Truss Technology IN BUILDING

How to Read a Truss Design Drawing

Before trusses are assembled in the manufacturer's plant, they are built conceptually on paper. These conceptual trusses become *Truss Design Drawings.* Although the primary use of Truss Design Drawings is to aid in the manufacture of trusses, they are a valuable resource for anyone building with or inspecting trusses. The purpose of this brochure is to highlight the important information that can be found on a typical Truss Design Drawing. The drawing shown below has color coded areas that are referenced and described in detail inside this document.

A. Geometry: A Truss Design Drawing usually contains the following geometrical information about the truss that it represents:

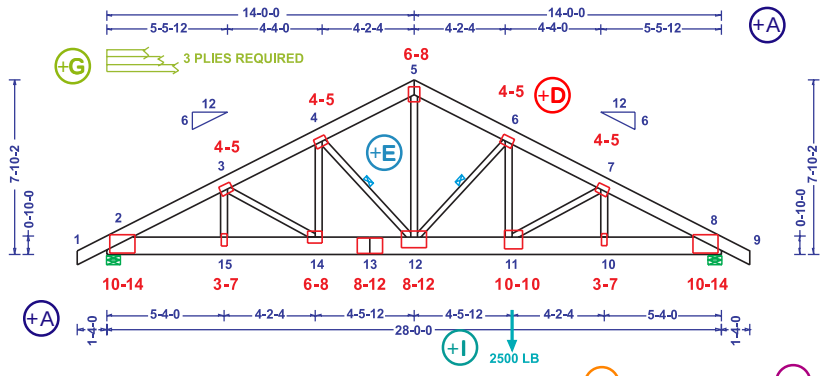
- **A1.** Span
- **A2.** Heel Height
- **A3.** Overhang Length
- **A4.** Truss Spacing
- **A5.** Pitch
- **A6.** Overall Height
- **A7.** Joint Locations

B. Bearings: Details of the truss bearings are specified on the Truss Design Drawing:

- **B1.** Bearing Locations
- **B2.** Required Bearing Widths
- **B3.** Mechanical Connection Details (i.e. hangers)
- **B4.** Magnitude & Direction of Support Reactions

+ Symbol indicates that this information can be found in more than one area of this document.

Job#: WTCA0001	Truss ID: G-18	Qty: 1	Plies: 3	09/04/2002



Spacing: 2-0-0
Lumber Increase: 1.15
Plate Increase: 1.15
Rep Member: YES
Code: UBC/ANSI95 (J)

TCLL 35 psf
TCDL 10 psf
BCLL 0 psf
BCDL 7 psf (+I)

DEFLECTION	(in)	L/Defl
Vert (LL)	-0.47	715
Vert (DL)	-0.29	1159
Vert (TL)	-0.76	442

(H)

BRG	Rxn (lb)	Size	Req	Uplift (lb)
2	10036	5.5"	1.5"	-1033
8	11035	5.5"	1.5"	-1136

(B)

This girder designed to carry 2ft framing TC/BC split from one side and 22ft framing to bottom chord from opposite side.

Concentrated Loads
1) Joint 11 2500LB

(+I)

3 PLY TRUSS
Fasten with 10d Box nails in staggered pattern: TC, WB at 9" oc, BC at 4" oc. Repeat nailing as each ply is added. (+G)

(+F) (C)

TC	AXL	BND	CSI	Force	Lumber
2-3	0.80	0.18	0.98	-17527	2x8 DF-L No. 1
3-4	0.61	0.09	0.70	-16163	2x8 DF-L No. 1
4-5	0.47	0.06	0.53	-11527	2x8 DF-L No. 1
5-6	0.48	0.07	0.55	-11527	2x8 DF-L No. 1
6-7	0.69	0.11	0.80	-17280	2x8 DF-L No. 1
7-8	0.77	0.19	0.96	-19592	2x8 DF-L No. 1

BC	AXL	BND	CSI	Force	BC
2-15	0.41	0.22	0.63	15341	2x10 SP 1650F-1.5E
15-14	0.40	0.14	0.54	15341	2x10 SP 1650F-1.5E
14-13	0.34	0.09	0.43	13562	2x10 SP 1650F-1.5E
13-12	0.34	0.17	0.51	13562	2x10 SP 1650F-1.5E
12-11	0.38	0.17	0.55	15456	2x10 SP 1650F-1.5E
11-10	0.45	0.16	0.61	17147	2x10 SP 1650F-1.5E
10-9	0.45	0.23	0.68	17147	2x10 SP 1650F-1.5E

WEB	AXL	BND	CSI	Force	WEB
3-15	0.18	0.00	0.18	2374	2x4 SPF No. 2
3-14	0.47	0.00	0.47	-2065	2x4 SPF No. 2
4-14	0.30	0.00	0.30	3776	2x4 SPF No. 2
4-12	0.26	0.00	0.26	-4150	2x4 SPF No. 2
5-12	0.77	0.00	0.77	9815	2x4 SPF No. 2
6-12	0.41	0.00	0.41	-6567	2x4 SPF No. 2
6-11	0.49	0.00	0.49	6225	2x4 SPF No. 2
7-11	0.47	0.00	0.47	-1964	2x4 SPF No. 2
7-10	0.19	0.00	0.19	2374	2x4 SPF No. 2

(+E)

BRACING
TC: Sheathed or 6ft oc purlins
BC: Rigid ceiling or 10ft oc bracing
Webs: 1 row CLB at midpt 4-12, 6-12

(+D)

ADDITIONAL NOTES:
1) Refer to WTCA-B1 and WTCA-B2 for handling and bracing guidelines
2) All Plates are 20 gauge unless noted
3) Design complies with ANSI/TPI 1-1995

C. Lumber: Each drawing specifies the properties of every wood member of the truss. The following information will be shown:

C1. Nominal Cross Section Dimensions
C2. Lumber Species
C3. Lumber Grade

Lumber
2x8 DF-L No. 1
2x8 DF-L No. 1
2x8 DF-L No. 1
2x8 DF-L No. 1
2x8 DF-L No. 1
2x8 DF-L No. 1

BC
2x10 SP 1650F-1.5E
2x10 SP 1650F-1.5E
2x10 SP 1650F-1.5E
2x10 SP 1650F-1.5E
2x10 SP 1650F-1.5E
2x10 SP 1650F-1.5E
2x10 SP 1650F-1.5E

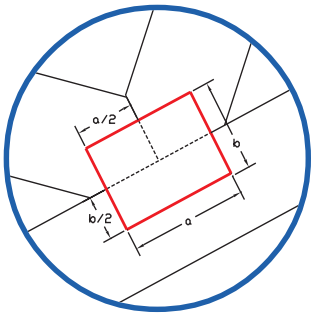
WEB
2x4 SPF No. 2
2x4 SPF No. 2
2x4 SPF No. 2
2x4 SPF No. 2
2x4 SPF No. 2
2x4 SPF No. 2
2x4 SPF No. 2
2x4 SPF No. 2
2x4 SPF No. 2
2x4 SPF No. 2

D. Plating Information: Metal plate connected wood trusses are generally designed using proprietary software provided by the manufacturer of the connector plates. As a result, the plate design specified on truss design drawings is only valid for plates supplied by a particular plate manufacturer.

For example, it is not acceptable to substitute one brand of plate for another brand of plate unless the substitution is approved by the engineer responsible for the truss design.

Most Truss Design Drawings will specify:

D1. Plate Manufacturer
D2. Size of plate for each joint
D3. Gauge of plates (corresponds to thickness)
D4. Dimensioned locations of plates

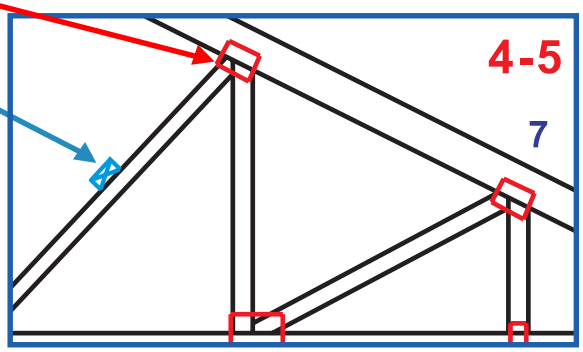


Note: Dimensioned plate locations are sometimes omitted when a plate is to be positioned symmetrically about a joint interface.

E. Permanent Truss Member Bracing:

Individual truss members are often subjected to compression forces. To prevent these members from buckling, permanent truss member bracing is sometimes required. Continuous lateral bracing and T-bracing are common bracing techniques.
Required permanent truss member bracing location(s) and/or spacing, will be specified on the design drawing.

See WTCA's *TTB Web Member Permanent Bracing* and *TTB T-Bracing*, for more detailed information.



BRACING
TC: Sheathed or 6ft oc purlins
BC: Rigid ceiling or 10ft oc bracing
Webs: 1 row CLB at midpt 4-12, 6-12

F. Truss Member Forces: Truss Design Drawings will specify the maximum axial force expected in each truss member. This information is required for the building designer to specify the details of the permanent continuous lateral bracing. The maximum axial force is usually expressed in two formats:

F1. Magnitude & Direction: This is the actual, numerical value of the truss member axial force (usually in pounds). It assumes positive values for members in tension and negative values for members in compression.

F2. Combined Stress Index (CSI): The combined stress index is a ratio of the maximum axial and bending forces expected in a member to the forces that the member should be capable of resisting. It has a maximum value of 1.00 and can be thought of as a measure of structural efficiency. A member with a CSI close to 1.00 is subject to forces approaching its maximum design capacity.

AXL	BND	CSI	Force
0.80	0.18	0.98	-17527
0.61	0.09	0.70	-16163
0.47	0.06	0.53	-11527
0.48	0.07	0.55	-11527
0.69	0.11	0.80	-17280
0.77	0.19	0.96	-19592

AXL	BND	CSI	Force
0.41	0.22	0.63	15341
0.40	0.14	0.54	15341
0.34	0.09	0.43	13562
0.34	0.17	0.51	13562
0.38	0.17	0.55	15456
0.45	0.16	0.61	17147
0.45	0.23	0.68	17147

AXL	BND	CSI	Force
0.18	0.00	0.18	2374
0.47	0.00	0.47	-2065
0.30	0.00	0.30	3776
0.26	0.00	0.26	-4150
0.77	0.00	0.77	9815
0.41	0.00	0.41	-6567
0.49	0.00	0.49	6225
0.47	0.00	0.47	-1964
0.19	0.00	0.19	2374

G. Multi-Ply Girder Connection: A girder is a truss that supports loads from other structural members framing into it. The girder may be a single truss or made up of identical trusses attached together to act as one. Multi-ply girder connections ensure that the load is transmitted equally between all plies.

Two and three-ply trusses are usually connected using nails. For trusses that are four plies or more, bolts must be used to fasten the plies together. The type of fasteners used, as well as the appropriate pattern and spacing of those fasteners, will be specified on the Truss Design Drawing.

3 PLY TRUSS
Fasten with 10d Box nails in staggered pattern: TC, WB at 9" oc, BC at 4" oc. Repeat nailing as each ply is added.

H. Deflection: The maximum deflection of a truss under design load is specified on the design drawing. It is usually shown using two formats.

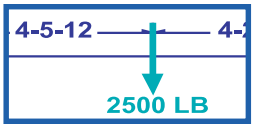
H1. Magnitude & Direction: This is the actual, numerical value of the truss deflection (usually in inches). It assumes positive values for upward deflection and negative values for downward deflection.

DEFLECTION	(in)	L/Defl
Vert (LL)	-0.47	715
Vert (DL)	-0.29	1159
Vert (TL)	-0.76	442

H2. Deflection Ratio: The deflection ratio is the ratio of the truss span to the maximum expected deflection. For example if a 60' truss deflects 2", the deflection ratio would be L/360 (720" / 2" = 360).

Note: Truss deflections are calculated assuming that all truss supports do not contribute to truss deflection. In situations where this is not the case, such as when support is provided by a beam or girder truss, additional deflection should be expected.

I. Design Loads: Every Truss Design Drawing must specify the loads that have been accounted for in the design. This includes:



I1. Top chord live loads (may include snow or construction loads)
I2. Top chord dead loads
I3. Bottom chord live loads
I4. Bottom chord dead loads
I5. Controlling wind and earthquake loads

TCLL	35 psf
TCDL	10 psf
BCLL	0 psf
BCDL	7 psf

This girder designed to carry 2ft framing TC/BC split from one side and 22ft framing to bottom chord from opposite side.

Concentrated Loads
1) Joint 11 2500LB

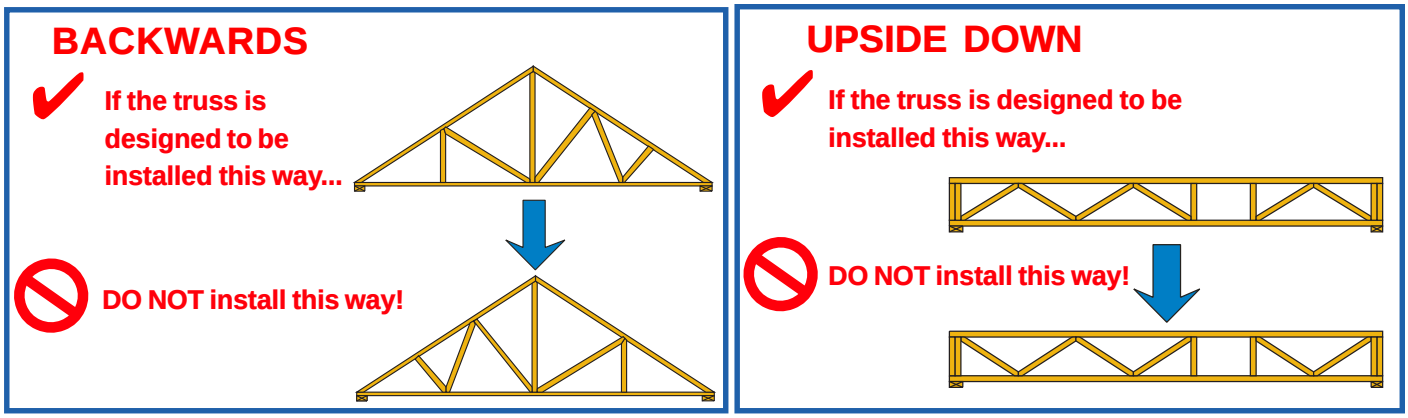
The Truss Design Drawing will show specific locations and magnitudes of concentrated or uniform loads applied to girder trusses.

J. Conditions of Use: The design values used for lumber and plates are dependent upon the conditions under which trusses will be used. For example, if the trusses are expected to function in wet or corrosive conditions, design values will have to be changed accordingly. Any factors that are applied to the design values for lumber and plates are usually stated on the Truss Design Drawings.

Spacing:	2-0-0
Lumber Increase:	1.15
Plate Increase:	1.15
Rep Member:	YES
Code:	UBC/ANSI95

Truss Installation Tip: Trusses may have symmetrical profiles but the loads they carry may not be symmetrical. Trusses that are mistakenly installed backwards or upside down cannot support the same amount of load as a correctly installed truss.

Avoid errors by taking the time to review your Truss Design Drawings.



Watch for the following:

- ✔ Is the web configuration symmetrical? If not, check your Truss Design Drawing to see that you have oriented the truss correctly.
- ✔ If the web configuration is symmetrical, are the plates and lumber symmetrical as well?
- ✔ Is the truss carrying any substantial point loads (beams, girders, etc.)? A major point load will usually coincide with the location of a truss joint.
- ✔ Is there a cantilever or interior bearing? If there is, the truss will usually be designed such that the bearing points line up with truss joints.

Wood Truss Council of America
One WTCA Center
6300 Enterprise Lane • Madison, WI 53719
608/274-4849 • 608/274-3329 (fax)
www.woodtruss.com • wtca@woodtruss.com

Truss Technology IN BUILDING
An informational series designed to address the issues and questions faced by professionals in the building construction process.