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HOUSING NOTE NO. 12

NEW NAILED "W" ROOF TRUSS DESIGNS OFFER SMALL BUILDERS ADVANTAGES

by
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Building with components in WOOD

New nailed "W" roof truss designs offer small builders advantages

These standard nailed truss designs have a number of important advantages, especially for smaller volume builders. Among them:

1—The designs have been proof tested either at Forest Products Laboratories or at the Division of Building Research in Ottawa. They conform to the requirements of the Housing Standards. This means that a builder can use the trusses without the expense of further proof tests or engineering if they are used in an area where the National Building Code (1960) is enforced.

2—These designs are economical in that a typical truss, spaced 2 ft. o.c. with 2 x 4 members, requires only slightly more than half the lumber required for typical joist and rafter roof framing using 2 x 6 members 16 in. o.c. The amount of labor will naturally vary with the amount of nailing required. For a typical truss with 26-ft. span and 5/12 slope, to be used in a 50-psf snow load area, observations made during fabrication at DBR indicated that about 53 minutes are required for one man to cut, assemble and nail all the members for the design shown in Figure 1.

3—Nailed truss designs are particularly suitable for small builders who wish to make their own trusses in that no special pneumatic or hydraulic equipment is necessary to assemble the trusses. The trusses can be built either in a shop or on the site using the subfloor as an assembly area.

For several years the Division of Building Research, National Research Council, and the Forest Products Research Branch of the Department of Forestry have carried out an extensive truss testing program to develop standard roof truss designs for use in house construction.

The first part of this work led to the publication of a number of nailed truss designs intended for use in areas with roof snow loads not exceeding 50 lb/sq ft (at 24-in. spacing). The designs were accepted by Central Mortgage and Housing Corporation for use in houses built under the National Housing Act. These designs for 24- to 28-ft spans and 4/12 and 5/12 roof slopes, were reproduced by Central Mortgage and Housing Corporation in Builders' Bulletin No. 94 and with slight revisions in Builders' Bulletin No. 109.

Subsequent to the publication of these designs, further testing was carried out to develop designs for 30- and 40-lb snow load areas. In addition, designs were developed to include 3/12 slope trusses as well as 4/12 and 5/12 slopes, and the range of spa extended to include trusses of 16 32 ft in length (in 2-ft increment

This last series of truss designs w also accepted by Central Mortgage a Housing Corporation for use in hous built under the National Housing A and were recently reproduced CMHC in Builders' Bulletin No. 1 This bulletin is available free charge and may be obtained eith from CMHC or the Division of Bui ing Research.

Figures 1 and 2 show some of t designs available in this bulletin. of these designs meet the perfor ance requirements in Housing Star ards, Canada, 1963 which forms Su plement No. 5 to the National Bui ing Code. These requirements st that the trusses must be able to wi stand the ceiling load plus twice t design snow load for a 24-hour p riod and must not deflect more th 1/360 of the span when loaded w the ceiling load plus the design sn load for a period of one hour. T ensures that the trusses in general w be at least as strong as well-built jo and rafter roofs.

Method for assembling trusses

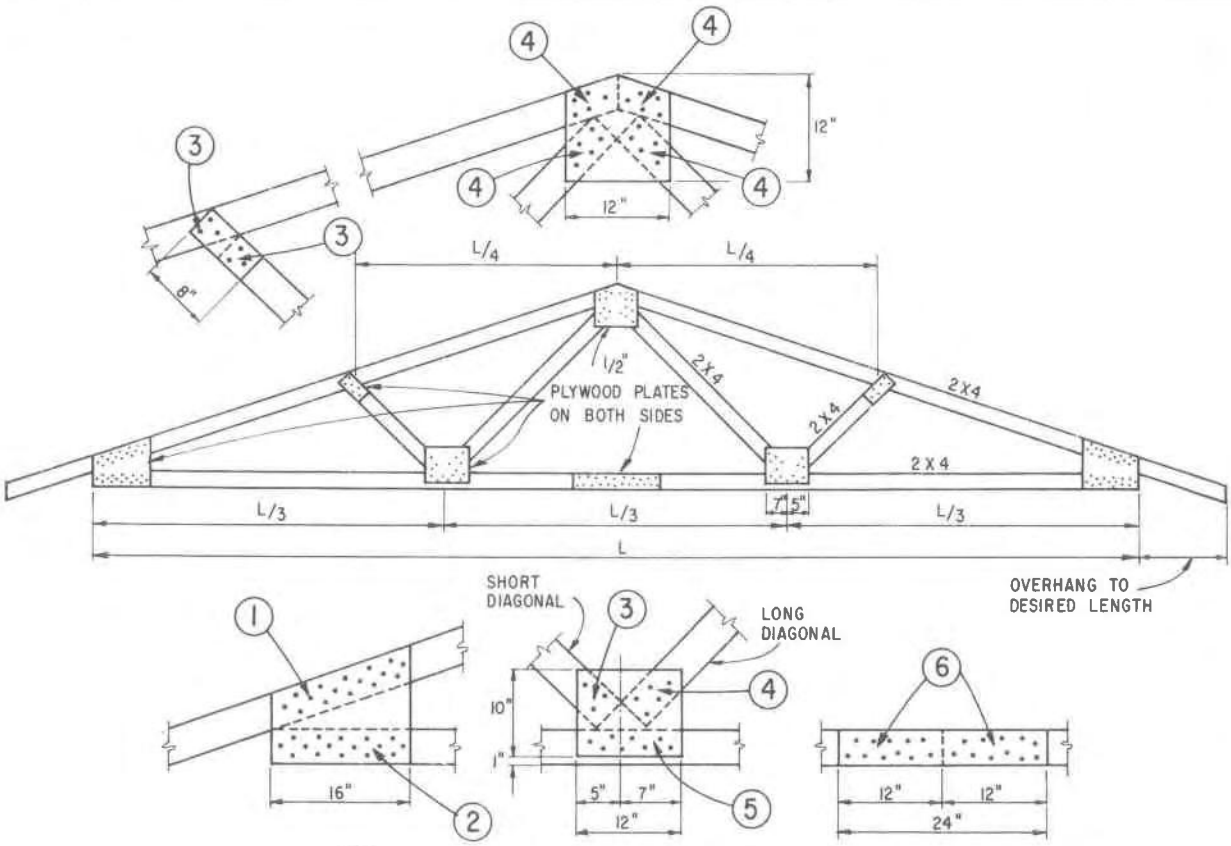
A simple method of providing a jig for accurate assembly of the truss members is to first draw the full size truss with chalk lines on the assembly bench or subfloor and mark the positions of the gusset plates. Wood cleats, usually about 2 in. thick and a foot or so long are then nailed on either side of where the truss members will lie, in sufficient numbers to hold the members in the correct relative positions while the truss is being assembled.

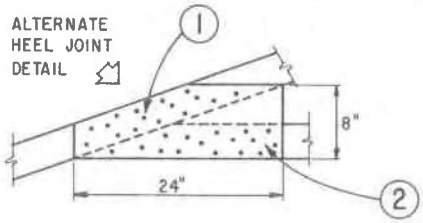
The pieces for the first truss should then be measured against the truss as indicated by the chalk lines and accurately cut and marked as pattern pieces which may be used for mar ing out the members for the remai ing trusses.

Degree of Precision Necessary

The trusses are designed so th precision cutting of most members not essential. In fact, most membe may be square cut. It is importa however, that the top chord membe be accurately cut where they meet the peak and that these members in good contact before the guss plates are installed. This may be a complished by nailing the top me bers together at the peak before t

(Continued on page 5)





NOTES: LUMBER - NO. 1 EASTERN SPRUCE OR EQUAL

NAILS - ALL NAILS - 3" COMMON
ALL ROWS OF NAILS ARE STAGGERED IN DIRECTION OF THE GRAIN TO KEEP SPLITTING TO A MINIMUM
NAILS MAY BE CLINCHED OR UNCLINCHED

PLYWOOD - ½" SHEATHING GRADE DOUGLAS FIR THROUGHOUT

TO ENSURE MAXIMUM STIFFNESS, THE UPPER CHORDS MUST BE IN GOOD BEARING CONTACT AT PEAK

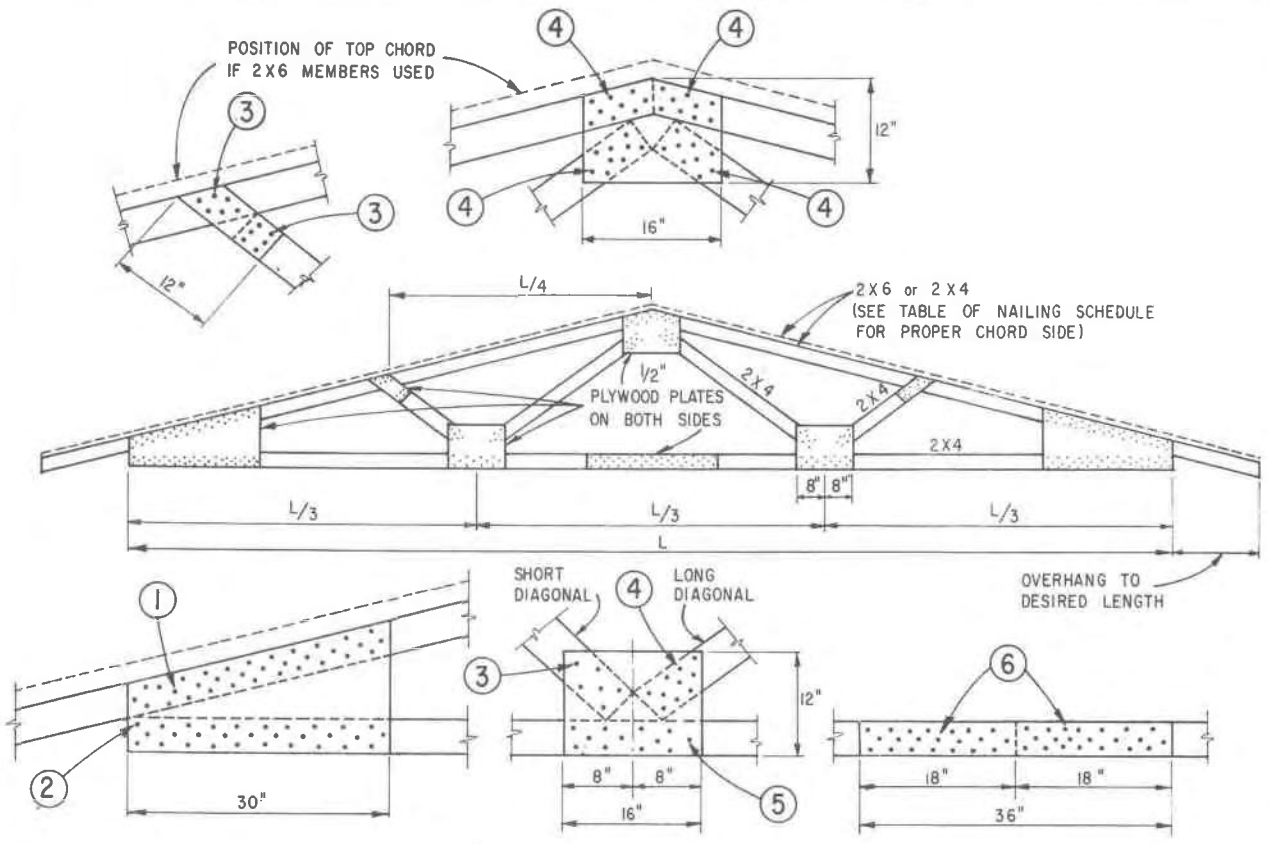
TRUSSES WITH SPANS DIFFERENT THAN THOSE LISTED MAY BE USED PROVIDED THE NAILING IS NOT LESS THAN THAT SHOWN FOR THE NEXT LARGER SPAN

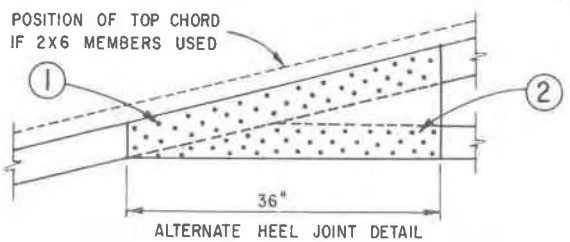
NUMBER OF NAILS REQUIRED AT VARIOUS JOINTS FOR DIFFERENT ROOF SNOW LOADS

Roof snow load	Slope	Span "L" ft	Span "L" in.	Joint location ①	②	③	④	⑤	⑥
30 psf	4/12	16	4	9	8	2	3	3	5
		18	4	10	9	2	3	4	6
		20	4	11	10	2	3	4	7
		22	4	12	11	2	4	4	7
		24	4	13	12	3	4	5	8
		26	4	14	13	3	4	5	9
		28	4	15	14	3	4	5	9
30 psf	5/12	16	4	7	7	2	2	3	5
		18	4	8	7	2	3	3	5
		20	4	9	8	2	3	4	6
		22	4	10	9	2	3	4	6
		24	4	10	10	2	3	4	7
		26	4	11	10	3	4	5	7
		28	4	12	11	3	4	5	8
40 psf	4/12	16	4	12	11	2	4	4	7
		18	4	13	12	3	4	5	8
		20	4	15	13	3	4	5	9
		22	4	16	14	3	5	6	10
		24	4	17	16	4	5	6	11
		26	4	19	17	4	6	7	11
		28	4	20	18	4	6	7	12
40 psf	5/12	16	4	10	9	2	3	4	6
		18	4	11	10	3	4	4	7
		20	4	12	11	3	4	5	8
		22	4	13	12	3	4	5	8
		24	4	14	13	3	4	6	9
		26	4	15	14	4	5	6	10
		28	4	16	15	4	5	6	10
50 psf	4/12	16	4	17	16	3	5	6	11
		18	4	19	18	4	5	7	12
		20	4	21	20	4	6	7	13
		22	4	23	21	4	7	8	14
		24	4	25	23	5	7	9	16
		26	4	27	25	5	8	10	17
		28	4	29	27	5	8	10	18
50 psf	5/12	16	4	14	13	3	4	5	9
		18	4	16	14	4	5	6	10
		20	4	17	16	4	5	7	11
		22	4	19	17	4	6	7	12
		24	4	20	19	4	6	8	13
		26	4	22	20	5	7	9	14
		28	4	24	22	5	7	9	15

FIGURE 1 NAILED "W" TRUSS, 2'-0" O.C.

FOR 4/12 & 5/12 SLOPES





ALTERNATE HEEL JOINT DETAIL

NAILING SCHEDULE

Roof snow load	Slope	Span "L" ft	Span "L" in.	Joint location ①	②	③	④	⑤	⑥
30 (2x4 top chord)	3/12	16	4	17	17	4	6	6	12
		18	4	20	18	4	6	6	13
		20	4	22	21	4	7	7	14
		22	4	24	24	4	8	8	16
		24	4	26	26	4	9	9	17
		26	4	29	28	5	9	9	19
		28	4	31	30	5	9	9	20
40 (2x4 top chord)	3/12	16	4	21	21	4	7	7	14
		18	4	24	23	4	7	7	16
		20	4	27	26	5	8	8	17
		22	4	29	29	5	9	9	19
		24	4	32	31	5	10	10	21
		26	4	35	34	6	11	11	23
		28	4	37	36	6	11	11	24
30 (2x6 top chord)	3/12	16	4	13	13	3	5	5	9
		18	4	15	14	3	5	5	10
		20	4	16	16	3	5	5	11
		22	4	18	18	3	6	6	12
		24	4	20	19	3	6	6	13
		26	4	21	21	4	7	7	14
		28	4	22	22	4	7	7	15
40 (2x6 top chord)	3/12	16	4	16	16	3	5	5	11
		18	4	18	17	3	5	5	12
		20	4	20	19	4	6	6	13
		22	4	22	22	4	7	7	14
		24	4	24	23	4	8	8	16
		26	4	26	25	5	8	8	17
		28	4	27	27	5	8	8	18
50 (2x6 top chord)	3/12	16	4	18	18	4	6	6	12
		18	4	21	20	4	6	6	14
		20	4	24	23	5	7	7	15
		22	4	26	25	5	8	8	17
		24	4	28	27	5	9	9	18
		26	4	30	30	6	10	10	20
		28	4	32	32	6	10	10	21

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TRUSSES WITH SPANS DIFFERENT THAN THOSE LISTED MAY BE USED PROVIDED THE NAILING IS NOT LESS THAN THAT SHOWN FOR THE NEXT LARGER SPAN

FIGURE 2 NAILED "W" TRUSS, 2'-0" O.C.
FOR 3/12 SLOPE

New nailed "W" roof truss designs

(Continued from page 2)

gusset plates are nailed in place. The fit at the other joints is not critical since the stiffness or strength of the trusses will be relatively unaffected if the members at the other joints are not tightly fitted. It is essential, however, that the size and number of nails used at each joint be not less than as shown on the drawings since the nailing largely determines truss performance. The nails should also be staggered in the direction of the grain to limit the amount of splitting that may occur. The nails used in making the trusses shown in Figures 1 and 2 do not have to be clinched.

Spacing may be varied for load

TABLE 1

Truss spacing	Allowable roof snow load (lb/sq.ft)		
24 in. o.c.	30 psf trusses	40 psf trusses	50 psf trusses
20 in. o.c.	36 psf trusses	48 psf trusses	60 psf trusses
16 in. o.c.	45 psf trusses	60 psf trusses	75 psf trusses
12 in. o.c.	60 psf trusses	80 psf trusses	100 psf trusses

The snow loads shown in Figures 1 and 2, for the various designs are based on truss spacings of 2 ft. If this spacing is reduced the trusses may be used in snow load areas greater than those shown. Table I shows how the allowable snow load may be altered by changing the truss spacing.

As an illustration of how this Table may be used, suppose the trusses are to be used in a 60-psf snow load area. One could use a truss originally designed for 30-psf snow load and 24-in. spacing by reducing the spacing to 12 in.; or one could use a 40-psf truss at 16 in. o.c.; or a 50-psf truss at 20 in. o.c.

In general, the most economical arrangement as far as framing costs are concerned will be to use the widest spacing possible (up to 24 in.). It may be desirable in some cases, however, to select an arrangement that will give a lesser spacing. A 16-in. spacing may be found to be preferable to a 20-in. spacing, for example, if plywood roof sheathing or gypsum board ceilings are to be used, or if one wishes to use 16-in. wide insulation batts.

All of these things should be considered in selecting the most economical arrangement for a particular snow load area.

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