

# MWPS-40' Truss

## 40' span, 4-web trusses

with plywood gussets

### **CAUTION!**

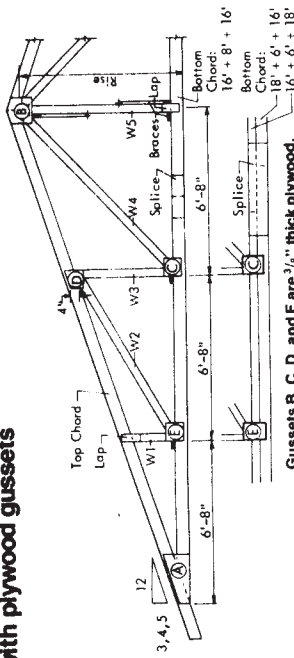
Additional professional services will be required to tailor this plan to your situation, including but not limited to: assurance of compliance with codes and regulations; review of specifications for materials and equipment; supervision of site selection, bid letting and construction; and provision for utilities, waste management, roads or other access. **Furthermore, any deviation from the given specifications may result in structural failure, property damage, and personal injury including loss of life.**

### **WARRANTY DISCLAIMER**

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<b>MIDWEST PLAN SERVICE</b>
Cooperative Extension Work in Agriculture and Home Economics and Agricultural Experiment Stations of North Central Region - USDA Cooperating
40' Truss
Title Page
MIDWEST PLAN NO. 40' Truss

# 40' span, 4-web trusses with plywood gussets



Gussets B, C, D, and E are 3/8" thick plywood.

Table of lengths

Roof Slope	Rise	Top Chord	W1	W2	W3	W4	W5
3/12	5'-0"	16'+5"	2'	7'	3'	8'	5'
4/12	6'-8"	18'+4"	2'	8'	5'	9'+8"	7'
5/12	8'-4"	18'+4"	3'	9'	6'	11'+10"	8'

4+4, 4+6, 6+6 indicate stacked lower chord.  
484, 684 indicate double web; a 2x4 is attached to the web member to increase its stiffness.

This sheet is to help you SELECT and ERECT trusses. DO NOT try to BUILD trusses from it, because it does not include enough information on gluing, joints, splices, and fabrication. See "Designs for Glued Trusses," MWFS-9. If you buy metal-plate trusses, use their designer's data.

To select a truss:

1. estimate roof dead load
2. determine appropriate snow load
3. roof dead load plus snow load = roof design load,  $psf$
4. select a truss to carry at least the total roof load for the lumber quality, slope, spacing, and ceiling dead load you will use.

For more information see back page and MWFS-9, Designs for Glued Trusses, 4th Edition, 1981.

## 1400F Lumber

Top chord	Truss spacing, ft.						Web member sizes						Gusset Sizes, in.					
	0	2	4	5	6	8	W1	W2	W3	W4	W5	A	B	C	D	E		
2x4	2x4	2x4	2x4	2x4	2x4	2x4	2x4	2x4	2x4	2x4	2x4	3/8x3x21	3/8x3x25	3/8x3x25	3/8x3x25	3/8x3x25		
2x6	2x6	2x6	2x6	2x6	2x6	2x6	2x6	2x6	2x6	2x6	3/8x4x22	3/8x4x22	3/8x4x22	3/8x4x22	3/8x4x22			
2x8	2x8	2x8	2x8	2x8	2x8	2x8	2x8	2x8	2x8	2x8	3/8x4x32	3/8x4x32	3/8x4x32	3/8x4x32	3/8x4x32			
2x10	2x10	2x10	2x10	2x10	2x10	2x10	2x10	2x10	2x10	2x10	3/8x4x42	3/8x4x42	3/8x4x42	3/8x4x42	3/8x4x42			
2x12	2x12	2x12	2x12	2x12	2x12	2x12	2x12	2x12	2x12	2x12	3/8x4x52	3/8x4x52	3/8x4x52	3/8x4x52	3/8x4x52			
2x12	2x12	2x12	2x12	2x12	2x12	2x12	2x12	2x12	2x12	2x12	3/8x4x62	3/8x4x62	3/8x4x62	3/8x4x62	3/8x4x62			

## 1600F Lumber

Top chord	Truss spacing, ft.						Web member sizes						Gusset Sizes, in.					
	0	2	4	5	6	8	W1	W2	W3	W4	W5	A	B	C	D	E		
2x4	2x4	2x4	2x4	2x4	2x4	2x4	2x4	2x4	2x4	2x4	2x4	3/8x3x21	3/8x3x25	3/8x3x25	3/8x3x25	3/8x3x25		
2x6	2x6	2x6	2x6	2x6	2x6	2x6	2x6	2x6	2x6	2x6	3/8x4x22	3/8x4x22	3/8x4x22	3/8x4x22	3/8x4x22			
2x8	2x8	2x8	2x8	2x8	2x8	2x8	2x8	2x8	2x8	2x8	3/8x4x32	3/8x4x32	3/8x4x32	3/8x4x32	3/8x4x32			
2x10	2x10	2x10	2x10	2x10	2x10	2x10	2x10	2x10	2x10	2x10	3/8x4x42	3/8x4x42	3/8x4x42	3/8x4x42	3/8x4x42			
2x12	2x12	2x12	2x12	2x12	2x12	2x12	2x12	2x12	2x12	2x12	3/8x4x52	3/8x4x52	3/8x4x52	3/8x4x52	3/8x4x52			
2x12	2x12	2x12	2x12	2x12	2x12	2x12	2x12	2x12	2x12	2x12	3/8x4x62	3/8x4x62	3/8x4x62	3/8x4x62	3/8x4x62			

## 1100F Lumber

Top chord	Truss spacing, ft.						Web member sizes						Gusset Sizes, in.					
	0	2	4	5	6	8	W1	W2	W3	W4	W5	A	B	C	D	E		
2x4	2x4	2x4	2x4	2x4	2x4	2x4	2x4	2x4	2x4	2x4	2x4	3/8x3x21	3/8x3x25	3/8x3x25	3/8x3x25	3/8x3x25		
2x6	2x6	2x6	2x6	2x6	2x6	2x6	2x6	2x6	2x6	2x6	3/8x4x22	3/8x4x22	3/8x4x22	3/8x4x22	3/8x4x22			
2x8	2x8	2x8	2x8	2x8	2x8	2x8	2x8	2x8	2x8	2x8	3/8x4x32	3/8x4x32	3/8x4x32	3/8x4x32	3/8x4x32			
2x10	2x10	2x10	2x10	2x10	2x10	2x10	2x10	2x10	2x10	2x10	3/8x4x42	3/8x4x42	3/8x4x42	3/8x4x42	3/8x4x42			
2x12	2x12	2x12	2x12	2x12	2x12	2x12	2x12	2x12	2x12	2x12	3/8x4x52	3/8x4x52	3/8x4x52	3/8x4x52	3/8x4x52			
2x12	2x12	2x12	2x12	2x12	2x12	2x12	2x12	2x12	2x12	2x12	3/8x4x62	3/8x4x62	3/8x4x62	3/8x4x62	3/8x4x62			

This page is a summary of the information in "Designs for Glued Trusses," MWPS-9. Refer to this publication before building trusses.

### ROOF SLOPE (Inches of rise/inches of run)

Roof slope significantly affects the forces in the truss members. A steeper roof allows higher roof loads. 3/12 slope—used in low snow load areas or for short spans and narrow spacings. 4/12 slope—most common for farm buildings. 5/12 slope—used in high snow load areas or for long spans and wide spacings.

### TRUSS SPACING

Roof and ceiling materials and wall framing influence truss spacing selection. In pole buildings it is desirable to support each truss on a pole.

1. Spacing uses more material and labor. It is common for buildings with ceilings and plywood roof decks.
2. Spacing is common in insulated livestock buildings with ceilings and metal roofs, and in some storage buildings.
3. Spacing uses least material and labor for buildings without ceilings such as machinery storages, un-insulated livestock buildings, etc. Total cost may be greater if a ceiling is needed.

### CEILING DEAD LOAD

Three ceiling dead load cases are included in the tables.

- 0 psf allows for no materials in addition to the truss, bracing, and stiffeners.
- 5 psf ceiling dead load allows for a metal or plywood ceiling with insulation (warm livestock buildings).
- 8 psf ceiling dead load allows for a gypsum board ceiling with insulation (residential or light commercial buildings).

### ROOF DEAD LOAD

Add the weights of the truss, purlins or decking, roofing, and roof insulation to get the dead load on the top chord.

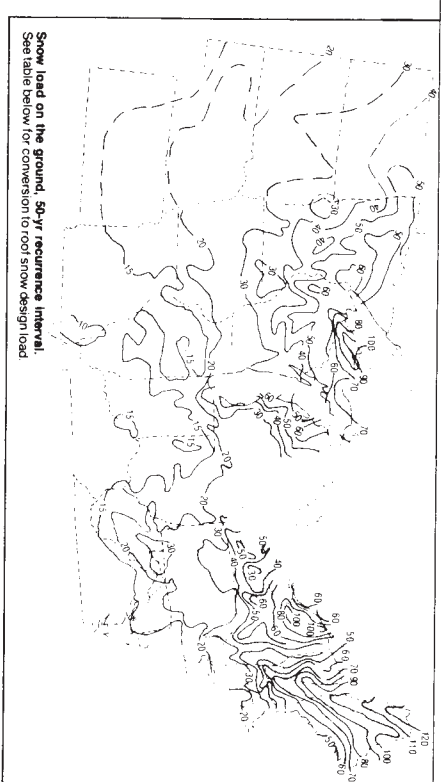
### Approximate weights of trusses, psf.

Example: a 4-web truss for 4' spacing with 2x8 top chord and 2x6 bottom chord weighs about  $13 + 0.7 = 20$  psf. Dashed lines in table indicate example.

Chord Size Top Bottom	Truss spacing	
	2'	4'
2x4 2x4	1.6	0.8
2x6 2x4	2.0	1.0
2x6 2x6	2.4	1.2
2x8 2x6	2.7	1.3
2x10 2x4x2x4	3.3	1.6
2x12 2x6x2x6	4.0	2.0
2x12 2x6x2x6	4.4	2.2

Add the following for:  
2x6x2-web Truss 1.4  
6-web Truss 2.1

0.4  
0.6  
1.2  
0.6



**SNOW LOAD**  
Use the map above and the table below for determining snow load for your building.

### Recommended snow loads.

Recommended by the MWPS and NAECS Committees for roofs up to about 100 ft long for buildings outside the jurisdiction of a building code. For roofs longer than 100 ft, a 20% increase in snow load is recommended. Other buildings: 50-yr. map load x 0.8 to convert from snow on ground to snow on roof. Minimum recommended load is 12 psf. In areas where all of the maximum snow load results from a single storm without significant wind the maximum roof load may equal the ground snow load.

Map load	Farm	Roof snow load	Other
15	12.0	12	12
20	14.4	16	16
30	21.6	24	24
40	28.8	32	32
50	36.0	40	40
60	43.2	48	48
70	50.4	56	56
80	57.6	64	64
90	64.8	72	72
100	72.0	80	80
110	79.2	88	88
120	86.4	96	96

### Weights of roofing and ceiling materials.

Roof framing	Weight
2x4 purlins 2' o.c.	0.7 psf
2x6 purlins 2' o.c.	1.1
Ceiling framing	0.4 psf
1x3 furring 16' o.c.	0.7
2x4 furring 2' o.c.	0.4 psf
Sheathing, etc.	2.2 psf
1/2 lumber solid	1.1
3/4 plywood	1.4
0.024 aluminum	0.4
28 ga steel	0.9
Asph/Flt shingles	2.6
Insulation, per inch of thickness	0.1 to 0.4

### Wind Loads

Trusses are designed to withstand winds of 80 mph on a building less than 30' high.

### LUMBER

Three lumber groups are indicated in the tables. Example of species in each group are listed below. SS = Select structural (15%) = moisture content at time of milling.

### 1600 Group

Species	Grade	Size
Douglas Fir—Larch	No. 1	2x4
Douglas Fir—Larch (North)	No. 1	2x4
Southern Pine (15%)	No. 2 dense	2x4
Southern Pine (15%)	No. 1	2x4
Southern Pine (15%)	No. 2 dense	2x6

### 1400 Group

Species	Grade	Size
Douglas Fir—Larch	No. 1	2x6
Douglas Fir—Larch (North)	No. 1	2x6
Hem—Fir	No. 1	2x4
Southern Pine (15%)	No. 2	2x4
Southern Pine (15%)	No. 2	2x4
Southern Pine (15%)	No. 1	2x6

### 1100 Group

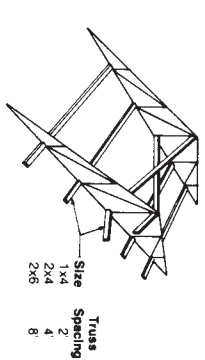
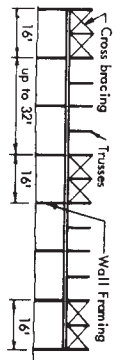
Species	Grade	Size
Douglas Fir—Larch	No. 2	2x6
Douglas Fir (North)	No. 2	2x4
Douglas Fir (South)	No. 2	2x6
Hem—Fir	No. 2	2x6
Hem—Fir (North)	No. 1	2x4
Hem—Fir (North)	No. 1	2x6
Hem—Fir (North)	No. 1	2x6
Southern Pine (15%)	No. 2	2x6
Southern Pine (15%)	No. 2	2x6
Southern Pine (15%)	No. 1	2x4
Southern Pine (15%)	No. 1	2x6

### Plywood

Use exterior C-C grade 1/2" or 3/4" plywood with outer plies of Group 1 species wood. Identification indexes: 240 and 32/16 respectively. Use 3-ply 1/2" plywood and 5-ply 1/2" plywood or use Structural I, 4-ply 1/2" plywood.

### BUILDING CONSTRUCTION

Brace and anchor the trusses as they are placed. Bottom chord stiffeners are required at panel points unless a rigid ceiling is to be installed. Use king post crossbracing in all buildings.



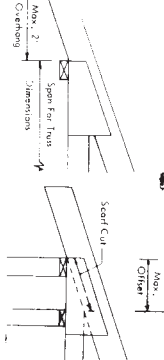
**Wind Anchorage**  
Minimum fasteners for wind anchorage, both ends of each truss.

Truss Span	Truss Spacing	Truss Size	Spacing
20'-24'	2'	1A or 1B	8
26'-30'	4'	1A or 1B	14
32'-46'	4'	1A or 1B	24
48'-50'	4'	1A or 1B	4
52'-60'	4'	1A or 1B	8

A = metal framing anchor  
4-30d ring-shank nails = 1/2" bolt  
B = 1/2" bolt

### Overhang

For a 2' to 4' overhang, use the top chord and heel gusset design for a 1/2 larger snow load.



### Roof Purlins

Stagger purlin joints for continuity across the trusses. Purlins may be laid flat with 2" and 4" truss spacings and butt joints used.

Alternating purlin lengths may be used in pole buildings where the poles are spaced evenly and the trusses are not. For poles 8' o.c. they may be of alternating 16' and 18' lengths with staggered and alternate sides of the poles.

