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FABRICATED FOLDED PLATE ROOF STRUCTURE AND SUPPORT THEREFOR
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4 Claims. (Cl. 52—18)

The invention relates to building construction and
refers more specifically to folded plate roof structure
fabricated of separate metal structural members includ-
ing end frames, ridge and valley fold-line members and
light gage metal panels extending between adjacent ridge
and valley fold-line members.

Traditional long span roof structures have been a series
of spaced beams or trusses covered by an independent
deck system spanning between the spaced beams and
trusses. Such structure requires particularly deep roof
constructions or objectionable intermediate vertical sup-
ports to prevent over-stressing roof constructions of lesser
depth.

In contrast to this traditional structure, folded plate
roof structures, which are in essence deep structural
beams tipped so that the flanges of adjacent beams are
in contact at ridge and valley lines, have been known for
some time. With folded plate roof structure efficiency of
material usage is increased since the sloping planes of
the deep structural beams not only carry primary web
shear but also serve as structural roof deck and often
as finished interior ceilings. Folded plate roof struc-
tures have in the past been practical only in concrete
and plywood construction.

Concrete folded plate roof structure however has the
disadvantage of requiring complicated design procedures.
Also, a much heavier dead load is present with concrete
folded plate roofing structure than is desired due to the
weight of the concrete and complicated construction pro-
cedures which are suitable only under certain weather
conditions are required with concrete folded plate roof
structure. In addition concrete in such structures is
not well suited to the application of insulation and built-
up roofing to the roof and does not in itself provide adequate
acoustical characteristics for many installations.

It is therefore one of the objects of the present inven-
tion to provide improved folded plate roof structure.

Another object is to provide folded plate roofing structure
comprising a plurality of separate metal members rigidly
secured together.

Another object is to provide improved folded plate
roof structure comprising a plurality of vertical supports,
parallel spaced apart end frames having aligned valleys
and ridges supported by the support members, elongated
fold-line members extending between the aligned valleys
and ridges and light gage metal panels covering the area
defined by the fold-line members and the frames.

Another object is to provide folded plate roof structure
as set forth above wherein the folded-line members are
elongated V-shaped metal plates.

Another object is to provide folded plate roof structure
as set forth above wherein the metal panels are
elongated and extend longitudinally between adjacent
ridge and valley fold-line members.

Another object is to provide folded plate roof structure
as set forth above wherein the top surface of the
fold-line members and adjacent surfaces of the end frames
are coplanar.

Another object is to provide metal folded plate roof
structure which is simple in construction, economical to
erect and efficient in use.

Other objects and features of the invention will be-
come apparent as the description proceeds, especially

when taken in conjunction with the accompanying draw-
ings, illustrating a preferred embodiment of the inven-
tion, wherein:

FIGURE 1 is a partly broken away diagrammatic
representation of a building including folded plate roof
structure constructed in accordance with the invention.
FIGURE 2 is an enlarged section view of a ridge of
the roof construction illustrated in FIGURE 1 taken sub-
stantially on the line 2—2 in FIGURE 1.

FIGURE 3 is an enlarged section view of a valley of
the roof construction illustrated in FIGURE 1 taken
substantially on the line 3—3 in FIGURE 1.

FIGURE 4 is an enlarged perspective view of a valley
detail of the folded plate roof structure illustrated in
FIGURES 1-3 with the insulation and roofing material
removed and illustrating a fold-line member in phantom.
FIGURE 5 is an enlarged perspective view of a modi-
fied eave detail of the folded plate roof structure illus-
trated in FIGURES 1-3 with the insulation and roofing
material removed and illustrating a fold-line member in
phantom.

FIGURE 6 is an enlarged section view of an end de-
tail of the roof construction illustrated in FIGURE 1
taken substantially on the line 6—6 in FIGURE 1.

FIGURES 7 and 8 are diagrammatic illustrations of
possible modifications of the profile of the folded plate
roof construction illustrated in FIGURE 1.

With particular reference to the figures of the draw-
ing, one embodiment of the present invention will now
be considered in detail.

As shown diagrammatically in FIGURE 1, the build-
ing construction 10 includes a folded plate roof struc-
ture 12 constructed of separate metal members rigidly
secured together. The folded plate roof structure illus-
trated includes the vertical support members 14, end
frame 16, fold-line members 18 and metal panels 20.
Flashing 22, insulation 24 and roofing material 26 com-
plete the folded plate roof structure 12.

More specifically the vertical supporting members 14
may be, for example, H-columns, as shown in FIGURES
2-5. The supporting members 14, as illustrated in FIG-
URE 1, are extending vertically from the ridges 28 and
valleys 30 defined by spaced apart parallel end
frames 16 to a support therefor, such as the foundation
32 of the building construction 10. As shown best in
FIGURE 2, the tops 34 of the columns 14 at the ridges
are provided with an inverted V configuration while the
tops 34 of the columns 14 at the valleys are provided
with a V configuration.

End frames 16, as shown, are fabricated of I-beams
secured to the spaced apart columns 14. As secured to
the columns 14 the end frames 16 define transversely
aligned ridges 28 and valleys 36.

The individual beams of the end frames 16 are pro-
vided with an upper flange 36 and 37 lower flange 40, as
best illustrated in FIGURE 4. The individual beams of
the end frames 16 make an angle with respect to the
columns 14 similar to the angle formed by the V con-
figuration of the ends 34 of the columns with respect to
the longitudinal axes thereof. The beams of the end
frames 16 are further provided with notches 42 in the
upper flange thereof to receive the edge portions 44 of
the fold-line members 18, as illustrated best in FIGURES
2-4.

The fold-line members 18 are elongated V-shaped
plates which are inverted at the ridges 28 but not at
the valleys 30. The fold-line members 18 are rigidly
secured to the tops of the columns 14 by convenient
means, such as welding and are provided with edge por-
tions 44 fitting into the notches 42 in the upper flanges
36 of the beams forming the end frames 16.
The end frames are so positioned vertically with respect to the fold-line members that the upper surfaces of the fold-line members and the end frames are coplanar. End frames and fold-line members are rigidly secured together and to the columns by convenient means, such as welding.

The panels are light gage steel, high shear panels, similar to the elongated, low depth metal floor and ceiling panels well known in the construction industry. The panels extend longitudinally between a fold-line member at a valley and a fold-line member at an adjacent ridge. Panels are rigidly secured to the fold-line members by welding.

Flashing members are provided at the valleys extending between the panels, as shown best in FIGURE 3. The flashing members extend downwardly and outwardly on both sides of the center of valleys, as illustrated best in FIGURE 1, to provide valley drainage in the folded plate roof structure.

The folded plate roof structure is completed by securing rigid insulation over the panels and applying a built-up roof over the insulation.

As shown best in FIGURE 2, the ridge portions shown in detail in FIGURE 6. In FIGURE 6 an end wall of masonry is provided, a fold-line member is secured to the masonry wall by convenient means, such as grout and anchor bolts. The panels are then secured to the upwardly and inwardly extending portion of the fold-line member. Flashing is provided to which the panels require to be securable and insulated. Insulation and built-up roofing are then provided over the panels, as illustrated.

The valley detail illustrated in FIGURES 3 and 4 is suitable for interior valley supports if needed or with the fold-line member extended on both sides of the plane of the end frame, as shown in FIGURE 4, is suitable for overhanging eaves construction. With the fold-line member extending only on one side of the end frame, the detail of FIGURES 3 and 4 is suitable for substantially flush eaves.

Alternatively, the structure illustrated in FIGURE 5 may replace the structure illustrated in FIGURE 4 at the eaves where flush eaves construction is desired. Thus in FIGURE 5 the I-beam end frame is replaced by an end frame extending flanges of the angles, fold-line member and channels are secured as by welding to the top of supporting column having a notched end as before. A similar detail may of course be provided at the ridges where substantially flush eaves construction is desired excepting of course that the end frame, top of the column and ridge fold-line member would be in an inverted V form.

Thus a metal folded plate roof structure is disclosed which is simple, economical and efficient. The folded plate roof disclosed has the particular advantage of simplifying design procedure and permits easy application of insulation and built-up roofing.

The fold-line members and ridge fold-line member are of non-combustible and is particularly rigid to prevent deflection and considerably stronger than, for example, similar wood structures.

While one embodiment of the present invention has been considered in detail other embodiments and modifications are contemplated. For example, as shown in FIGURES 7 and 8, the ridges and valleys may be built to a horizontal portion or may be singularly provided with a flat portion. It is the intention to include all such modifications as are defined within the scope of the appended claims within the scope of the invention.

What I claim as my invention is:

1. Folded plate roof structure comprising a plurality of spaced apart vertical supporting H-columns, parallel spaced apart roof end frames constructed of I-beams and having transversely aligned ridges and valleys which end frames are supported at the ridges and valleys on said H-columns, V-shaped plate fold-line members extending transversely between and secured to the end frames at both the ridges and valleys, the columns having V-shaped ends at the ridges and the fold-line members at the ridges having downwardly opening V-shaped cross sections complementary to the ends of the columns at the ridges, said beams being rigidly secured to the end of the columns at the ridges, the panels extending transversely between the columns and in the upper beam flanges at the ridges, the fold-line members being secured to the top of the columns at the ridges and in the recesses in the beams to provide coplanar upper surfaces on the fold-line members and upper beam flanges at the ridges, light gage metal panels extending between and secured to the adjacent fold-line members to cover the area between the end frames and fold-line members, rigid insulation positioned over the panels and roofing material applied over said rigid insulation.

2. Folded plate roof structure comprising a plurality of spaced apart vertical supporting H-columns, parallel spaced apart roof end frames constructed of I-beams and having transversely aligned ridges and valleys which end frames are supported at the ridges and valleys on said H-columns, V-shaped plate fold-line members extending transversely between and secured to the end frames at both the ridges and valleys, the columns having upwardly open V-shaped ends at the valleys, the fold-line members at the valleys being complementary in cross section to the end of the columns at the valleys, said beams being rigidly secured to the ends of the columns at the valleys, and including upper and lower flanges, recesses in the upper beam flanges at the valleys and the fold-line members being secured to the top of the columns at the valleys and in the recesses in the beams to provide coplanar upper surfaces on the fold-line members and upper beam flanges at the valleys, light gage metal panels extending between and secured to the adjacent fold-line members to cover the area between the end frames and fold-line members, rigid insulation positioned over the panels and roofing material applied over said rigid insulation.

3. Folded plate roof structure comprising a plurality of spaced apart vertical supporting structural members, parallel spaced apart roof end frames having transversely aligned ridges and valleys which end frames are supported on said structural members, V-shaped plate fold-line members extending transversely between and secured to the end frames at both the ridges and valleys, the structural members having V-shaped ends at the ridges and the fold-line members at the ridges having downwardly opening V-shaped cross section complementary to the ends of the structural members at the ridges, said end frames being rigidly secured to the ends of the structural members at the ridges, the fold-line members being secured to the top of the structural members at the ridges and providing the coplanar upper surfaces on the fold-line members and end frames at the ridges, light gage metal panels extending between and secured to the adjacent fold-line members to cover the area between the end frames and fold-line
members, rigid insulation positioned over the panels and roof-
ing material applied over said rigid insulation.

4. Folded plate roof structure comprising a plurality of
spaced apart vertical supporting structural members, par-
allel spaced apart roof end frames having transversely
aligned ridges and valleys which end frames are sup-
ported at the ridges and valleys on said structural mem-
bers, rigid insulation positioned over the panels and roof-
ing material applied over said rigid insulation.

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