

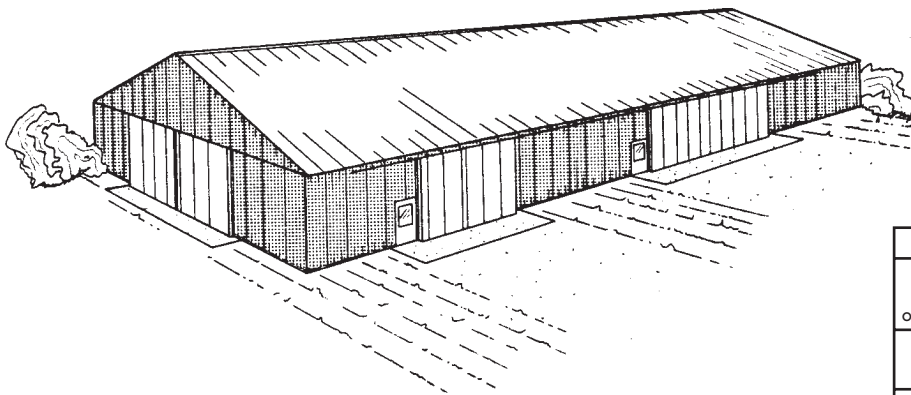
MWPS-74143

40' x 104' Machine Shed

13' clearance with 40' x 40' shop.

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.



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Title Page
MIDWEST PLAN NO. 74143

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.**

***PREFERRED LUMBER SPECIFICATIONS**

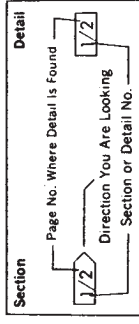
Roof Purlins and Wall Girts
2x4 Construction Grade (Doug Fir or Southern Yellow Pine).
2x6 No. 2 (Doug Fir or Southern Yellow Pine).

Trusses and Headers
No. 1 or 15001 machine rated (Doug Fir or Southern Yellow Pine).

Posts and Splashboards
Pressure Preservative Treated (Southern Yellow Pine or equivalent) creosote—10 pcf; Pentac—0.50 pcf; ACA or CCA (Type A or B)—0.40 pcf.
Rough sawn 6x6's may be substituted for 6x8 sidewall posts.

*For alternate member sizes, using Hem-Fir and round poles, see page 2 and Truss Page.

Use 40' glue-nailed trusses, 8'-0" o.c. Install 16' and 18' long roof jurlins with staggered joints. Locate trusses on far side of sliding door opening for knee brace installation.



Section & Detail Indicator

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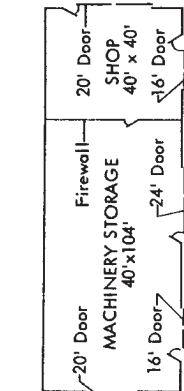
Truss Page

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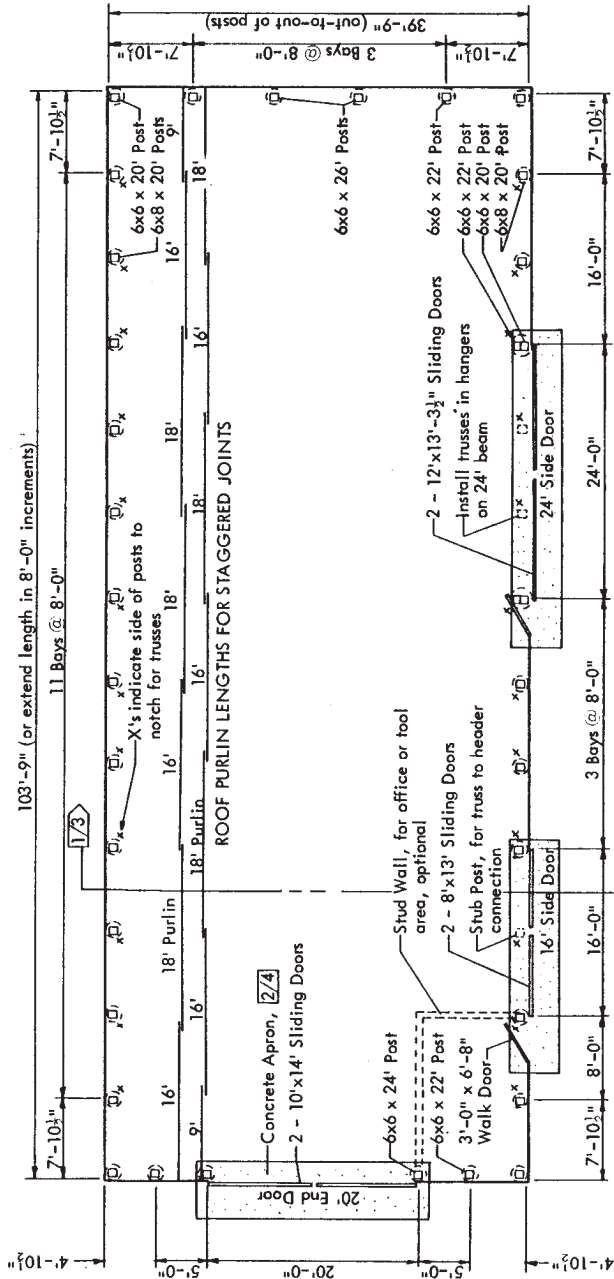
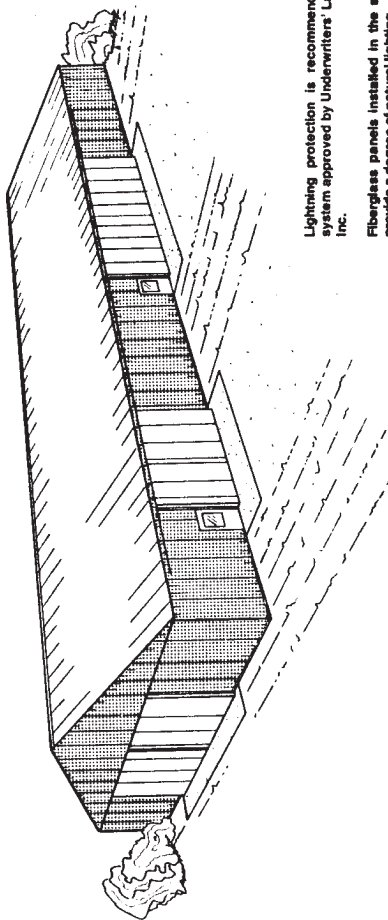
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Machine Shed plus Shop
See pages 9 & 10 for details

Lighting protection is recommended. Use a system approved by Underwriters' Laboratories, Inc.

Fiberglass panels installed in the sidewall can provide a degree of natural lighting.



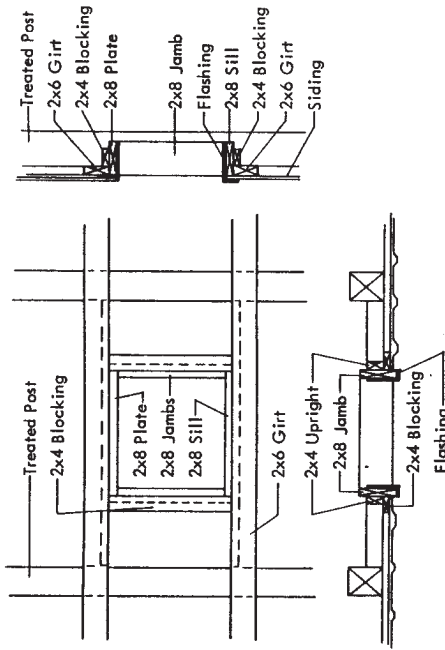
FLOOR & FOOTING PLAN—1/1

Located doors as desired

Endwall post lengths are for 4/12 roof slope

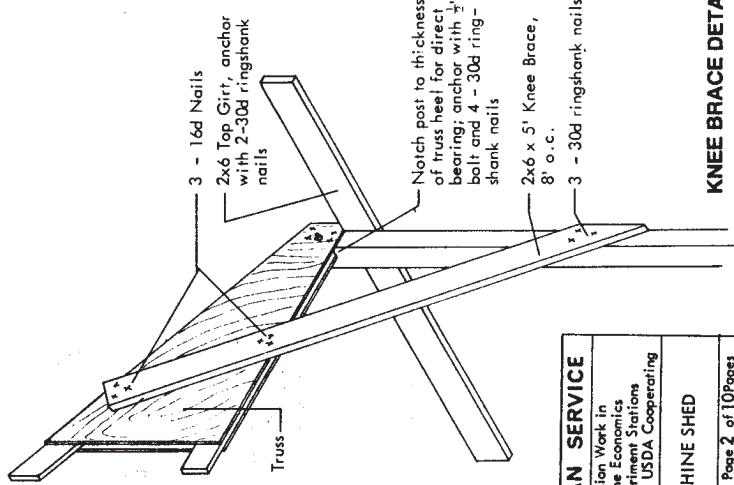
You may require professional services to complete this general plan, to fit it to your situation, and to include consideration of site selection and preparation; provisions for utilities, waste manage-

ment, and roads or other access; assurance of compliance with codes and regulations; specifications for some materials and equipment; and supervision of bid letting and construction.

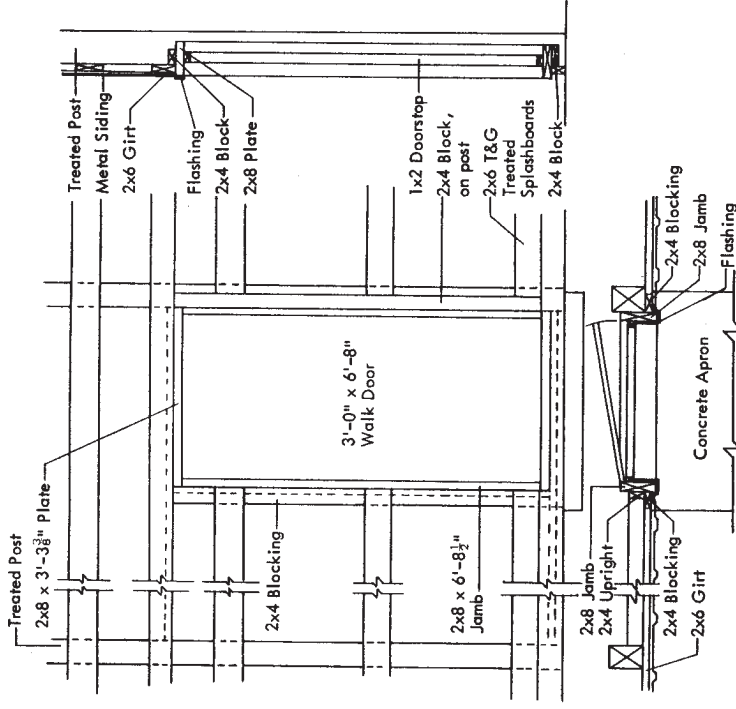


FRAMED OPENING DETAIL—1/2

For windows, fans and small vent doors. For a building with an interior lining, extend the jamba, plate and sill to be flush with the inside edges of the posts.

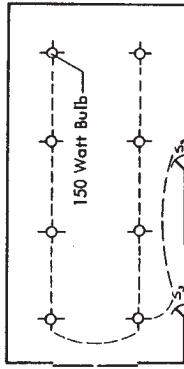


KNEE BRACE DETAIL—2/2



WALK DOOR FRAMING—4/2

For a building with an interior lining, extend the jamba, plate and sill to be flush with the inside edges of the posts.



LIGHTING PLAN—3/2

S₁ = 3-way switch

Alternate Lumber Specifications, Spacing and Sizes.

2x4 Purfins (Construction Grade Hem-Fir) Max Spacing

Snow Zone 1: 28" o.c.

Snow Zone 2: 24" o.c.

Snow Zone 3: 18" o.c.

2x6 Girts (No. 2 Hem-Fir)

Max Spacing: 24" o.c.

Headers (No. 1 Hem-Fir)

16' Door

Snow Zone 1: 3—2x12

Snow Zone 2: 4—2x12

Snow Zone 3: 5—2x12

24' Door

All Zones: 5 1/2" x 24"

Posts (Round vs Sawn)

6x8 = ASA or ASAE Class 5, 6.0" Top

Diameter

6x6 = ASA or ASAE Class 7, 4.8" Top

Diameter

Trusses (No. 1 Hem-Fir)

See Truss Page

***Footing Size**

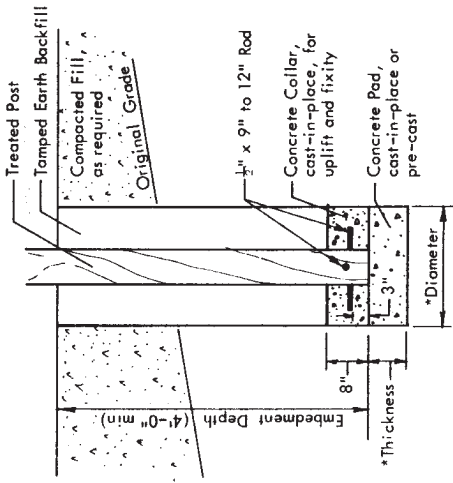
12" Dia x 6" Thick @ Endwall Posts

16" Dia x 6" Thick @ Sidelwall Posts

20" Dia x 6" Thick @ 16' Door

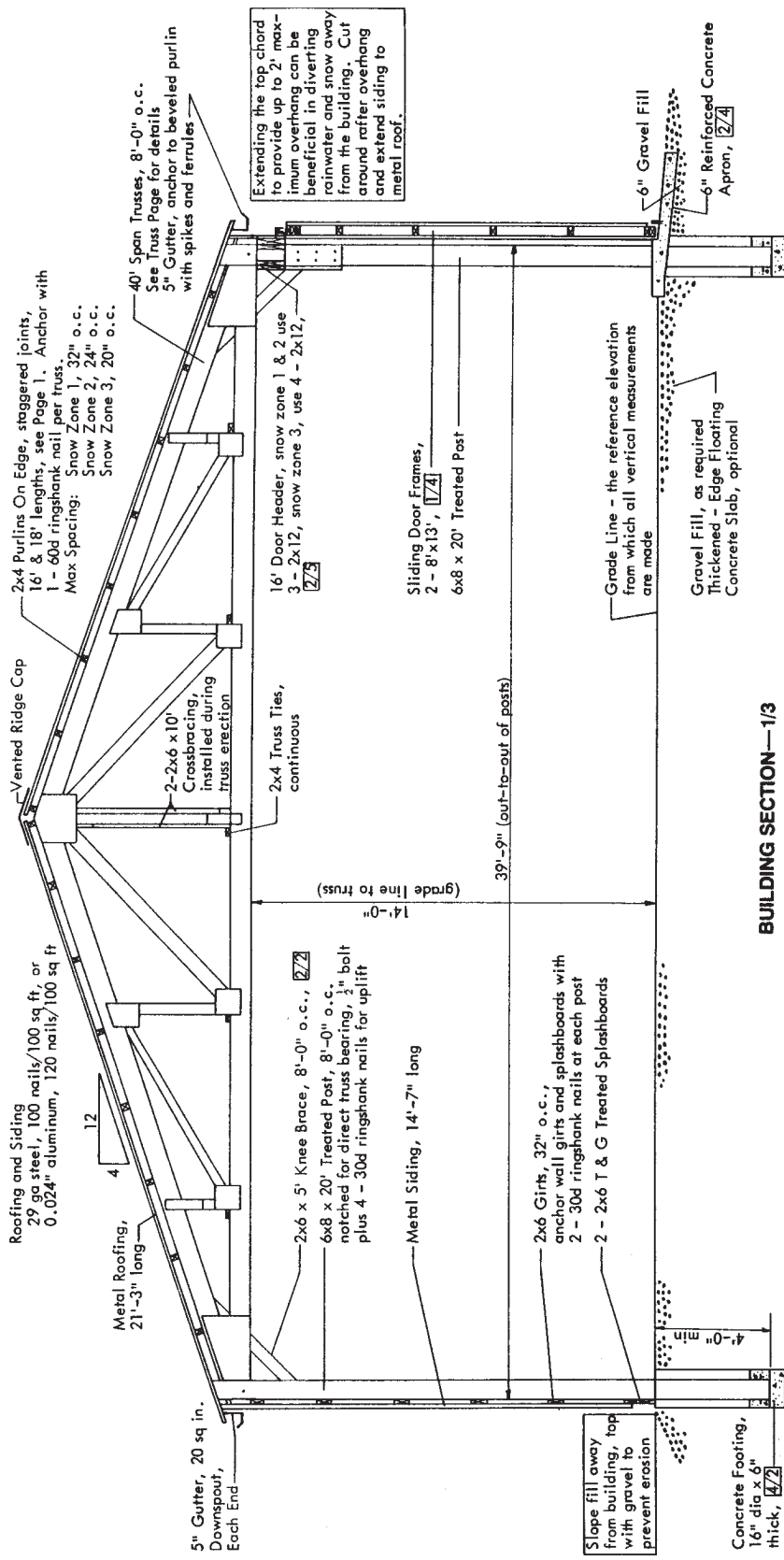
24" Dia x 7" Thick @ 24' Door

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.

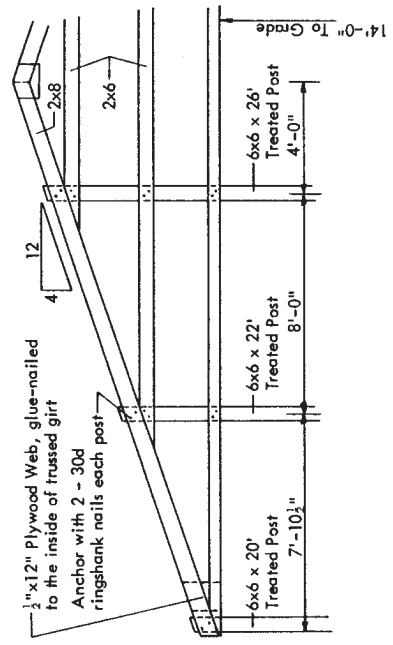


POST FOOTING DETAIL—5/2

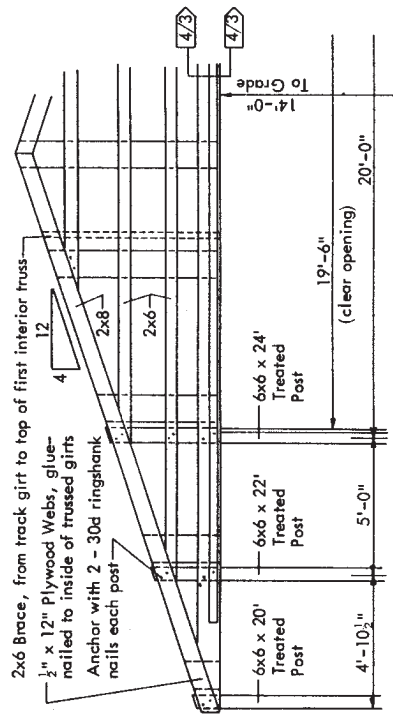
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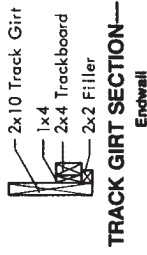
BUILDING SECTION—1/3



SOLID ENDWALL—2/3

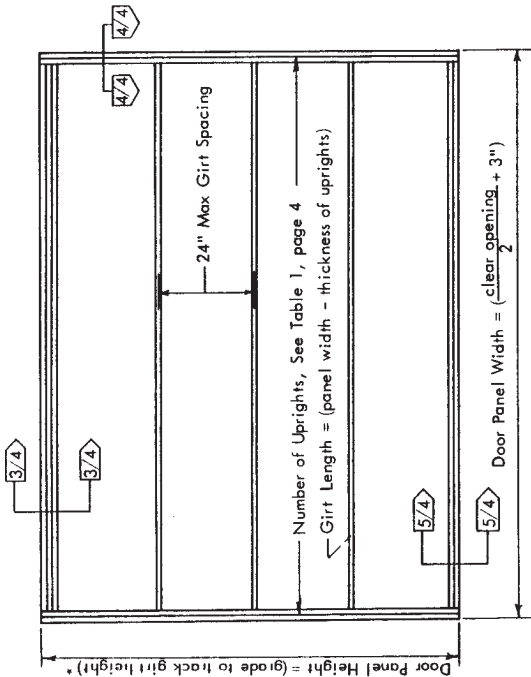


ENDWALL WITH 20' DOOR—3/3



TRACK GIRT SECTION—4/3

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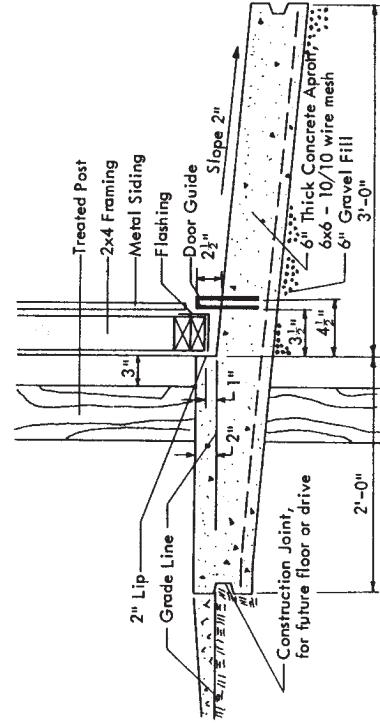
DOUBLE SLIDING DOOR—1/4

2x4 Framing
 *If sliding door apron 2/4 is not installed, reduce door panel height by 2".
 Use clear opening dimensions from Detail 1/5 or 2/7.



"U"-Shaped Door Guide

Locate 1/2" dia x 20" "U"-shaped door guide at center of door opening. Break at center to force closing door against apron lip. Taper from 4 1/2" end to 3" center clearance.



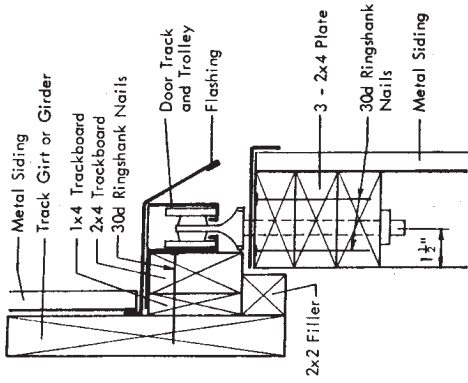
SLIDING DOOR APRON—2/4

Set adjustable roller guides in the concrete apron at door jamb. Use door stops as required.

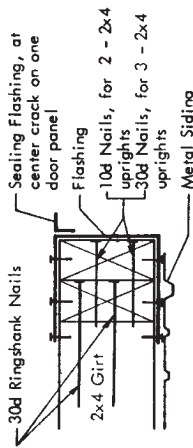
Table 1. Number of 2x4 uprights, each side of door panel.

Door Panel Height, ft	Door Panel Width, ft													
	6	7	8	9	10	11	12	13	8	9	10	11	12	13
1	1	1	1	1	1	1	2	2	2	2	2	2	2	2
2	1	1	1	1	2	2	2	2	2	2	2	2	2	2
3	1	1	2	2	2	2	2	2	2	2	2	2	2	2
4	1	2	2	2	2	2	2	2	2	2	2	2	2	2
5	1	2	2	2	2	2	2	2	2	2	2	2	2	2
6	1	2	2	2	2	2	2	2	2	2	2	2	2	2
7	1	2	2	2	2	2	2	2	2	2	2	2	2	2
8	1	2	2	2	2	2	2	2	2	2	2	2	2	2
9	1	2	2	2	2	2	2	2	2	2	2	2	2	2
10	1	2	2	2	2	2	2	2	2	2	2	2	2	2
11	1	2	2	2	2	2	2	2	2	2	2	2	2	2
12	1	2	2	2	2	2	2	2	2	2	2	2	2	2
13	1	2	2	2	2	2	2	2	2	2	2	2	2	2
14	1	2	2	2	2	2	2	2	2	2	2	2	2	2

Door Siding Sheet length approx. 2" shorter than upright length.

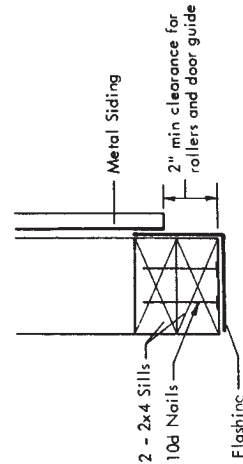


DOOR TRACK ASSEMBLY—3/4



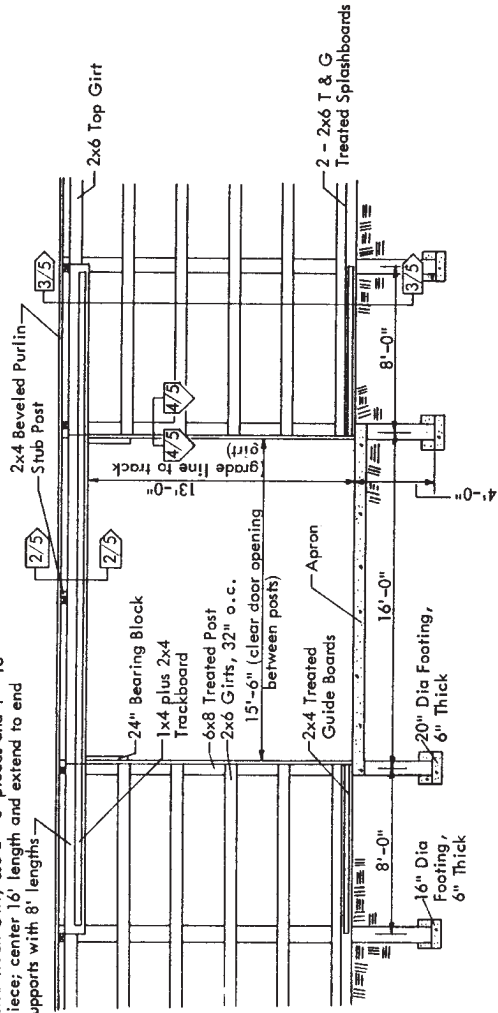
UPRIGHT SECTION—4/4

Extend flashing around uprights and nail to girts and uprights.



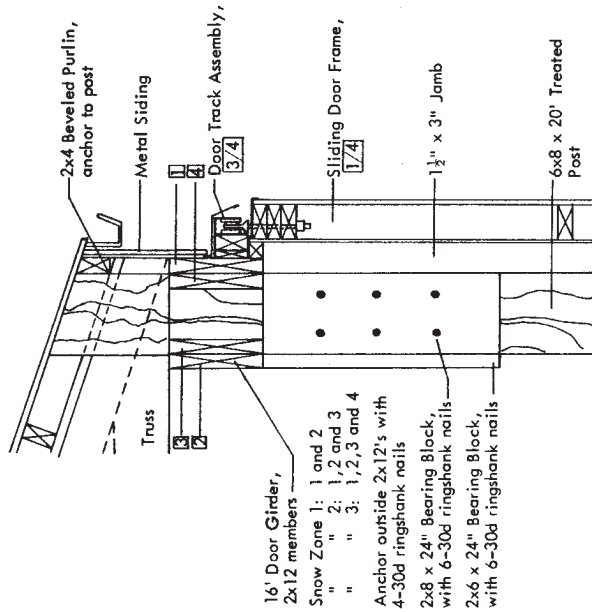
SILL SECTION—5/4

2x12 Track Girt, use 2 - 8' pieces and 1 - 16' piece; center 16' length and extend to end supports with 8' lengths

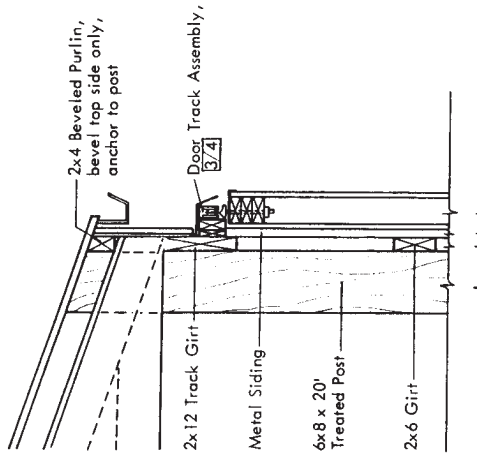


16' DOOR - 1/5

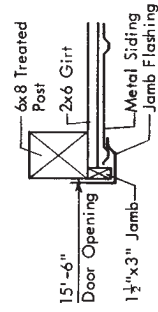
Use stub post for intermediate truss to girder connection, notch post to fit girder opening.



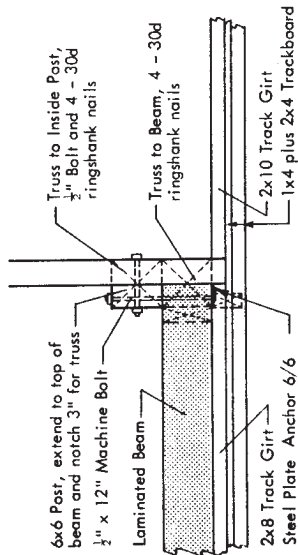
16' DOOR GIRDER SECTION - 2/5



16' DOOR TRACK GIRT SECTION - 3/5

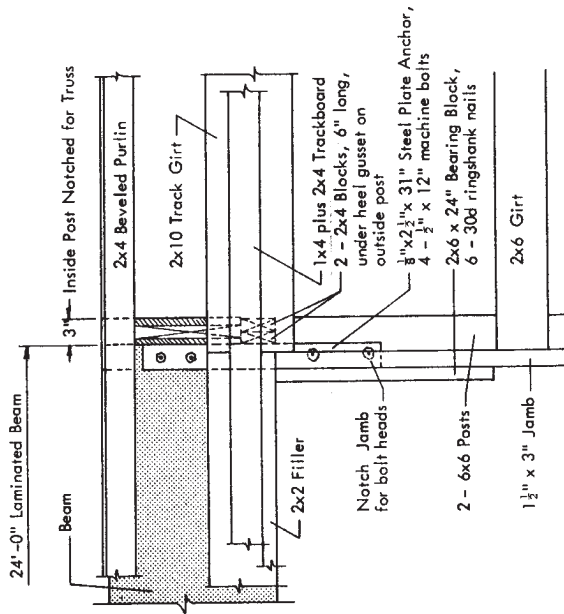


JAMB SECTION - 4/5



SECTION-1/6

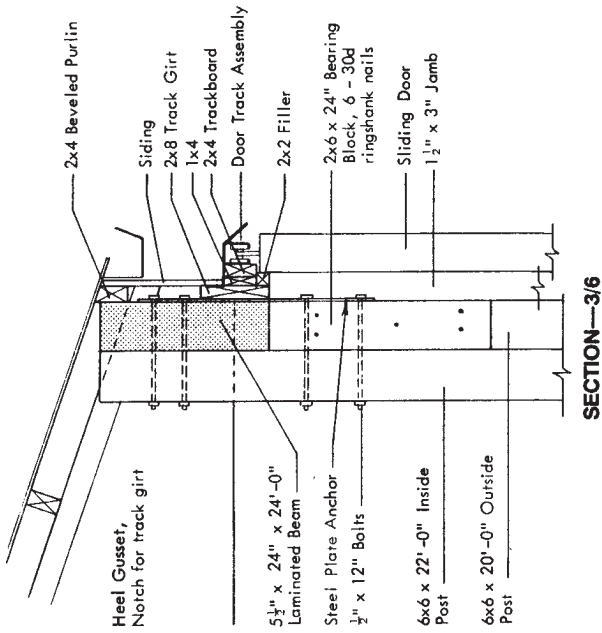
If metal shear plates are used in the truss, notch the posts 1 1/2" and lengthen the beam to 24'-3".



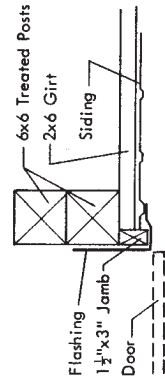
BEAM TO COLUMN CONNECTION-2/6

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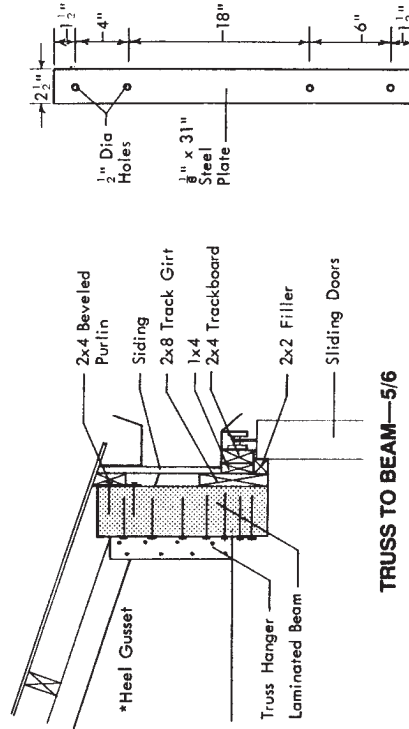
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SECTION-3/6

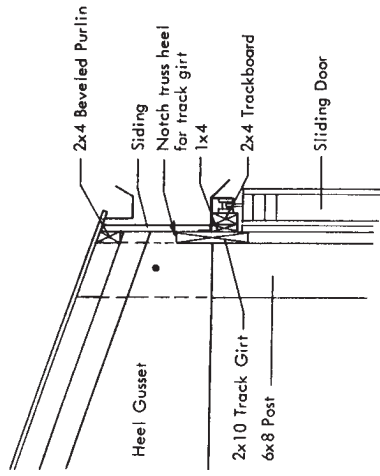


JAMB SECTION-4/6

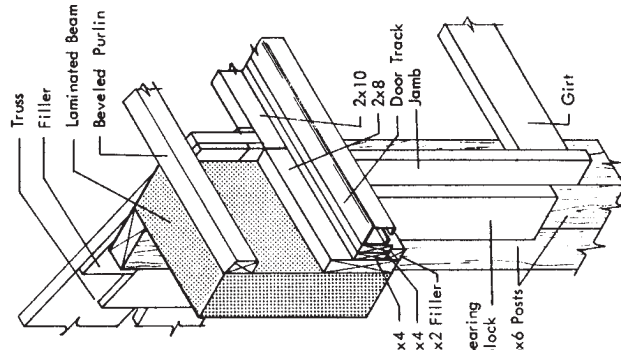


TRUSS TO BEAM-5/6

* 40' truss with 7" cut off the heel. Extend gussets 7" to the left so they are not shortened.



TRACK GIRT SECTION-7/6



JOINT ASSEMBLY-8/6

STEEL PLATE ANCHOR-6/6

24' BEAM — for 24' wide sidewall door

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 5/8" C-C Ext. ("Identification Index" = 42/20)

Glue

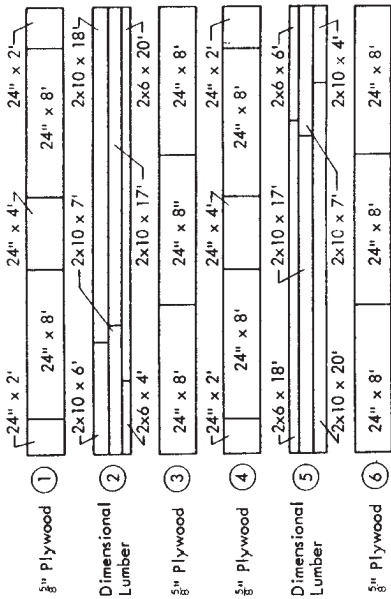
Casein (MMM-125A, type II, mold resistant) is not waterproof, but is highly water resistant. Resorcinol resin glue is waterproof and should be used if the beam is to be exposed to unusual moisture conditions.

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

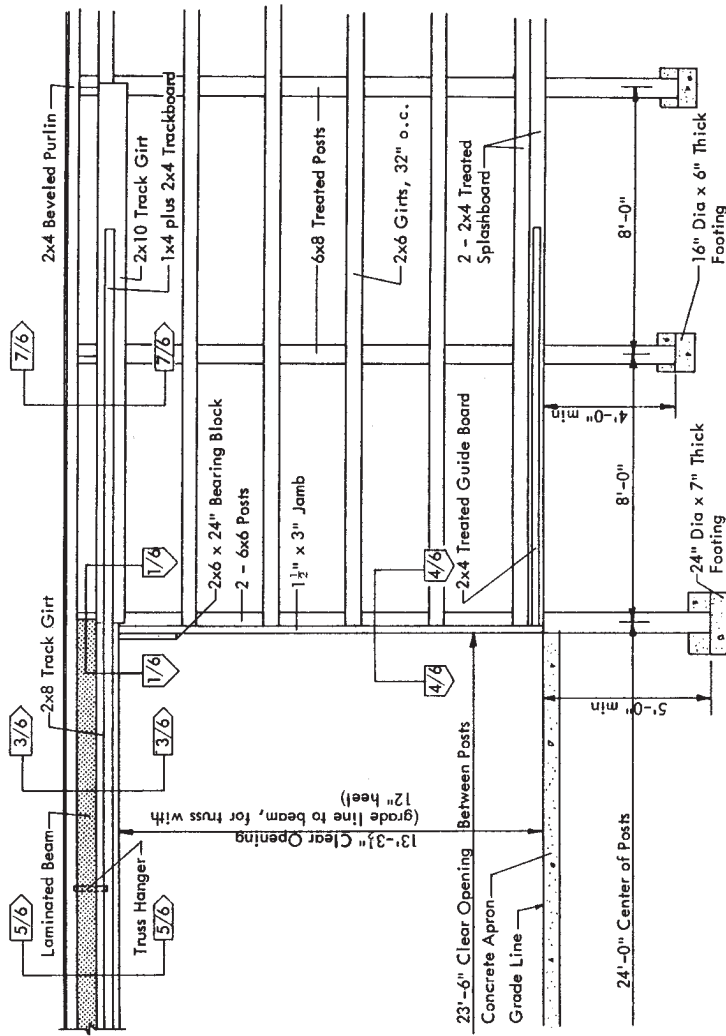
BEAM CONSTRUCTION

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 = 2x6 + 2x10 + 2x10 = 2x26). Spread glue on the plywood (Layer #1). Nail plywood to Layer #2 with 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 for 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' Material is preferable, if available

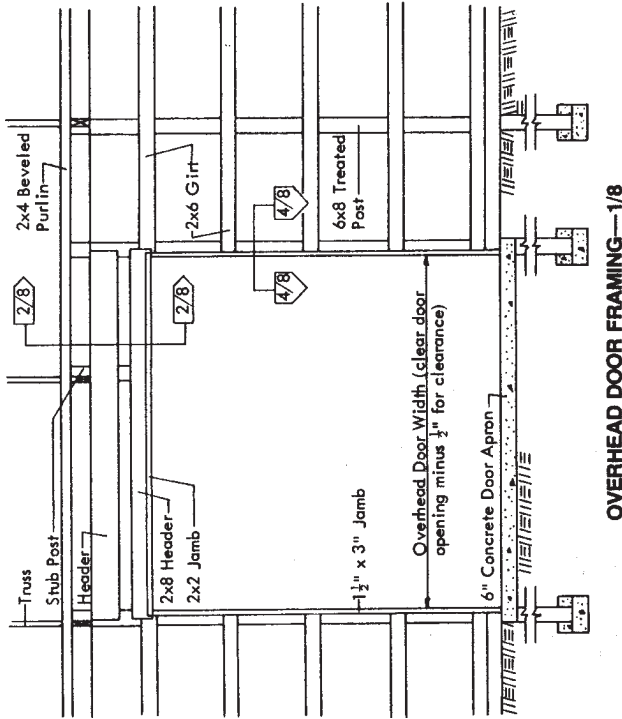


24' LAMINATED BEAM ASSEMBLY—117

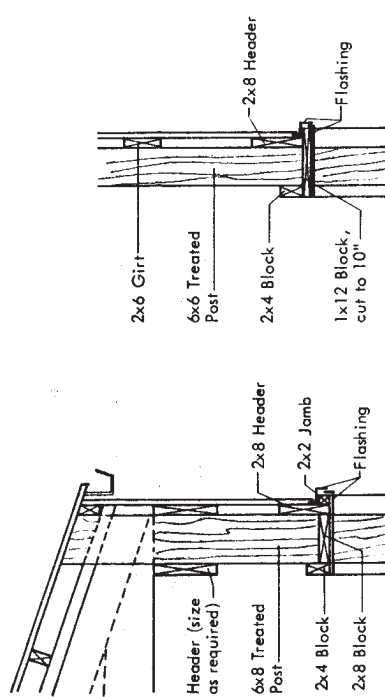


24' DOOR FRAMING—217

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OVERHEAD DOOR FRAMING—1/8



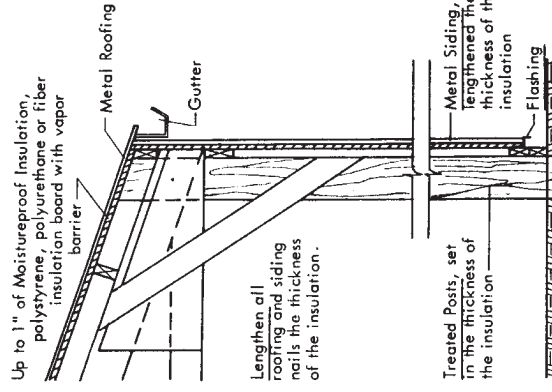
SIDEWALL HEADER SECTION—2/8

ENDWALL HEADER SECTION—3/8

For 6x8 Post

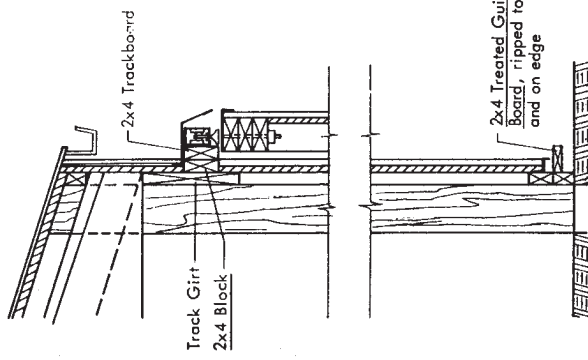
OVERHEAD DOOR DETAILS

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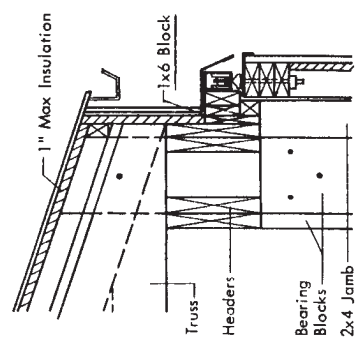
TYPICAL GABLE END SECTION—5/8

TYPICAL WALL SECTION—7/8



WALL SECTION—6/8

With Side Door



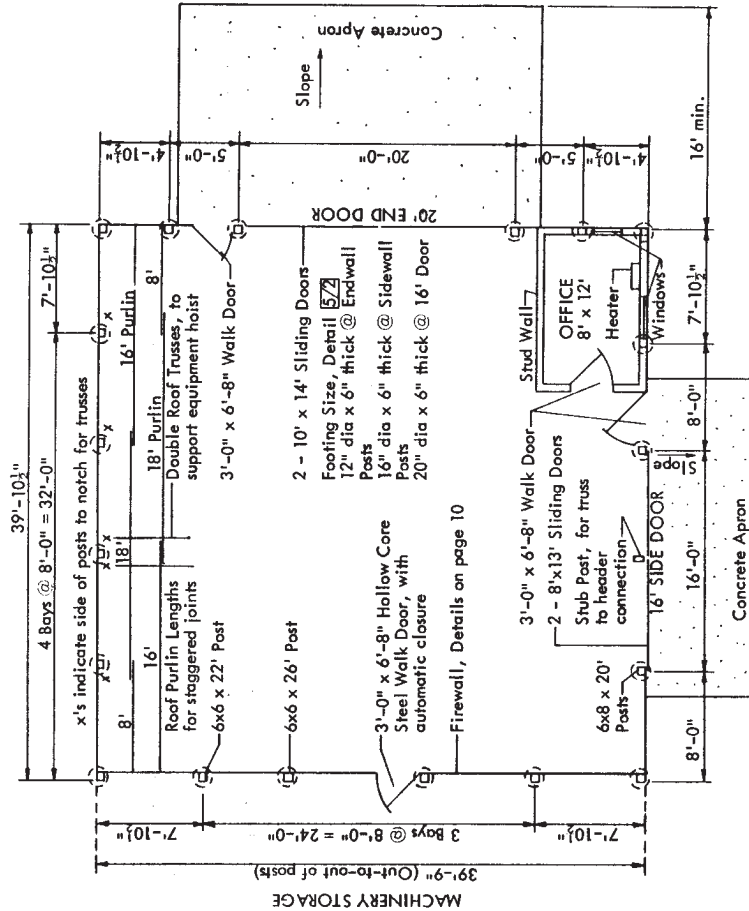
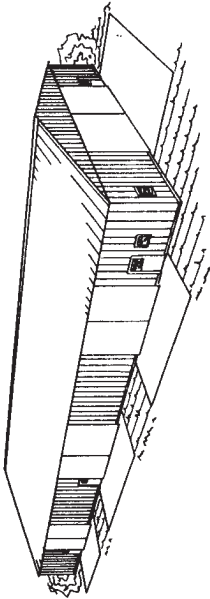
16' DOOR HEADER—8/8

INSULATION DETAILS

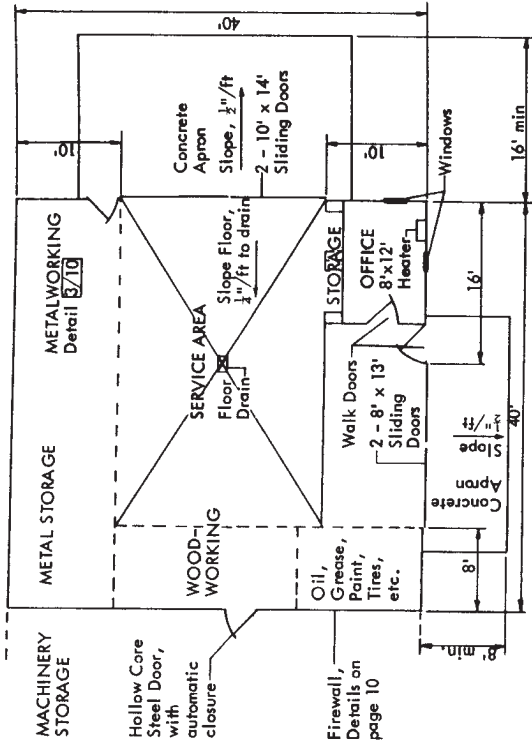
Underlines show materials that change when insulation is added.

Heating Specifications

Office
 Electric: baseboard or wall unit, best size is 2,000-4,000 watts.
 Gas: wall unit, 10,000 Btu/hr, oversized.
 Service Area
 Underfloor: install 4" wide U-shaped strip around the floor drain, open end toward door, 2" away from floor drain.
 Electric: 15 watt/sq ft, easy installation, potential failure due to floor cracks.
 Hot water: 50 Btu/sq ft, high installation cost, durable.
 Space: hot air, 50,000 Btu/hr in lightly insulated shop, 25,000 Btu/hr in heavily insulated shop, ceiling or wall mounted or pot belly stove.
 Radiant: electric or gas over work area.



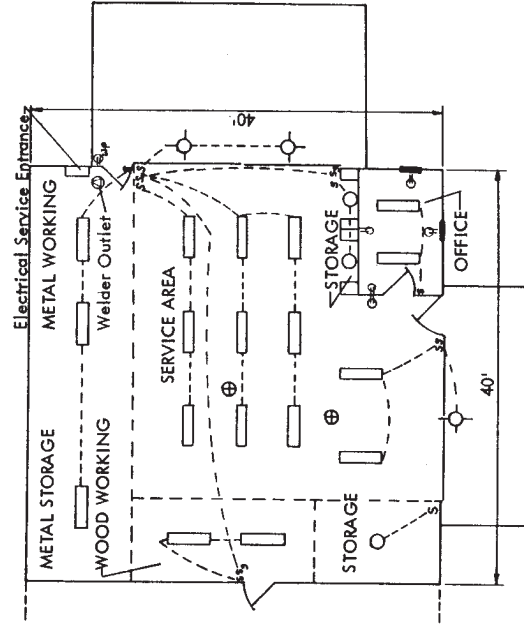
SHOP WALL AND FOOTING PLAN—1/9



SHOP FLOOR PLAN—2/9

KEY:

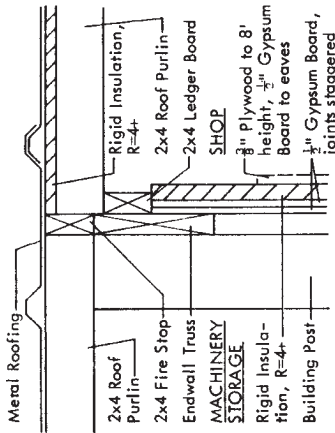
- S Single Pole Switch
- S₃ 3-Way Switch
- S₄ 4-Way Switch
- 2 - 40 Watt Fluorescent Light
- 100 Watt Light Bulb
- ⊕ Retractable Trouble Light
- ⊖ 120 Volt Outlet
- ⊖ 150 Watt Weather Proof Flood Light
- ⊖ 240 Volt Outlet
- w/p Weather Proof



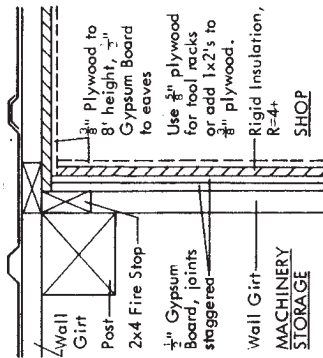
GENERAL LIGHTING PLAN—3/9

See page 10 for general electrical specifications and this page for heating specifications. Fluorescent lights may have difficulty starting at temperatures less than 32°F. Use 150 watt bulbs with reflectors in unheated shops.

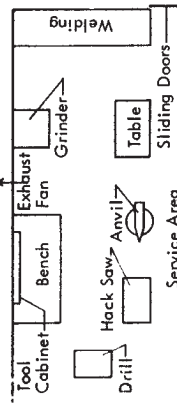
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LIGHTLY INSULATED FIREWALL ROOFLINE—1/10



LIGHTLY INSULATED FIREWALL WALL LINE—2/10



METALWORKING EQUIPMENT LAYOUT—3/10

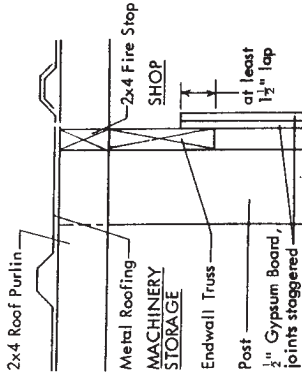
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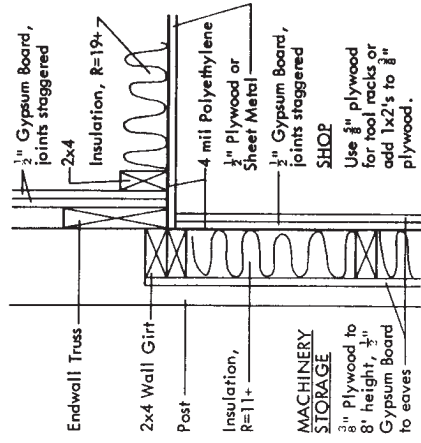
FARM SHOP ELECTRICAL SPECIFICATIONS

Use general lighting as shown on plan Special Lighting
Place two 150-watt bulbs with reflectors or one 4' fluorescent fixture over each 10' of work bench, positioned 4' above the front 1/2 of bench.
Place special lighting outlets over each stationary power tool.
Convenience Outlets
Provide one 20-amp duplex outlet for every 5' of bench.
Provide a 240-volt 50-amp outlet for an electric welder located close to an outside door so large machinery can be repaired outside.
Locate an outlet on the ceiling for a retractable trouble light in the service area.
Position outlets about 4' above floor.
Install all exposed wiring on the walls in electrical metallic or PVC tubing.
Special Purpose Outlets
Provide single-phase 120-volt 20-amp outlets for small motors. If 3-phase electrical service is available, wire all permanent motor locations greater than 1/2 hp to 3 phase, unless you already have single-phase motors.

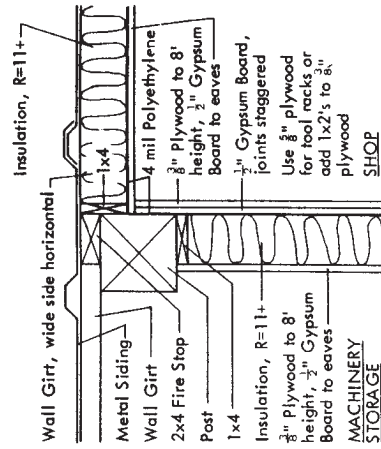
Circuits
Lighting and duplex outlets.
Provide a 120-volt 20-amp circuit of 12-ga wire for each 1500 watts of lighting, 10 duplex outlets or motors under 1/2 hp.
Provide a 120-volt 15-amp circuit of 14-ga wire for each 1100 watts of lighting or 7 duplex outlets.
Special circuits
Provide a 240-volt 50-amp individual circuit of 6-ga wire for a welder.
Provide 240-volt circuits for heating loads over 1,000 watts and motors over 1/2 hp.
Use 8-ga wire for 40-amp circuits and 10-ga wire for 30-amp circuits.
Use wire one size larger if aluminum is used instead of copper.
Service entrance
Locate the service entrance by the welder outlet.
Surface mount it at face height.



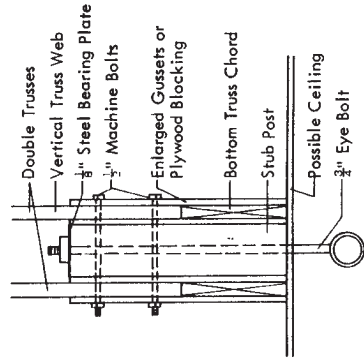
HEAVILY INSULATED FIREWALL ROOFLINE—6/10



HEAVILY INSULATED FIREWALL CEILING LINE—7/10

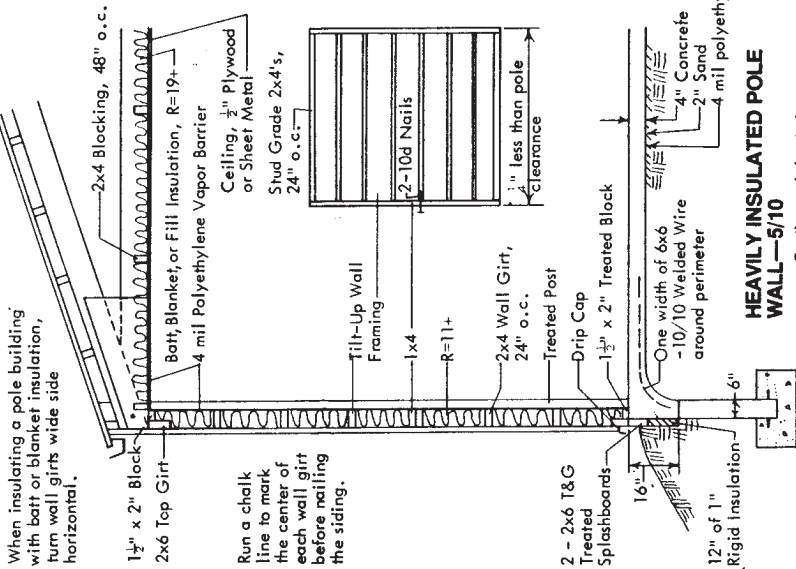


HEAVILY INSULATED FIREWALL WALL LINE—8/10



1 1/2 TON HOIST TO TRUSS CONNECTION

See Table 7 in MWSP-9, Designs for Gilted Trusses, for enlarged gusset sizes. Locate at any bottom chord panel point.



HEAVILY INSULATED POLE WALL—5/10
Continuously heated.

When insulating a pole building with batt or blanket insulation, run wall girts wide side horizontal.

Run a chalk line to mark the center of each wall girt before nailing the siding.

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:

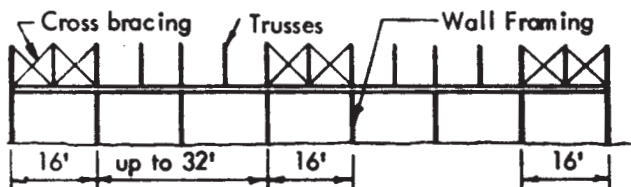
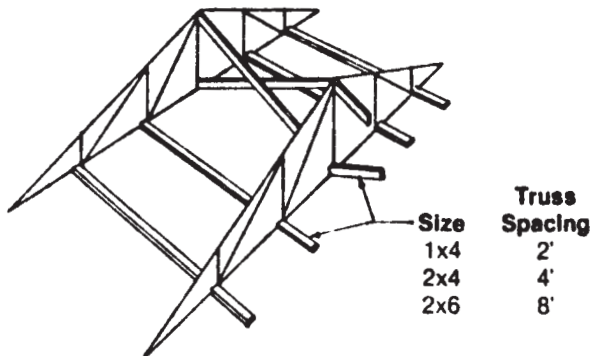
Get a copy of MWPS-9 and follow its recommendations.

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.



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

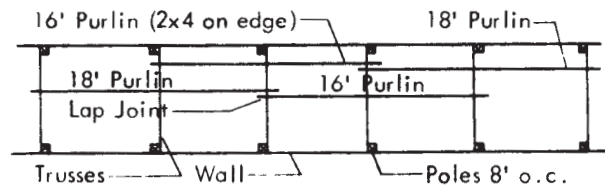
4-30d ring-shank nails -- 1/2" bolt

B = 1/2" bolt

Roof Purlins

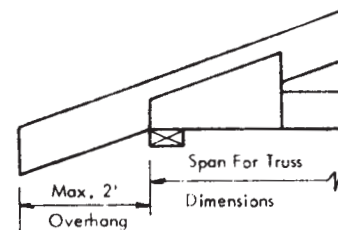
Stagger purlin joints for continuity across the trusses. Purlins may be laid flat with 2' and 4' truss spacings and butt joints used.

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 1/2 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.

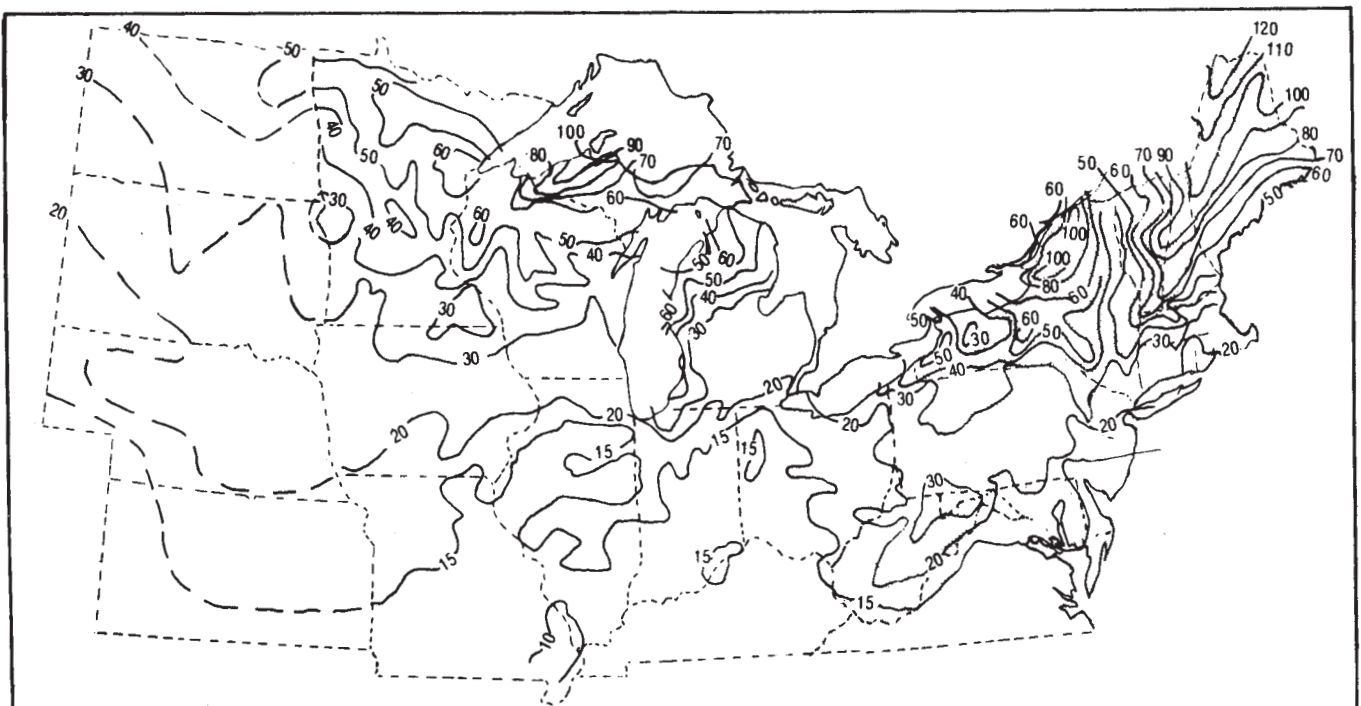
Map load	Roof snow load	
	Farm	Other
15	12.0	12
20	14.4	16
30	21.6	24
40	28.8	32
50	36.0	40
60	43.2	48
70	50.4	56
80	57.6	64
90	64.8	72
100	72.0	80
110	79.2	88
120	86.4	96

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