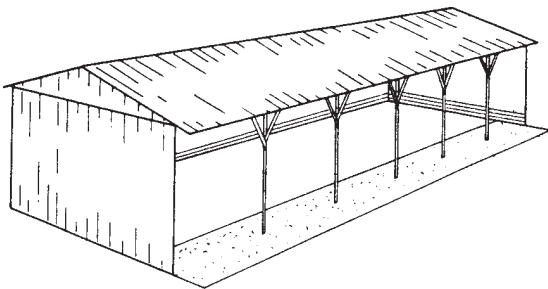


# MWPS-73110

## 24' Wide Hay Barn

### WARRANTY DISCLAIMER

This plan provides conceptual information only. **Neither MidWest Plan Service nor any of the cooperating land grant universities, or their respective agents or employees, have made, and do not hereby make, any representation, warranty or covenant with respect to the specifications in this plan.** 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.

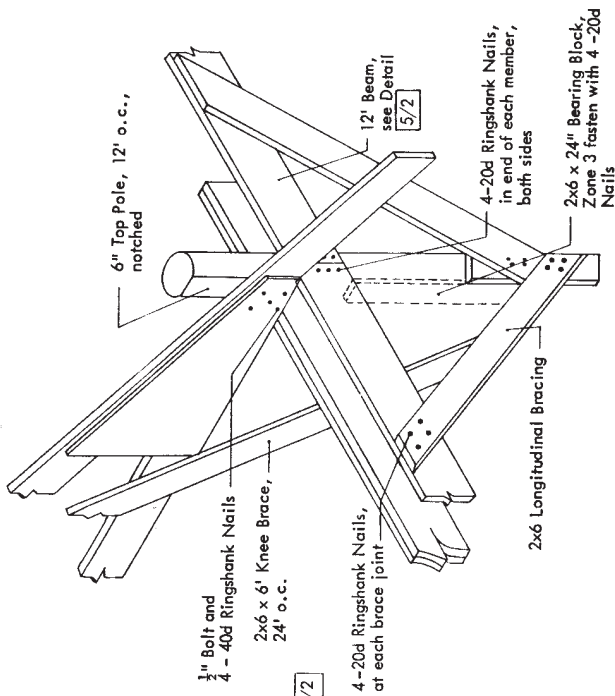


<b>MIDWEST PLAN SERVICE</b>
Cooperative Extension Work in Agriculture and Home Economics and Agricultural Experiment Stations of North Central Region - USDA Cooperating
24' WIDE HAY BARN
Title Page
MIDWEST PLAN NO. 73110

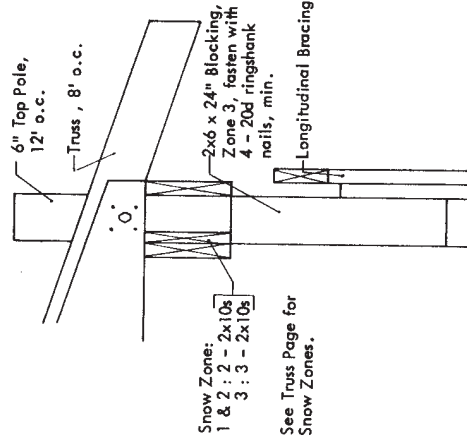
## **CAUTION!**

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.**

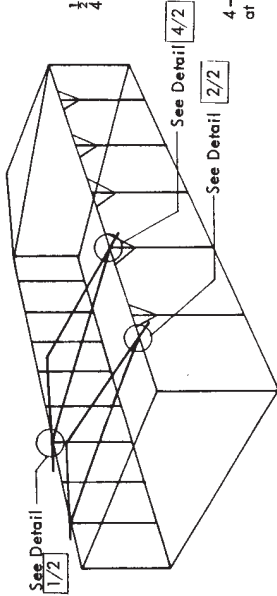




TRUSS/POLE DETAIL—OPEN FRONT SIDE —1/2

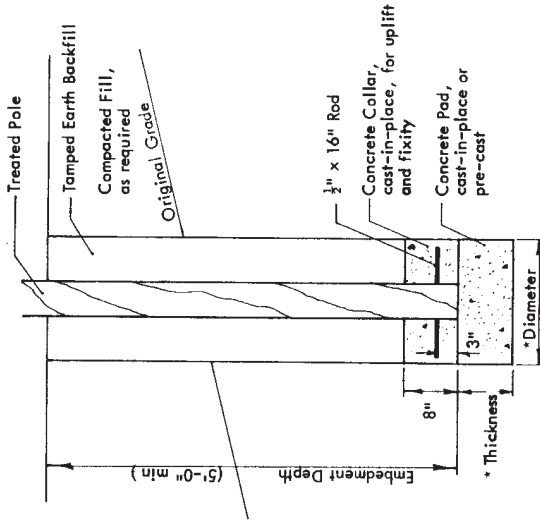


TRUSS/POLE DETAIL—OPEN FRONT SIDE —4/2

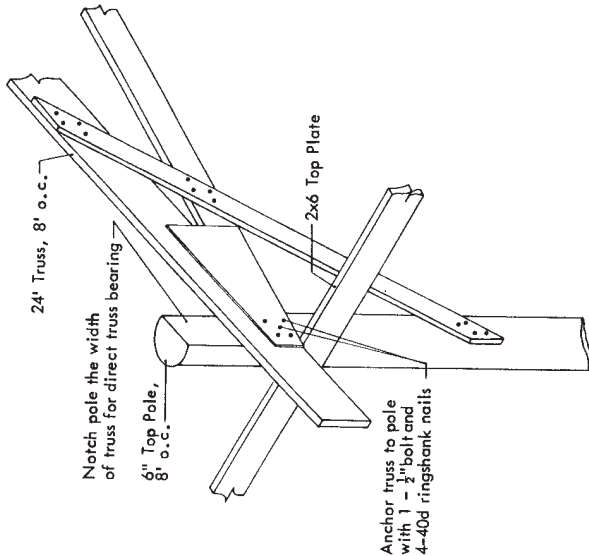


\* Footing Size  
 18" Dia x 6" Thick @ Endwall Posts (8' o.c.)  
 18" Dia x 6" Thick @ Sidewall Posts (8' o.c.)  
 20" Dia x 6" Thick @ 12' Opening

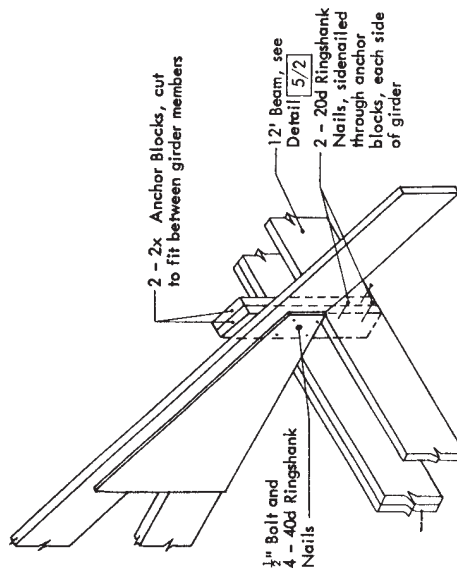
Extend embedment depth as required to place footing on undisturbed soil. For large diameter footings, use smaller diameter auger and flare the bottom of the hole with Lineman's spoon.



POST FOOTING DETAIL —3/2

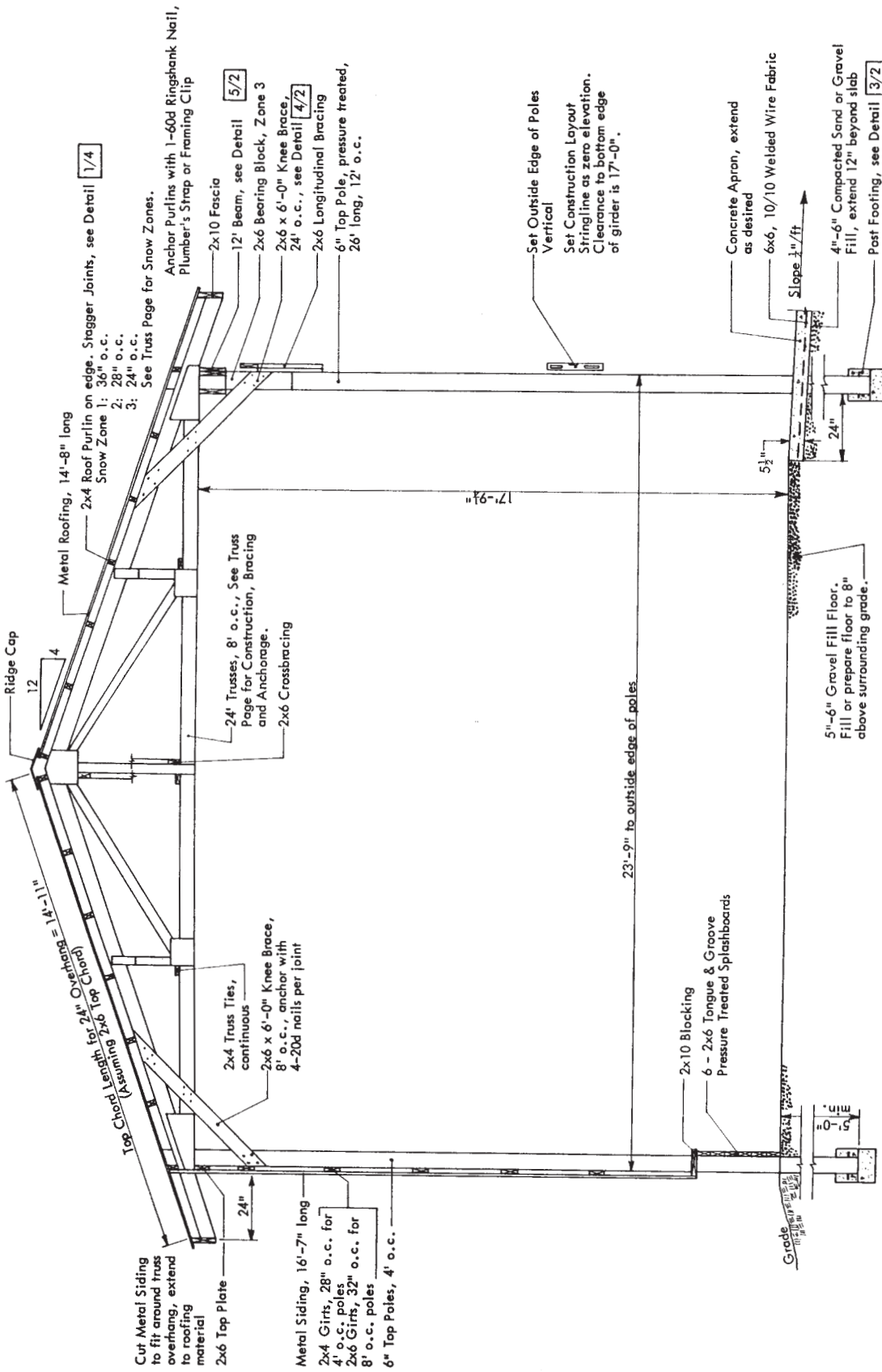


TRUSS/POLE DETAIL—ENCLOSED SIDE —1/2

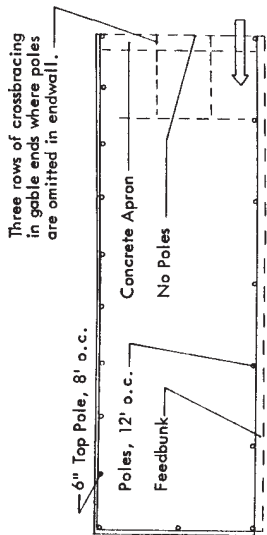


TRUSS/BEAM DETAIL—OPEN FRONT SIDE —2/2

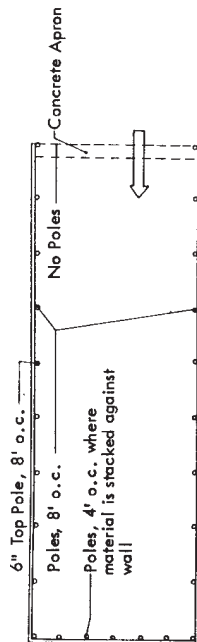
<b>MIDWEST PLAN SERVICE</b>			
24' WIDE HAY BARN			
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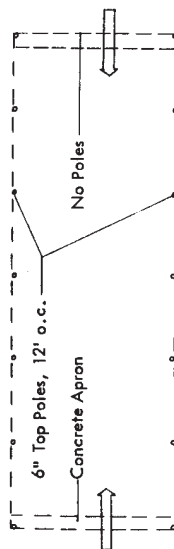
BUILDING CROSS SECTION—1/3



One Endwall, One Sidewall Open, Feedbunk  
6" Top Pole = 6x10 sawn post for this plan.



One Endwall Open  
6" Top Pole = 6x10 sawn post for this plan.



All Walls Open  
6" Top Pole = 6x8 sawn post for this plan.

**WALL ENCLOSURE OPTIONS**

1/2" x 12" Plywood Web, glue nailed to the inside of trussed girder.

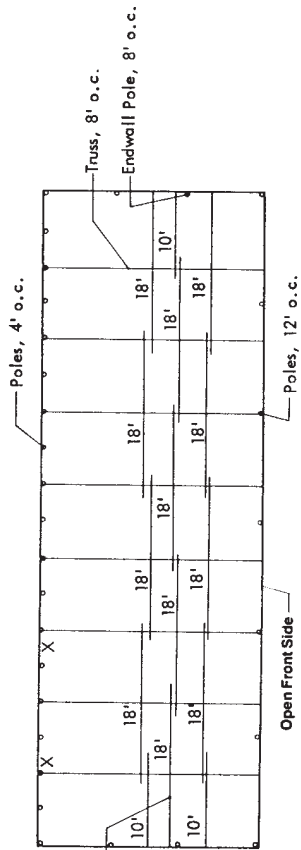
6" Top Pole, 28' long

6" Top Pole, 26' long

4' o.c. Pressure Treated

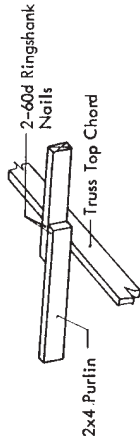
<b>MIDWEST PLAN SERVICE</b>	
<b>24' WIDE HAY BARN</b>	
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16' purlin lengths may be substituted for 18' lengths where "X" side of pole is notched for truss bearing.

**TRUSS/POLE/PURLIN DETAIL — 1/4**



**PURLIN ANCHORAGE**

**PREFERRED LUMBER SPECIFICATIONS**

**Roof Purlins, Wall Girts, and Spineboards**  
No. 2 Doug Fir or Southern Pine

**Trusses and Headers**  
See Truss Page for Additional Information  
No. 1 or 1500-l Machine Stress Rated, Doug Fir or Southern Pine

**Round Poles**  
Doug Fir or Southern Pine (F<sub>v</sub> = 2100 psi)  
Preservative Treatment  
Creosote

Southern Pine, 9 pcf  
Coastal Doug Fir, 12 pcf  
Interior Doug Fir, 16 pcf  
Penta  
0.60 pcf

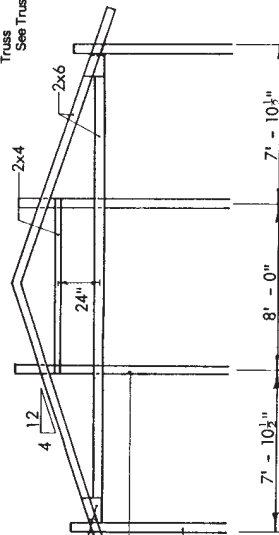
ACA or CCA (Type A or B) 0.60 pcf  
Sawn Timber Posts may be substituted for 6" top poles. Use 6x8s with F<sub>b</sub> = 1300 psi min. for this plan.

**Alternate Lumber Specs.**  
2x4 Purlins (No. 2 Hem-Fir)  
Maximum Spacing:  
Snow Zone 1 30"  
2 28"  
3 24"

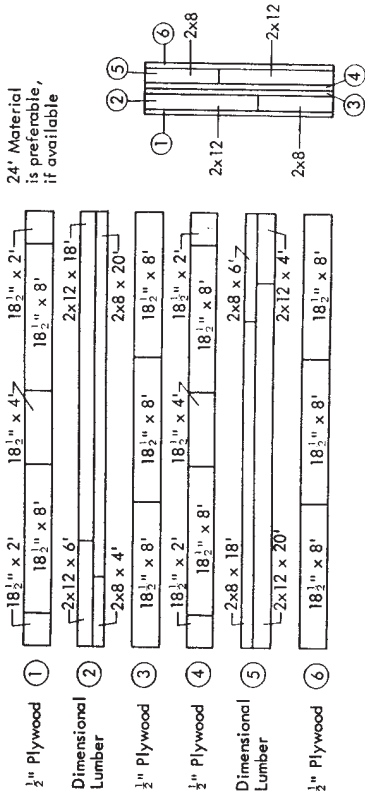
2x6 Girts (No. 2 Hem-Fir)  
Maximum Spacing: 24"  
See Truss Page

**LIST OF MATERIALS**

Quantity	Description
26	6" Top Poles, 26' long, Pressure Treated (17 for 8' o.c. rear wall posts)
4	6" Top Poles, 28' long, Pressure Treated
55	2x6 x 16' Wall Girts and Top Plates
45	2x6 x 16' Pressure Treated Tongue and Groove Spineboards
14	2x4 x 18' Truss Ties
12	2x6 x 10' Crossbraces
56	2x4 x 18' Roof Purlins (Zone 2)
14	2x4 x 10' Roof Purlins (Zone 2)
10	2x6 x 6' Knee Braces
12	2x10 x 12' Girder Members (Zone 2)
8	2x10 x 12' Blocking and Bracing
Truss	24' Truss, 2-web Pratt, 8' o.c., 4/12 Slope
Zone 2, 8	required with 8' o.c. spacing. See Truss Page for Alternate Lumber Specs.
16	2x6 x 16' Top Chords (Doug Fir)
8	2x4 x 14' Bottom Chords (Doug Fir)
8	2x4 x 10' Bottom Chords (Doug Fir)
8	2x4 x 18' Wise Members
1 sheet	4"x8" - 1/2" CC Exterior Plywood
2 sheets	4"x8" - 3/4" CC Exterior Plywood
	Glue and Nails. See Truss Page
32 yds	Gravel Fill min.
7 yds	Air Entrained Concrete (6" apron + post footings)
72 ft	5" wide - 6x6/10/10 Welded Wire Fabric
2200 ft <sup>2</sup>	Siding
2200 ft <sup>2</sup>	Roofing
72'	Ridge Cap
16	1/2" x 12" Anchor Bolts
	60d + 20d Ringshank Nails



**SOLID ENDWALL DETAIL — 2/4**



24' Material is preferable, if available

### 24' Beam—for 24' Wide Sidewall Bays

#### MATERIALS

##### Lumber

This beam is designed for use of Douglas Fir-Larch (No. 1, MC19) or Southern Yellow Pine (No. 1, MC19).

Use clean and smooth lumber. Do not use cupped or twisted lumber.

##### Plywood

Use 1/2" C-C Ext. ("Identification Index" = 32/16)

##### Glue

Casein (XOM-125A, type II, mold resistant) is not waterproof, but is highly water resistant. Resorcinol resin glue is waterproof and should be used if the beam is to be exposed to unusual moisture conditions.

Follow the manufacturer's specifications for mixing, pot life, temperature during use, etc.

#### BEAM CONSTRUCTION

1. Assemble the beam in two pieces, layers 1, 2, and 3 and layers 4, 5, and 6. Clamp the narrow faces of the dimensional lumber together (Layer #2 = 2x8 + 2x12 = 2x20). Spread glue on the plywood (Layer #1). Nail plywood to Layer #2 and 6d box nails, preferably galvanized or cement coated, 4" o.c. both ways. Glue should squeeze out from the edges of the beam. Remove the clamps; glue and nail Layer #3 plywood to the other side of the dimensional lumber in a similar manner. Then assemble layers #4, #5, and #6.

2. Final Assembly - use method a, or b.

##### a. Clamping method.

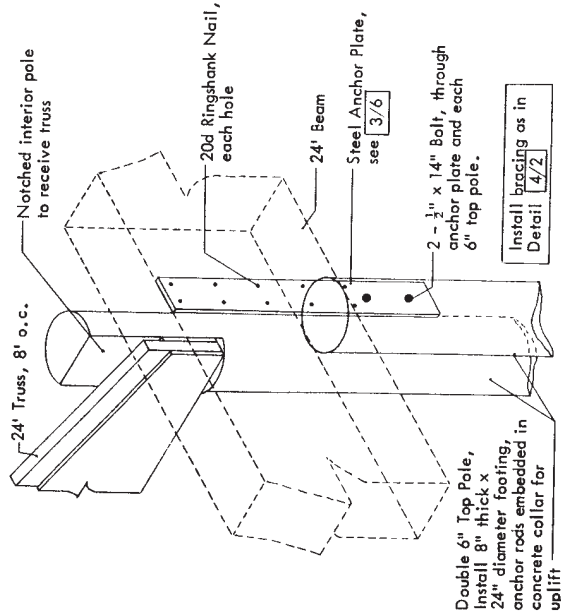
When both halves of the beam have been assembled, apply glue to the two remaining inside surfaces. Place clamps about 2' apart on the fully assembled beam and leave on the 24 hours.

##### b. Weighting method.

When both halves of the beam have been assembled, apply glue to the two remaining inside surfaces. Lay the beam on a level surface. Place sufficient weight on the fully assembled beam to squeeze glue out from the edges of the beam. Leave on for 24 hours.

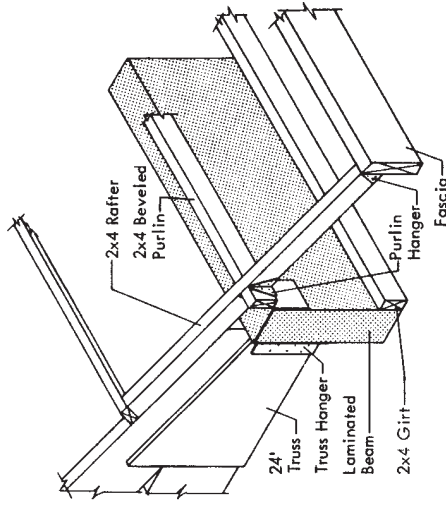
### 24' LAMINATED BEAM ASSEMBLY—1/5

For snow Zones 1, 2, and 3

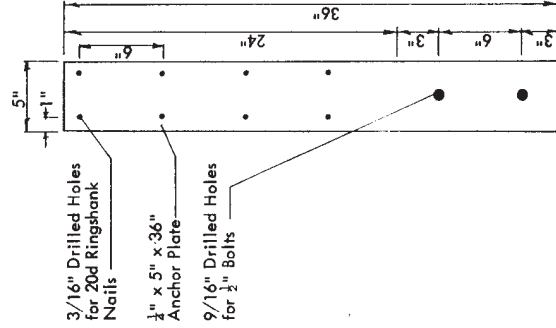


Double 6" Top Pole, install 8" thick x 24" diameter footing, anchor rods embedded in concrete collar for uplift

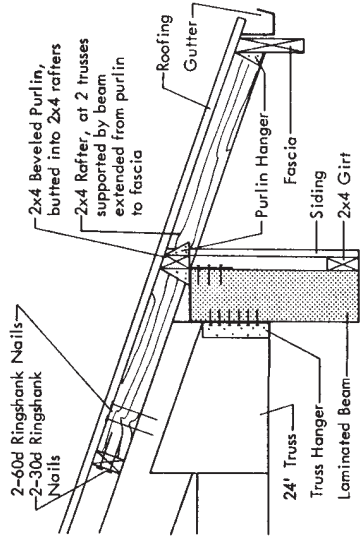
### 24' BEAM TO POST DETAIL—2/5



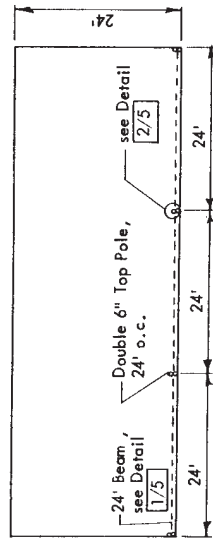
**OVERHANG RAFTER DETAIL — 2/6**



**ANCHOR PLATE DETAIL — 3/6**



**SECTION — 1/6**  
 24' truss with 6 1/2" cut off heel. Extend gussets 6 1/2" to the left so they are not shortened.



**FLOOR PLAN FOR 24' OPEN FRONT BAYS**



# TRUSSES

July, 1984

## Dear Customer:

When this plan was released, the last sheet had details for glue-nailed truss selection. Most buildings are erected with purchased trusses. The truss sheet did not have space enough to present all that was needed to build glue-nailed trusses.

Therefore, the sheet has been dropped. The plan has not yet been revised to include the following notes:

## TRUSS NOTES

If you buy trusses:

Specify the span, slope, and spacing shown on the plan. Specify the roof and ceiling types. Require strength adequate for the wind and snow loads for your locality.

Require installation details specifying anchorage, bracing, and roofing and ceiling framing and attachment. If you buy glue-nailed trusses:

Have them built and installed to the recommendations in MWPS-9, *Designs for Glued Trusses*, Fourth Edition.

If you build your own trusses:

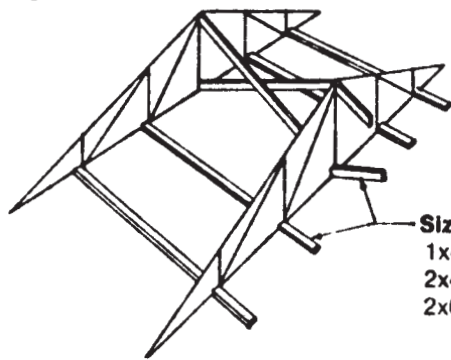
Get a copy of MWPS-9 and follow its recommendations.

Send \$5.00 for *Designs for Glued Trusses*, MWPS-9 to:

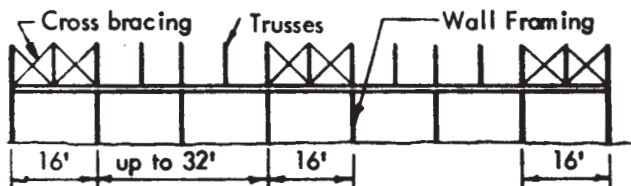
Midwest Plan Service, 122 Davidson Hall, Iowa State University, Ames, IA 50011

## Windbracing

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.



Size	Truss Spacing
1x4	2'
2x4	4'
2x6	8'



## Wind Anchorage

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

Truss span	Truss spacing		
	2'	4'	8'
20'-24'	1A or 1B	1A or 1B	2A or 1B
26'-30'	1A or 1B	1A or 1B	2A or 2B
32'-46'	1A or 1B	2A or 1B	3A or 2B
48'-50'	1A or 1B	2A or 1B	4A or 2B
52'-60'	1A or 1B	2A or 2B	4A or 3B

A = metal framing anchor

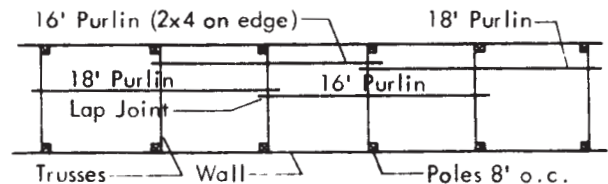
4-30d ring-shank nails = 1/2" bolt

B = 1/2" bolt

## Roof Purlins

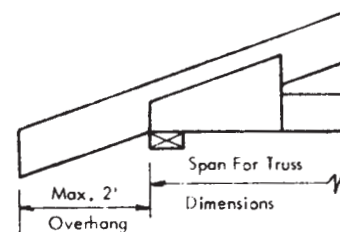
Stagger purlin joints for continuity across the trusses. Purlins may be laid flat with 2' and 4' truss spacings and butt joints used.

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 lapped end joints if pairs of trusses are mounted on alternate sides of the poles.



## Overhang

For a 2' to 4' overhang, use the top chord and heel gusset design for a 1/3 larger snow load.



**Loads**

Install trusses to withstand the loads.

- Required by any applicable building code.
- Recommended by an engineer familiar with farm buildings in your area.
- Or, if necessary, estimated from the material below.

**Ceiling Dead Load**

- 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 1.3 + 0.7 = 2.0 psf. Dashed lines in table indicate example.

Chord size Top	Bottom	Truss spacing		
		2'	4'	8'
2x4	2x4	1.6	0.8	0.4
2x6	2x4	2.0	1.0	0.5
2x6	2x6	2.4	1.2	0.6
2x8	2x6	2.7	1.3	0.7
2x10	2x4 + 2x4	3.3	1.6	0.8
2x12	2x4 + 2x6	4.0	2.0	1.0
2x12	2x6 + 2x6	4.4	2.2	1.1

Add the following for:				
2-&4-Web				
Truss	1.4	0.7	0.4	
6 Web Truss	2.1	1.2	0.6	

**Recommended snow loads**

For roofs up to about 5/12 slope for buildings outside the jurisdiction of a building code. Farm buildings:

50-yr map load x 0.9 for 25-yr x 0.8 for snow on roof.  
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.

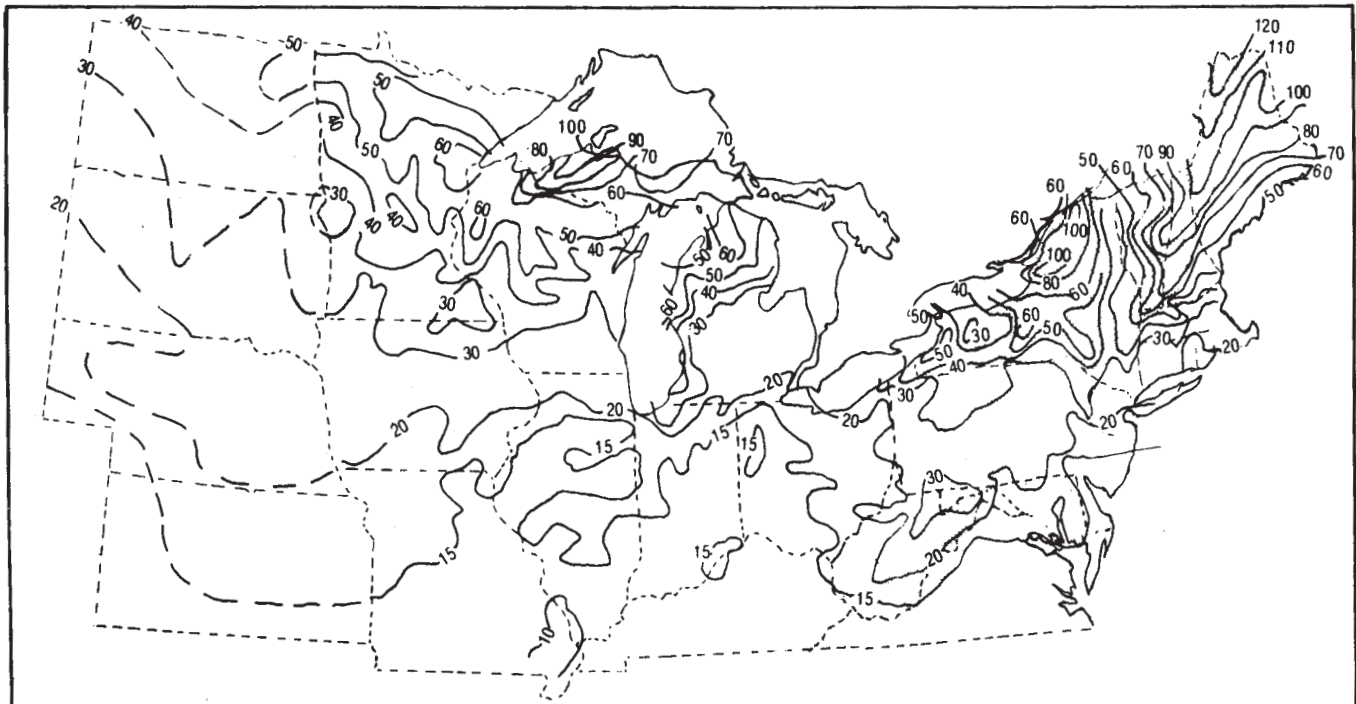
Map load	Roof snow load	
	Farm	Other
15	12.0	12
20	14.4	16
30	21.6	24
40	28.8	32
50	36.0	40
60	43.2	48
70	50.4	56
80	57.6	64
90	64.8	72
100	72.0	80
110	79.2	88
120	86.4	96

**Weights of roofing and ceiling materials**

2x4s, 2' o.c.	0.7 psf
2x6s, 2' o.c.	1.1
1" lumber, solid	2.2 psf
1x3s, 16" o.c.	0.4
3/8" plywood	1.1
1/2" plywood	1.4
0.024" aluminum	0.4
28 ga steel	0.9
Asphalt shingles	2.6
Insulation, per inch of thickness	0.1-0.4

**Wind Loads**

For most areas of the U.S., trusses are designed to withstand winds of 80 mph on a building less than 30' high.



Snow load on the ground, 50-yr recurrence interval