, by glazing bars 27, to the first and second limbs and the Monitor lights 20 are weatherproofed to an asbestos sheet covered roof surface 28 by means of lead flashings 29. 90

The glazing secured to the first limbs 22 may include pivotable sashes if desired. 95

The Monitor lights are each closed at each end 30 by glazing or other means, and one example of the construction of the closed ends 30 will be described later with reference to Figures 10 and 11. 100

Figures 4, 5 and 6 illustrate a second embodiment of the invention, as applied to a multi-portal building 32, wherein the Monitor lights 33 are cuneiform. 105

The purlins 19 which, in this instance, are of Z-shaped cross-section, comprise horizontal portions 21 and first and second limbs 22, 23, which meet at their upper ends, thus avoiding the need for intermediate members. The first limbs 22 carry Z-sectioned purlins 34 to which steel or a similar surfacing or decking material 35 is secured. The second limbs 23 support glazing 36 through the intermediary of glazing bars 27. 110

Figure 7 serves to illustrate a further embodiment of Monitor lights, wherein the first and second limbs 22, 23, are each arranged perpendicularly to the respective horizontal parts 21 of the purlins 19. The intermediate members 24 each extend horizontally and support a roofing material 38 such as corrugated industrial aluminium sheeting, the roof of the building being covered with a similar roofing material 38. 115

The first and second limbs 22, 23, each support glazing 37 through the intermediary of respective glazing bars 27. 120

Figure 8 illustrates in section a further em- 130

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embodiment of Monitor roof lights in accordance with the present invention. This embodiment is similar to the embodiment illustrated in Figures 1 to 3.

5 The purlins 19 of I-section and the horizontal portions 21 support a roof surfacing material 39 comprising channel reinforced insulation 40, a cement/sand screed 41 there-
10 above, and a top surfacing of asphalt 42. The intermediate members 24 support a roof surfacing material 44a of channel reinforced insulating blocks, a cement/sand screed and a top surfacing comprising a triple layer of roofing felt.

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15 An upstand 44 is provided peripherally of the roofing light of composition similar to the roof surfacing material 40, the upstand 44 being perpendicular to the roof surface and, to provide for this, each second limb 23 is
20 bent to provide a perpendicular as well as a sloping part. Above the upstand, glazing 45 is secured to the limbs 22 and 23. An overhang 46 is provided to overhang the glazing 45 secured to the first limbs 22.

25 Figures 9, 10, 11 and 12 illustrate a further embodiment of Monitor roof lights, but the construction shown in Figures 10 and 11 of the end of a light may, with suitable modifications, be applied to all the embodi-
30 ments. Similarly, the manner in which the apex of the roof lights (i.e. the joint at the ridge of the roof) is constructed (see Figure 12), is applicable with suitable modification, to the embodiments hereinbefore described.

35 Figure 9 is a section of a Monitor roof light in accordance with the invention, the construction of which is similar to the embodiments of Figures 1, 2, 3 and 8.

40 The purlins 19 are of I-section, and the horizontal portions 21 support a roof surfacing material 47 comprising a bitumen impregnated expanded metal layer, an insulating layer and a triple layer roofing felt as a top surfacing material. A similar roof surfacing
45 material 47 is supported by the intermediate members 24.

50 The roof light is provided with a peripheral upstand 48 of material similar to the roof surfacing material 47, and that part of the upstand 48 secured to the first limbs 22 is perpendicular to the roof surface whereas that part of the upstand 48 which is secured to the second limbs 23 slopes therewith at an angle to the roof surface.

55 Glazing bars 27 support glazing 49 secured to the first and second limbs. The edges of the surfacing material 47, supported by the intermediate members 24, have a capping 50 of lead, aluminium or a similar material.

60 Figures 10 and 11 are views of the gable end of the Monitor light shown in Figure 9. The gable end has a continuous angle iron frame 51 similar to the frame of a roof light provided by the two limbs 22 and 23 and the intermediate members 24. The frame 51
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is arranged perpendicularly to the roof surface, but can if desired be vertical. A continuously horizontal end purlin 52 supports the frame 51 on brackets 53. Strengthening members 54 extend between upper and lower members of the frame 51, and glazing 55 is secured to the frame 51.

Figure 12 illustrates a convenient manner in which the roof light shown in Figures 9, 10 and 11 may be continued to the apex or ridge of the roof structure. It will be seen that the apex of the roof light is supported by two angle iron strips 56 which are secured to the two adjacent frames 57 by metal cleats (not shown) which may be welded to the frames 57 and the strips 56 at their ends.

The invention is not confined to the precise details of the foregoing example, and variations may be made thereto. For instance, the purlins 19 may be of I-section as described, or T-section, strip metal, rolled steel joist, channel section or of any other suitable section.

The three sided monitor frames may be glazed on one or both sides.

The glazing may be conventional or any one of several types of "patent" glazing which may be secured to metal frames as hereinbefore described.

As the described embodiments illustrate, a wide variety of roof surfacing materials may be employed to surface a roof structure in accordance with the present invention.

A roof structure in accordance with the present invention permits in an economical and efficient manner, the construction of monitor lights transversely of the ridge of ridged roofs without the disadvantages of obstruction of light by beams and/or diagonal bracings and, of course, of maintenance of such beams or bracings.

The lights can be spaced longitudinally of the roof largely without reference to the stanchion spacing and a desired light factor can thus readily be obtained.

WHAT WE CLAIM IS:—

1. A pitched roof structure having purlins extending parallel to the ridge of the roof, the purlins being cranked upwardly at intervals to form frames for supporting Monitor lights with the Monitor lights running up parallel with the roof slope.

2. A pitched roof structure as claimed in Claim 1, wherein each purlin comprises horizontal portions and upwardly extending first and second limbs connected together at their upper ends and serving to support the roof lights.

3. A roof structure as claimed in Claim 2, wherein the first and second limbs are directly connected together at their upper ends, the roof light supported thereby being cuneiform.

4. A roof structure as claimed in Claim 3, wherein the first limbs support a roof light

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10 above, and a top surfacing of asphalt 42. The intermediate members 24 support a roof surfacing material 44a of channel reinforced insulating blocks, a cement/sand screen and a top surfacing comprising a triple layer of roofing felt.

screed

15 An upstand 44 is provided peripherally of the roofing light of composition similar to the roof surfacing material 40, the upstand 44 being perpendicular to the roof surface and, to provide for this, each second limb 23 is
20 bent to provide a perpendicular as well as a sloping part. Above the upstand, glazing 45 is secured to the limbs 22 and 23. An overhang 46 is provided to overhang the glazing 45 secured to the first limbs 22.

25 Figures 9, 10, 11 and 12 illustrate a further embodiment of Monitor roof lights, but the construction shown in Figures 10 and 11 of the end of a light may, with suitable modifications, be applied to all the embodi-
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45 material 47 is supported by the intermediate members 24.

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50 upstand 48 secured to the first limbs 22 is perpendicular to the roof surface whereas that part of the upstand 48 which is secured to the second limbs 23 slopes therewith at an angle to the roof surface.

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65 the intermediate members 24. The frame 51

is arranged perpendicularly to the roof surface, but can if desired be vertical. A continuously horizontal end purlin 52 supports the frame 51 on brackets 53. Strengthening members 54 extend between upper and lower members of the frame 51, and glazing 55 is secured to the frame 51.

Figure 12 illustrates a convenient manner in which the roof light shown in Figures 9, 10 and 11 may be continued to the apex
75 or ridge of the roof structure. It will be seen that the apex of the roof light is supported by two angle iron strips 56 which are secured to the two adjacent frames 57 by metal cleats (not shown) which may be welded to the frames 57 and the strips 56 at their ends.

The invention is not confined to the precise details of the foregoing example, and variations may be made thereto. For instance, the purlins 19 may be of I-section as described, or T-section, strip metal, rolled steel joist, channel section or of any other suitable section.

The three sided monitor frames may be glazed on one or both sides.

The glazing may be conventional or any one of several types of "patent" glazing which may be secured to metal frames as hereinbefore described.

As the described embodiments illustrate, a wide variety of roof surfacing materials may be employed to surface a roof structure in accordance with the present invention.

A roof structure in accordance with the present invention permits in an economical and efficient manner, the construction of monitor lights transversely of the ridge of
100 ridged roofs without the disadvantages of obstruction of light by beams and/or diagonal bracings and, of course, of maintenance of such beams or bracings.

The lights can be spaced longitudinally of the roof largely without reference to the
105 staunchion spacing and a desired light factor can thus readily be obtained.

WHAT WE CLAIM IS:—

1. A pitched roof structure having purlins extending parallel to the ridge of the roof, the purlins being cranked upwardly at intervals to form frames for supporting Monitor lights with the Monitor lights running up parallel
110 with the roof slope.

2. A pitched roof structure as claimed in Claim 1, wherein each purlin comprises horizontal portions and upwardly extending first and second limbs connected together at their upper ends and serving to support the roof lights.

3. A roof structure as claimed in Claim 2, wherein the first and second limbs are directly connected together at their upper ends, the roof light supported thereby being cuneiform.

4. A roof structure as claimed in Claim 3, wherein the first limbs support a roof light

- surfacing material and the second limbs support glazing through the intermediary of glazing bars which extend transversely thereof.
- 5 5. A roof structure as claimed in Claim 2, wherein the upper ends of the first and second limbs are connected by an intermediate member.
- 10 6. A roof structure as claimed in Claim 5, wherein the second limb supports glazing through the intermediary of glazing bars.
7. A roof structure as claimed in Claim 5 or 6, wherein the first limbs support glazing through the intermediary of glazing bars.
- 15 8. A roof structure as claimed in Claim 7, wherein the glazing supported by the first limbs includes pivotable sashes.
9. A roof structure as claimed in any one of the Claims 5, 6, 7 and 8, wherein the intermediate members support a roof lights surfacing material.
- 20 10. A roof structure as claimed in any one of the Claims 5 to 9, wherein the intermediate members slope downwardly towards the respective first limbs.
- 25 11. A roof structure as claimed in Claim 10, wherein the intermediate members at their lower ends support a projecting overhang.
12. A roof structure as claimed in any one of the Claims 5 to 11, wherein the first limbs extend perpendicularly upwardly from the respective horizontal portions.
- 30 13. A roof structure as claimed in any one of the Claims 5 to 12, wherein the second limbs slope upwardly, being inclined towards the respective first limbs.
- 35 14. A roof structure as claimed in any one of the Claims 5 to 13, wherein a peripheral upstand, of material similar to that of the general roof surface, surrounds each roof light.
15. A roof structure as claimed in any one of the preceding Claims, wherein the gable ends of the roof lights are closed by glazing supported by a glazing frame of shape similar to the shape of the roof lights.
- 45 16. A roof structure as claimed in any one of the preceding Claims, wherein two strips are provided at the apex for supporting the same, the two strips being connected by cleats to the adjacent frames whereby continuity of the roof lights at the apices of the structures is assured.
- 50 17. A building having a roof structure as claimed in any one of the preceding Claims.
18. A building as claimed in Claim 17, comprising uprights or main stanchions, between the upper ends of pairs of which rafters extend transversely of the building, the purlins extending longitudinally of the building above the rafters and being secured thereto.
- 55 19. A pitched roof structure substantially as hereinbefore particularly described with reference to and as illustrated in Figures 1, 2 and 3, Figures 4, 5 and 6, Figure 7, Figure 8 or Figures 9, 10, 11 and 12 of the accompanying drawings.
- 60 20. A building substantially as hereinbefore described with reference to and as illustrated in Figures 1, 2 and 3, Figures 4, 5 and 6, Figure 7, Figure 8, or Figures 9, 10, 11 and 12 of the accompanying drawings.
- 65 70
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PROVISIONAL SPECIFICATION

Improvements in Roof Structures

- We, CONDER ENGINEERING COMPANY LIMITED, a British Company, of Easton Lane, Winchester, Hampshire, do hereby declare this invention to be described in the following statement:—
- The present invention concerns pitched roof structures, and in particular windows or "lights" for same.
- 80 It is generally accepted that the best natural interior lighting is provided by the use of what are known as Monitor lights. However, continuous Monitor lighting of conventional form cannot be used with pitched roof structures, and can only be used on roofs which are effectively flat. In such cases the main roof members are usually lattice beams in planes parallel and immediately adjacent to the planes of the glazing. The diagonal members of these beams tend to obstruct light and are unsightly. Also diagonal braced mem-
- bers are costly to maintain, the painting being a lengthy process.
- 95 An object of the present invention is to enable Monitor lights to be built into pitched roof structures of wide span, enabling economy of materials to be obtained. Another object is to provide a structure wherein the lights are unobstructed, the Monitor being completely free from beams or bracings which would obscure light. Another object is to provide the construction in which the Monitor light spacing can be varied to obtain the light factor required independently of the main stanchion spacing. Another object is to use Monitor lights on a pitched roof which greatly reduces the maintenance troubles experienced with Felt or Asphalt type flat roofs.
- 100 According to the present invention there is provided a roof structure consisting of a pitched roof structure preferably of portal
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frame construction. Purlins which run longitudinally are oranked (i.e., parallel with the ridge upwards and normal to the roof slope) at selected intervals to form Monitor frames.

5 Thus with the construction of the present invention, the purlins provide a grid work upstanding from the roof to support glazing frames or the lights. Thus according to the present invention there is provided a pitched
10 roof structure wherein the glazing runs parallel with the roof slope; that is to say, assuming the pitch to run transversely of the building, the glazing also runs transversely.

15 The form of each monitor will be determined by prevailing circumstances; for example, the orientation of the building, and where possible this will be erected with the ridges on a north/south line, or approximately so. The lights can be cuneiform to present a
20 sloping glazed surface on one or both sides, or can have glazed surfaces on each side, united by a plane unglazed top or roof.

In an example, the lights are supported by purlins which run longitudinally of the building and suitably spaced to form a supporting
25 grid. The purlins are of strip or angle iron, and each consists of a horizontal part between the lights, each light-supporting part consisting of two limbs upstanding from the roof and united at their upper ends. Thus,
30 from the one end of each horizontal purlin part on a common transverse line, a part upstands substantially vertically, and from the adjacent end of the next horizontal purlin part (which is spaced from the one end aforesaid by a distance to accommodate the light) a
35 part upstands sloping in the direction towards the said one end. The upper ends of the two upstanding parts may intersect or be joined by an intermediate or upper part sloping down slightly from the upstanding sloping part to the upstanding vertical part. There is thus provided the skeleton of what may be termed
40 an inverted box or wedge sloped upstand structure extending across a pitch of the roof. The upstanding sloping sides of these are intended to face the North.

45 The intermediate or upper parts serve to support a top roof for the light, this roof consisting of corrugated sheeting or decking or other suitable type of roofing material, and in certain cases extending at one or both ends, beyond the upstanding parts, slightly at the North (sloping) end and more at the South (Upright) end, this latter extension being supported by a cantilever bracket assembly, and also providing a tight shield.

50 Both sides of the skeleton are suitably framed and glazed, and the South face may have a sash frame for ventilation. The horizontal purlin parts between the lights serve to support normal roofing such as asbestos or the like. It is not essential to provide an upper purlin part. For example, the upstanding parts can be connected inverted V-fashion at their
60 tops, both sides of the tunnel skeleton framework being glazed. The angle of slope of each side will be to suit requirements; for example, the North side vertical or sloping back slightly, the South side at a less angle to the horizontal. This latter side need not be glazed.

The ends of the lights are, of course, closed. The ends of the lights can, if desired, be formed with windows with the mullion normal to the roof slope.

75 The use of monitor lights on a pitched roof enables economy of materials to be achieved, and full continuity can be obtained if desired. The lights are completely unobstructed, and the spacing can be varied to obtain the desired light factor without reference to the stanchion spacing.

80 It will be appreciated that a pitched roof is preferred to a flat roof, because of the difficulty of maintaining a flat roof of the felt or asbestos type. A pitched roof can be constructed more cheaply, but known arrangements of lighting on pitched roof structures are usually inadequate. The present invention provides all that can be desired in regard to
85 lighting with a pitched roof structure.

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