Engineered Wood Trusses

Understanding and Installing Trusses:

Definition

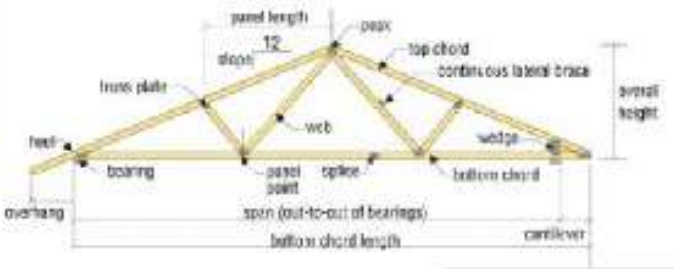
- A **truss** is a frame comprising one or more triangular units constructed with straight members whose ends are connected at joints referred to as nodes. External forces and reactions to those forces are considered to act only at the nodes and result in forces in the members which are either tensile or compressive forces.

Truss Technology in Building

TRUSS CONFIGURATIONS

The following examples represent some of the possible variations on the basic types of trusses.

Click on graphics to learn more.




SCISSORS


VAULTED PARALLEL CHORD

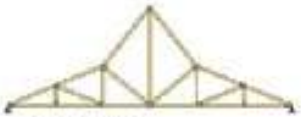

VAULT


FLAT VAULT


STUDIO VAULT


TRAY OR COFFER


BARREL VAULT


POLYNESIAN

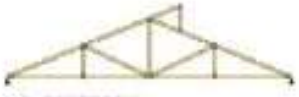

GAMBREL


ROOM-IN-ATTIC


BOWSTRING


DOUBLE CANTILEVER


TRI-BEARING


CLERESTORY


CANTILEVERED MANSARD W/PARAPETS


HIP


DUAL PITCH

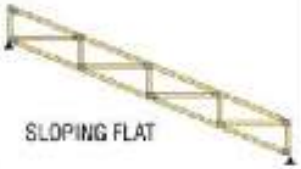

DOUBLE INVERTED


MULTI-PIECE/PIGGYBACK


MONO


HALF SCISSORS


HALF HIP


SLOPING FLAT

STANDARD ROOF TRUSSES


DOUBLE FINK


DOUBLE HOWE


MODIFIED FAN


MULTI-PANEL

PARALLEL CHORD


4x2 FLOOR TRUSS WITH CHASE


2x4 FLOOR OR ROOF TRUSS

Importance

- Wood Roof Trusses are the most common roof framing system employed in small buildings in Ontario
- Wood Floor Trusses are often used on projects where long clear spans are required
- Wood trusses, along with walls, floors and foundations are one of the major structural parts of most small buildings

Trusses in the Building Code

- The NBC mentions trusses in few places
- 9.23.5.5. Roof Trusses
  - shall not be notched, drilled or otherwise weakened
- 9.23.13.11. Wood Roof Trusses
  - if not designed under Pt.4, deflection limits, 6' web bracing, method of testing, method of analysis
- 9.4.3.1 (Deflection – L/360, L/240), 9.23.3.4 (Nailing – 3 Toenails-3.25"), 9.23.10.7 (Studs under girders)

Code Based Checklist

1. Damage to truss?.....easy
2. 6’ compression webs braced ?????
3. TPIC design ??????
4. Deflection ??????
5. Nailing at Bearing?.....easy
6. Studs under girders?...easy

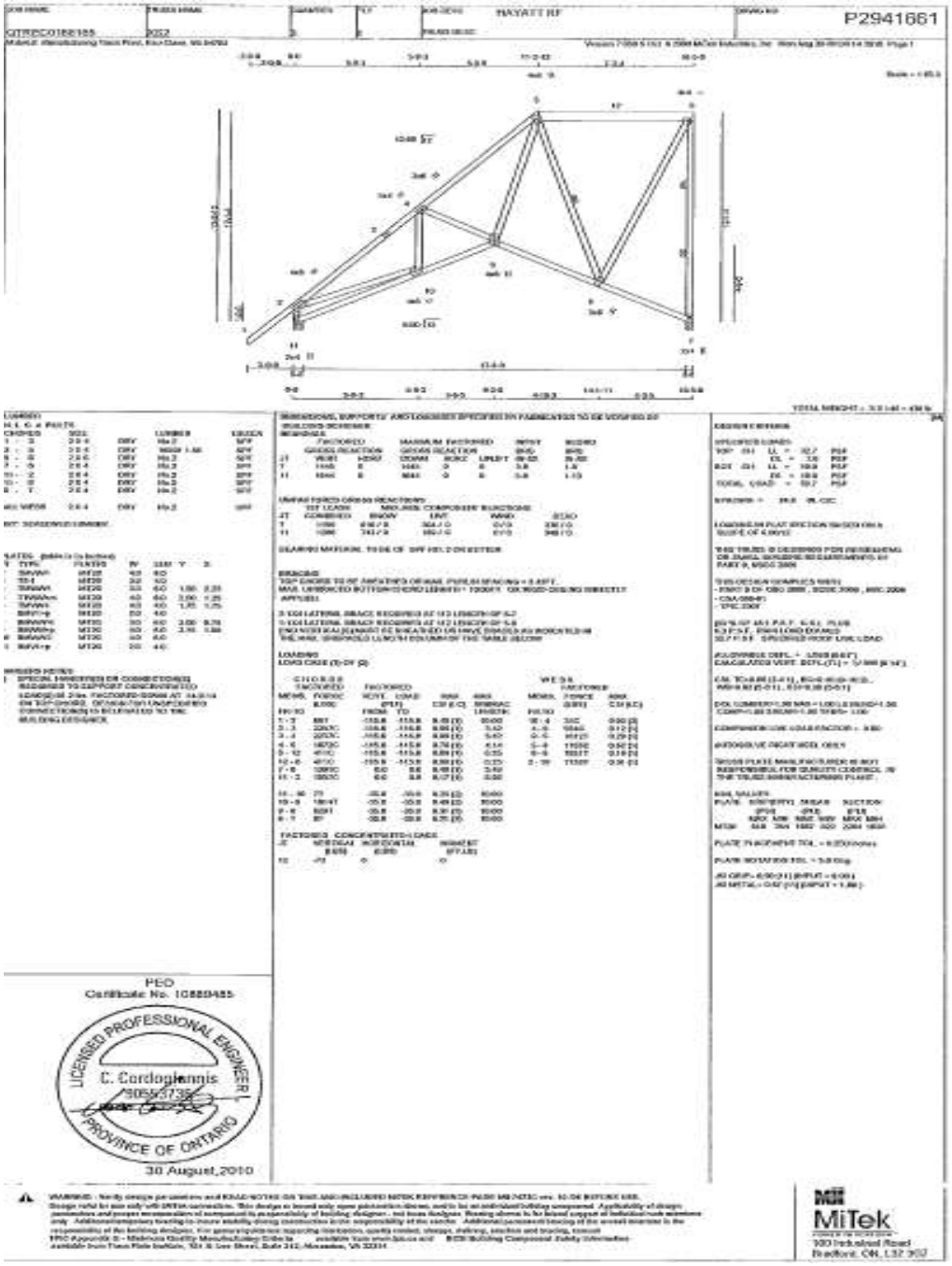
How to Check the Other Items

- Every manufactured truss used in Ontario must have an Ontario Engineer stamped drawing available for the Builder
- The Builder should ask for the truss and layout drawings on every project – make sure you have the Drawings when the trusses are delivered
- On simple projects you still need the truss drawings to determine web bracing
- Use the Engineering Drawings and Truss Layout Supplied by the Truss manufacturer to check design and installation requirements

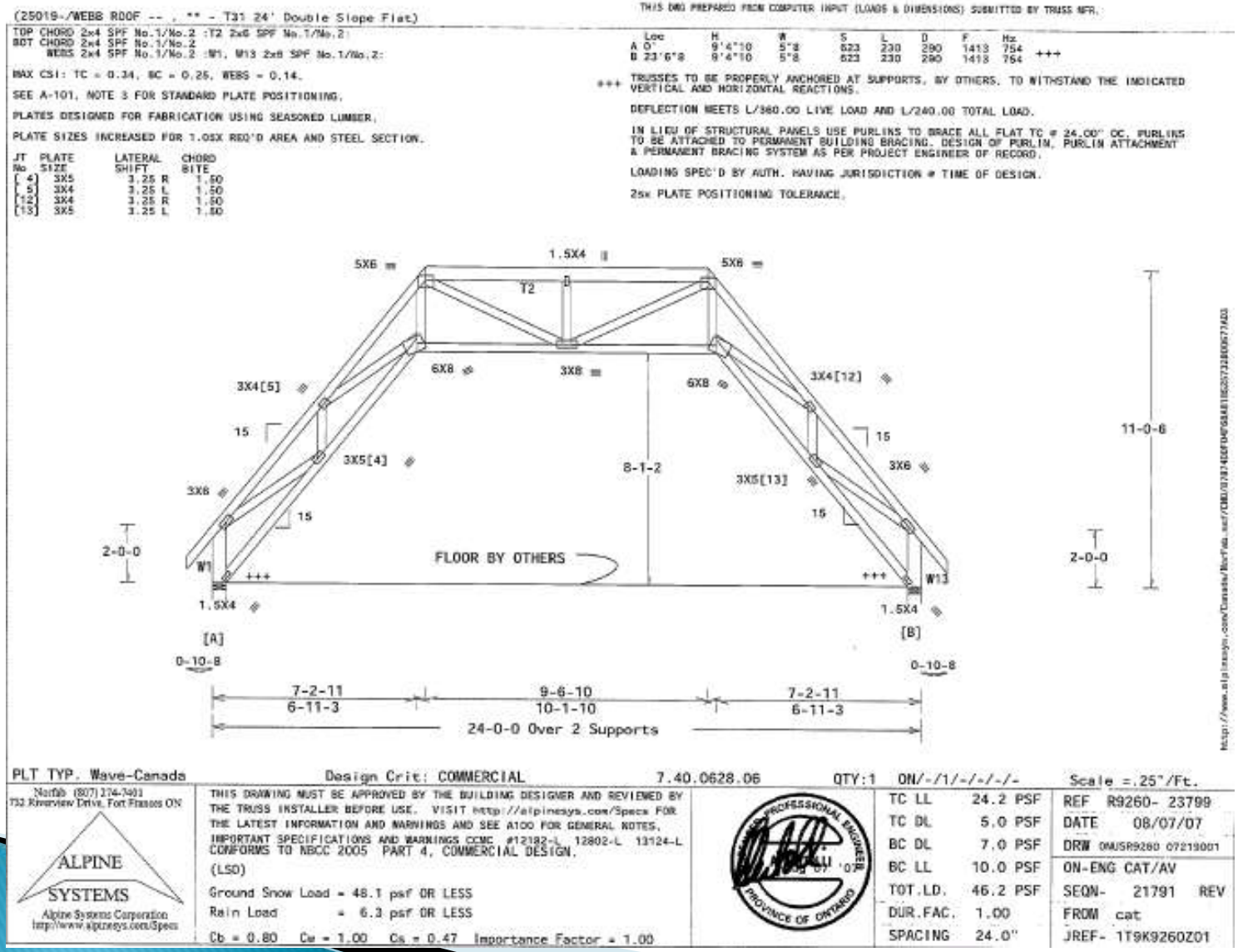
Truss Engineering Drawings

- Contain a lot of info, some important to the builder, some not
- Examples of truss drawings from the 2 main suppliers of truss connector plates and truss design software
  - Mitek
  - Alpine

Mitec Truss Drawing



Alpine Truss Drawing



Important Info on Drawings

- Loads and Design Basis – Part 4, Part 9
- Spacing
- Deflection
- Support locations
- Web and chord bracing
- Uplift, bearing and hanger requirements

Loads and Design

Standard Part 9 Loads:
-no attic trusses
-no spans over 40’
Eg: Live Load Due to Snow
= 0.55 x 48.1psf + 6.3 = 32.7 psf

Part 4 Loads:
-Part 9 over 40’, Attic trusses
-Post Disaster Buildings
-Part 4 Buildings
Eg: Live Load Due to Snow
= 0.8 x 48.1 + 6.3 = 44.8 psf

Design Crit: RESIDENTIAL 7.31.1205.21 QTY:1 ON/ /1/ / / /

THE LATEST INFORMATION AND WARNINGS AND SEE A100 FOR GENERAL NOTES.
IMPORTANT SPECIFICATIONS AND WARNINGS CCMC #12182-L 12802-L
CONFORMS TO NBCC 2005 PART 9 HOUSING AND SMALL BUILDINGS.
(LSD)
Ground Snow Load = 48.1 psf OR LESS
Rain Load = 6.3 psf OR LESS
Cb = 0.55 Cw = 1.00 Cs = 1.00 Importance Factor = 1.00

TC LL	32.7 PSF
TC DL	7.0 PSF
BC DL	7.0 PSF
BC LL	10.0 PSF
TOT.LD.	52.7 PSF
DUR.FAC.	1.00
SPACING	24.0"

DESIGN CRITERIA

*** SPECIAL LOADS ANALYSIS ***
GEOMETRY AND/OR BASIC LOADS CHANGED BY USER
LOADS WERE DERIVED FROM USER INPUT
NO FURTHER MODIFICATIONS WERE MADE

SPECIFIED LOADS:
TOP CH LL = 32.7 PSF
DL = 7.0 PSF
BOT CH LL = 10.0 PSF
DL = 10.0 PSF
TOTAL LOAD = 59.7 PSF

SPACING = 24.0 IN. C/C

LOADING IN FLAT SECTION BASED ON A SLOPE OF 6.00/12

*** NON STANDARD GIRDER ***
ADDT'L USER-DEFINED LOADS APPLIED TO ALL LOAD CASES.

THIS TRUSS IS DESIGNED FOR RESIDENTIAL OR SMALL BUILDING REQUIREMENTS OF PART 9, NBCC 2005

THIS DESIGN COMPLIES WITH:
- PART 9 OF OBC 2006 , BCBC 2006 , ABC 2006
- CSA O86-01
- TPIC 2007

(55 % OF 48.1 P.S.F. G.S.L. PLUS
6.3 P.S.F. RAIN LOAD EQUALS
32.7 P.S.F. SPECIFIED ROOF LIVE LOAD

ALLOWABLE DEFL. = L/360 (1.20")
CALCULATED VERT. DEFL.(TL) = L/ 999 (0.13")

CSI. TC=0.36 (3-4,1) , BC=0.55 (16-18:1) ,
WB=0.97 (6-15:1) , SSI=0.94 (16-18:1)

DOL LUMBER=1.00 NAIL=1.00 LS BEND=1.00
COMP=1.00 SHEAR=1.00 TENS= 1.00

COMPANION LIVE LOAD FACTOR = 0.50

Spacing

Design Crit: RESIDENTIAL 7.31.1205.21 QTY:1 ON/-/1/-/-/-/-

THIS DRAWING MUST BE APPROVED BY THE BUILDING DESIGNER AND REVIEWED BY THE TRUSS INSTALLER BEFORE USE. VISIT http://alpinesys.com/Specs FOR THE LATEST INFORMATION AND WARNINGS AND SEE A100 FOR GENERAL NOTES, IMPORTANT SPECIFICATIONS AND WARNINGS CCMC #12162-L 12802-L 13124-L CONFORMS TO NBCC 2005 PART 9, HOUSING AND SMALL BUILDINGS.

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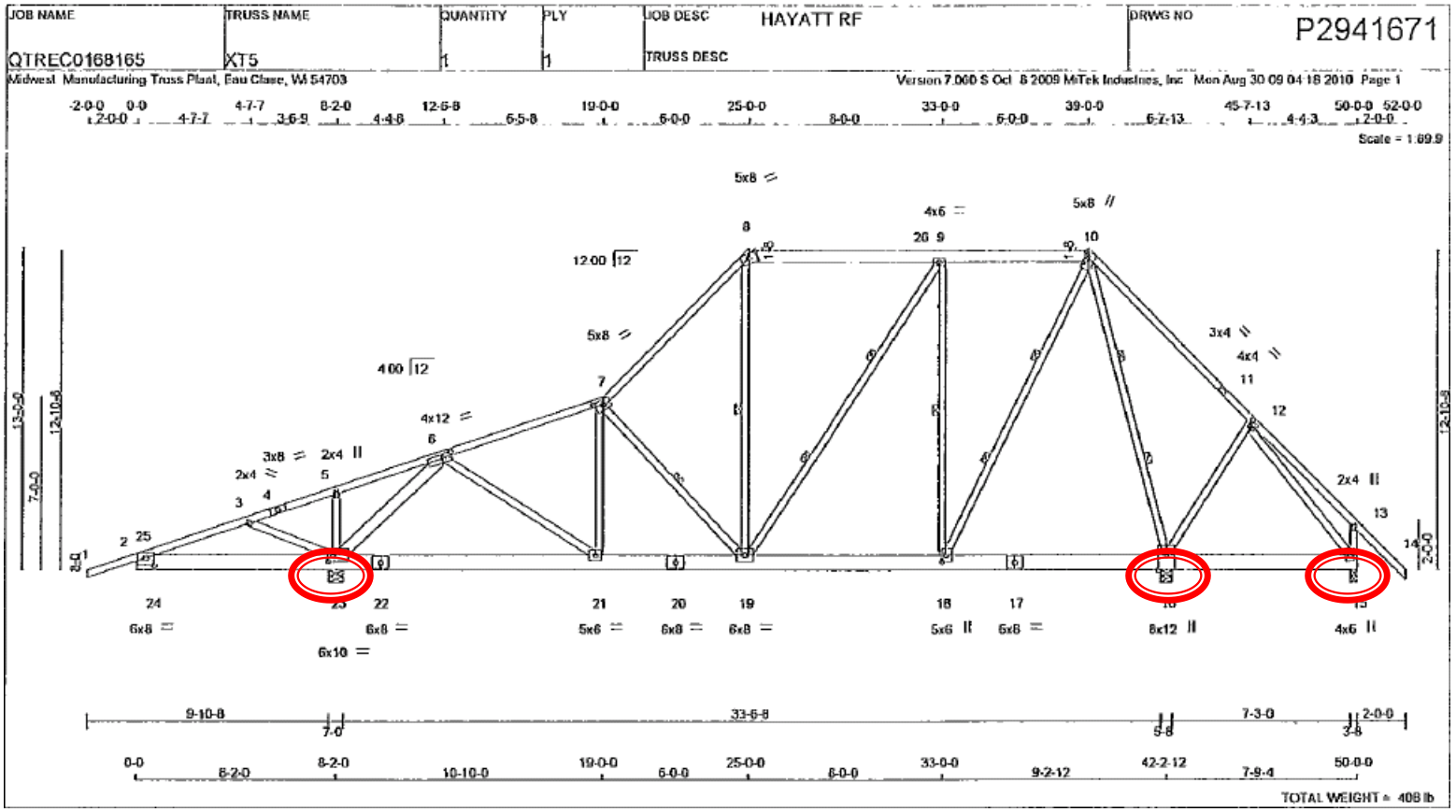
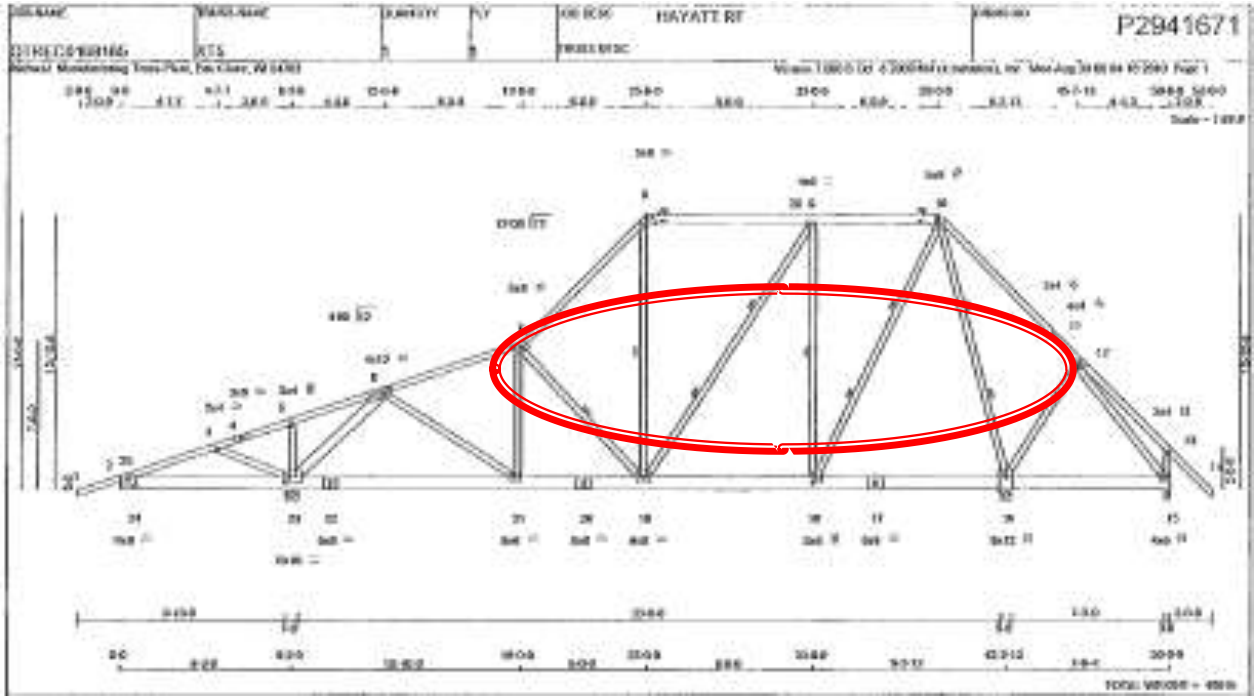
DOL LUMBER=1.00 NAIL=1.00 LS BEND=1.00 COMP=1.00 SHEAR=1.00 TENS= 1.00

COMPANION LIVE LOAD FACTOR = 0.50

Support Locations



Web Bracing



LEN	Y	X
8.0	3.75	4.00
4.0		
8.0		
4.0		
12.0	1.75	4.25
8.0	2.25	4.00
6.0	Edge	4.00
6.0		
8.0	2.25	2.00
4.0		
4.0	2.00	1.75
4.0		
6.0		
12.0	Edge	4.00
8.0		
6.0	3.00	2.00
8.0		
6.0		

BEARING MATERIAL TO BE OF SPF NO. 2 OR BETTER

BRACING
MAX. UNBRACED TOP CHORD LENGTH = 2.88FT.
MAX. UNBRACED BOTTOM CHORD LENGTH = 5.21FT. OR RIGID CEILING DIRECTLY APPLIED

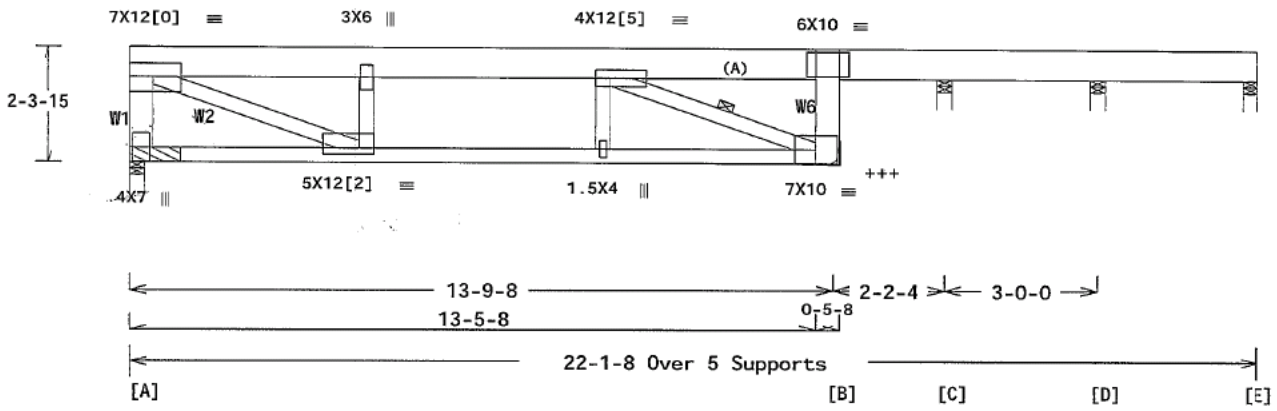
1-2X4 LATERAL BRACE REQUIRED AT 1/2 LENGTH OF 7-19, 8-19, 9-16
2-2X4 LATERAL BRACE REQUIRED AT 1/3 LENGTH OF 9-19, 10-18, 10-16
END VERTICAL(S) MUST BE SHEATHED OR HAVE BRACES AS INDICATED IN THE MAX. UNBRACED LENGTH COLUMN OF THE TABLE BELOW

LOADING
LOAD CASE (1) OF (17)

CHORDS						WEBS		
MEMB. FR-TO	FACTORED FORCE (LBS)	FACTORED VERT LOAD (PLF) FROM	TO	MAX CSI (LC)	MAX UNBRAC LENGTH	MEMB. FR-TO	FACTORED FORCE (LBS)	MAX CSI (LC)

Web Bracing – Girders or Single Trusses

(A) 2x4 SPF#3 CLB's EQUALLY SPACED ON MEMBER. ATTACH W/(2) 3.5" NAILS. OR 2x4 "T" BRACE. 80% LENGTH OF WEB MEMBER. SAME SPECIES & GRADE OR BETTER, ATTACHED W/3.0" NAILS @ 6" OC. BRACING MATERIAL SUPPLIED & ATTACHED @ BOTH ENDS TO SUITABLE SUPPORT BY ERECTION CONTRACTOR. DESIGN OF PERMANENT BUILDING BRACING SYSTEM BY PROJECT ENGINEER OF RECORD.



Web Bracing– Gable End

(25019-/WEBB ROOF -- , ** - T23 24' DTC Gable)

THIS DRW PREPARED FROM COMPUTER INPUT (LOADS & DIMENSIONS) SUBMITTED BY TRUSS MFR.

TOP CHORD 2x4 SPF No.1/No.2
BOT CHORD 2x4 SPF No.1/No.2
WEBS 2x4 SPF No.1/No.2 :W2, W5 2x4 SPF 2100f-1.8E:

MAX CSI: TC = 0.18, BC = 0.07, WEBS = 0.24.

SEE A-101, NOTE 3 FOR STANDARD PLATE POSITIONING.

PLATES DESIGNED FOR FABRICATION USING SEASONED LUMBER.

2sx PLATE POSITIONING TOLERANCE.

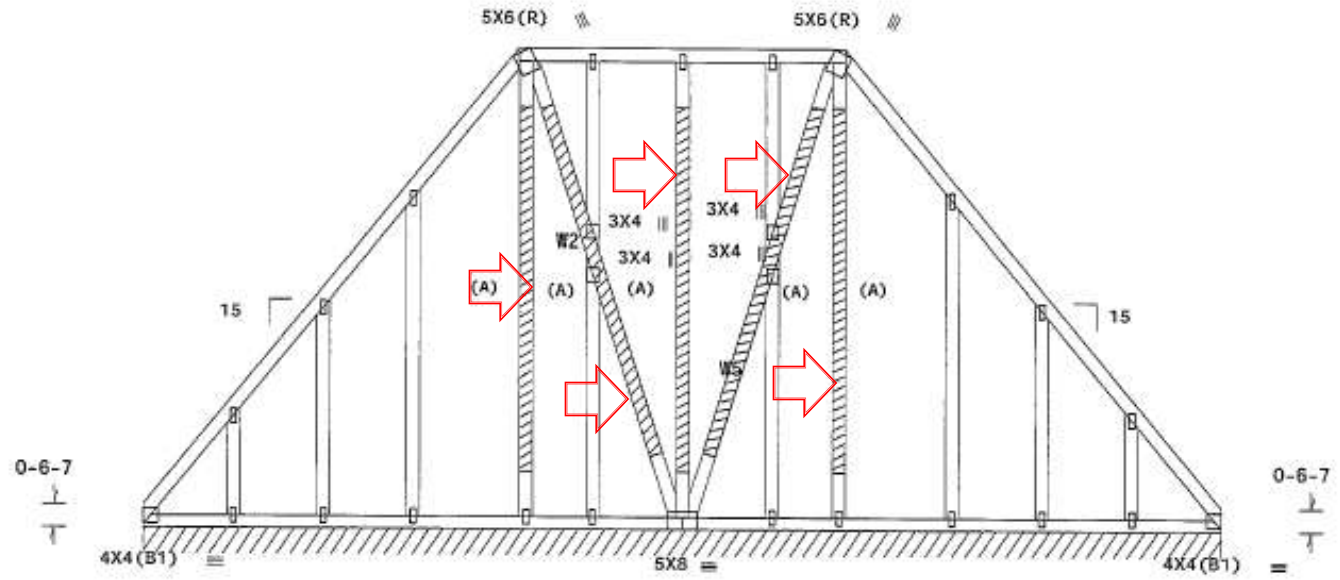
Loc	H						
A 0'	11-5-12	24'	1570	3380	1337	6032	0

(A) #3 OR BETTER SCAB BRACE, SAME SIZE & 80% LENGTH OF WEB MEMBER. ATTACH W/3.5 NAILS @ 6" OC. BRACING MATERIAL SUPPLIED BY ERECTION CONTRACTOR.

IN LIEU OF STRUCTURAL PANELS USE PURLINS TO BRACE ALL FLAT TC @ 24.00" OC.

LOADING SPEC'D BY ABTH. HAVING JURISDICTION @ TIME OF DESIGN.

PLATE SIZES INCREASED FOR 1.05X REQ'D AREA AND STEEL SECTION.



Chord Bracing

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MAX. UNBRACED BOTTOM CHORD LENGTH = 5.21FT. OR RIGID CEILING DIRECTLY APPLIED.

1-2X4 LATERAL BRACE REQUIRED AT 1/2 LENGTH OF 7-19, 8-19, 9-18
2-2X4 LATERAL BRACE REQUIRED AT 1/3 LENGTH OF 9-19, 10-18, 10-16
END VERTICAL(S) MUST BE SHEATHED OR HAVE BRACES AS INDICATED IN THE MAX. UNBRACED LENGTH COLUMN OF THE TABLE BELOW

IN LIEU OF STRUCTURAL PANELS USE PURLINS TO BRACE ALL FLAT TC @ 24.00" OC. PURLINS TO BE ATTACHED TO PERMANENT BUILDING BRACING. DESIGN OF PURLIN, PURLIN ATTACHMENT & PERMANENT BRACING SYSTEM AS PER PROJECT ENGINEER OF RECORD.

Uplift and Hanger Requirements

PROVIDE UPLIFT CONNECTION AT BEARINGS AS INDICATED
FACTORED UPLIFT (LBS): 363 449 200 229 200
BRG. LOC. (ft): 0.00 13.67 15.83 18.83 21.83
q=10.00 psf, 12.66' REF.HT., CALC'D INT. PRESS=6.30 psf,
C2 BLDG,10.00/7.00 TCDL/BCDL. OPNGS MAINLY WINDWARD SIDE.

DEFLECTION MEETS L/360.00 LIVE LOAD AND L/360.00 TOTAL LOAD.

DIMENSIONS, SUPPORTS AND LOADINGS SPECIFIED BY FABRICATOR TO BE VERIFIED BY BUILDING DESIGNER

BEARINGS

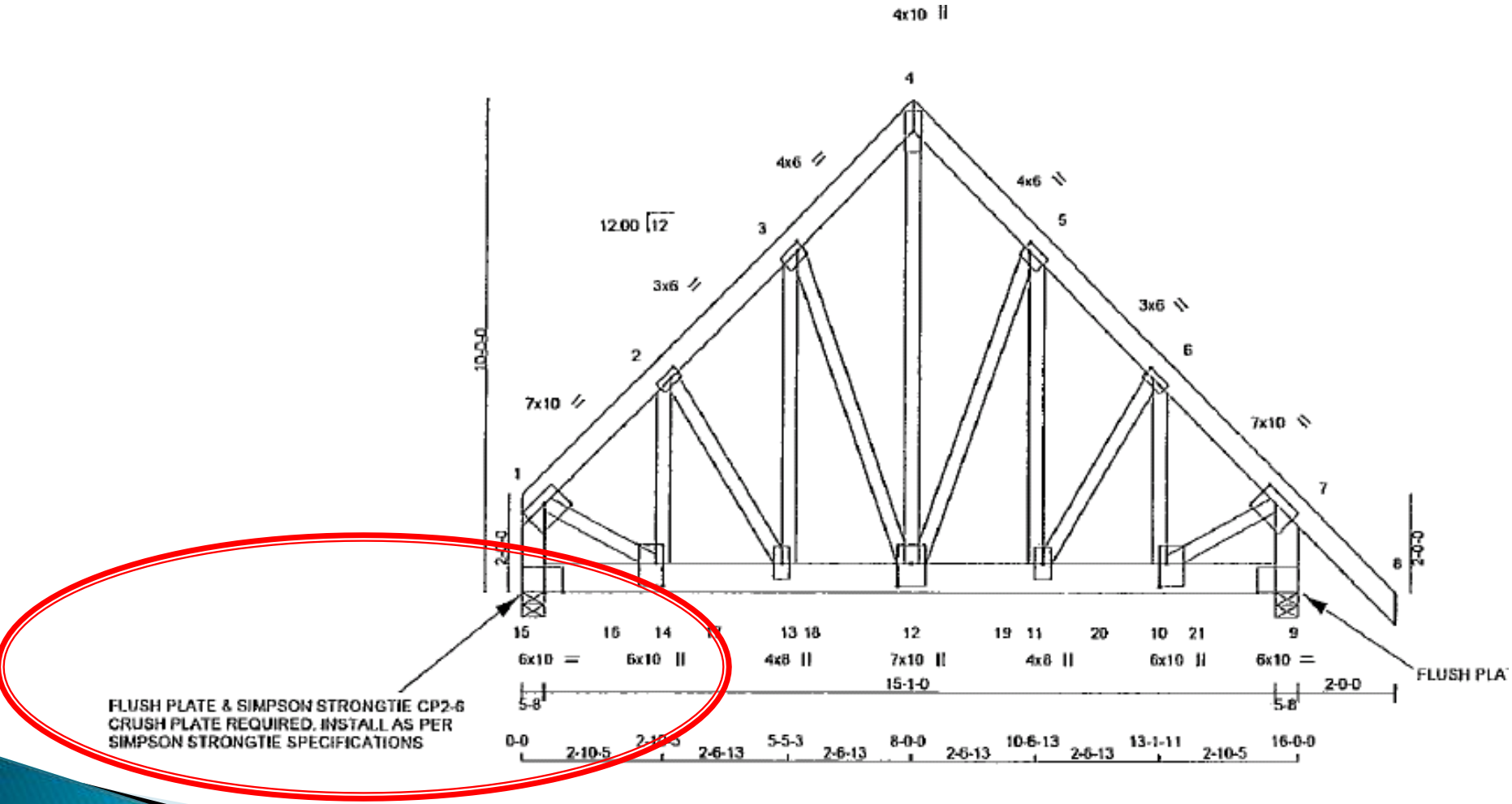
	FACTORED GROSS REACTION		MAXIMUM FACTORED GROSS REACTION			INPUT BRG	REQRD BRG
JT	VERT	HORZ	DOWN	HORZ	UPLIFT	IN-SX	IN-SX
20	4620	0	4620	0	0	5-6	4-5
11	4246	0	4246	0	0	HANGER BY OTHERS	
						MIN. SEAT SIZE 3-0	

UNFACTORED GROSS REACTIONS

	1ST LCASE	MAX./MIN. COMPONENT REACTIONS			
JT	COMBINED	SNOW	LIVE	WIND	DEAD
20	3846	2062 / 0	671 / 0	0 / 0	1113 / 0
11	3385	1620 / 0	588 / 0	0 / 0	976 / 0

BEARING MATERIAL TO BE OF SPF NO. 2 OR BETTER

Bearing Conditions – Crush Plates



Bearing Conditions – Floor Required

ROOF -- , ** - T31 24' Double Slope Flat)

SPF No.1/No.2 :T2 2x6 SPF No.1/No.2:
SPF No.1/No.2
SPF No.1/No.2 :W1, W13 2x6 SPF No.1/No.2:

0.34, BC = 0.25, WEBS = 0.14.

TE 3 FOR STANDARD PLATE POSITIONING.

ED FOR FABRICATION USING SEASONED LUMBER.

NCREASED FOR 1.05X REQ'D AREA AND STEEL SECTION.

LATERAL SHIFT	CHORD BITE
3.25 R	1.50
3.25 L	1.50
3.25 R	1.50
3.25 L	1.50

Loc	H	W	S		D	F	Hz	
A 0'	9'4"10	5"8	623	230	290	1413	754	+++
B 23'6"8	9'4"10	5"8	623	230	290	1413	754	

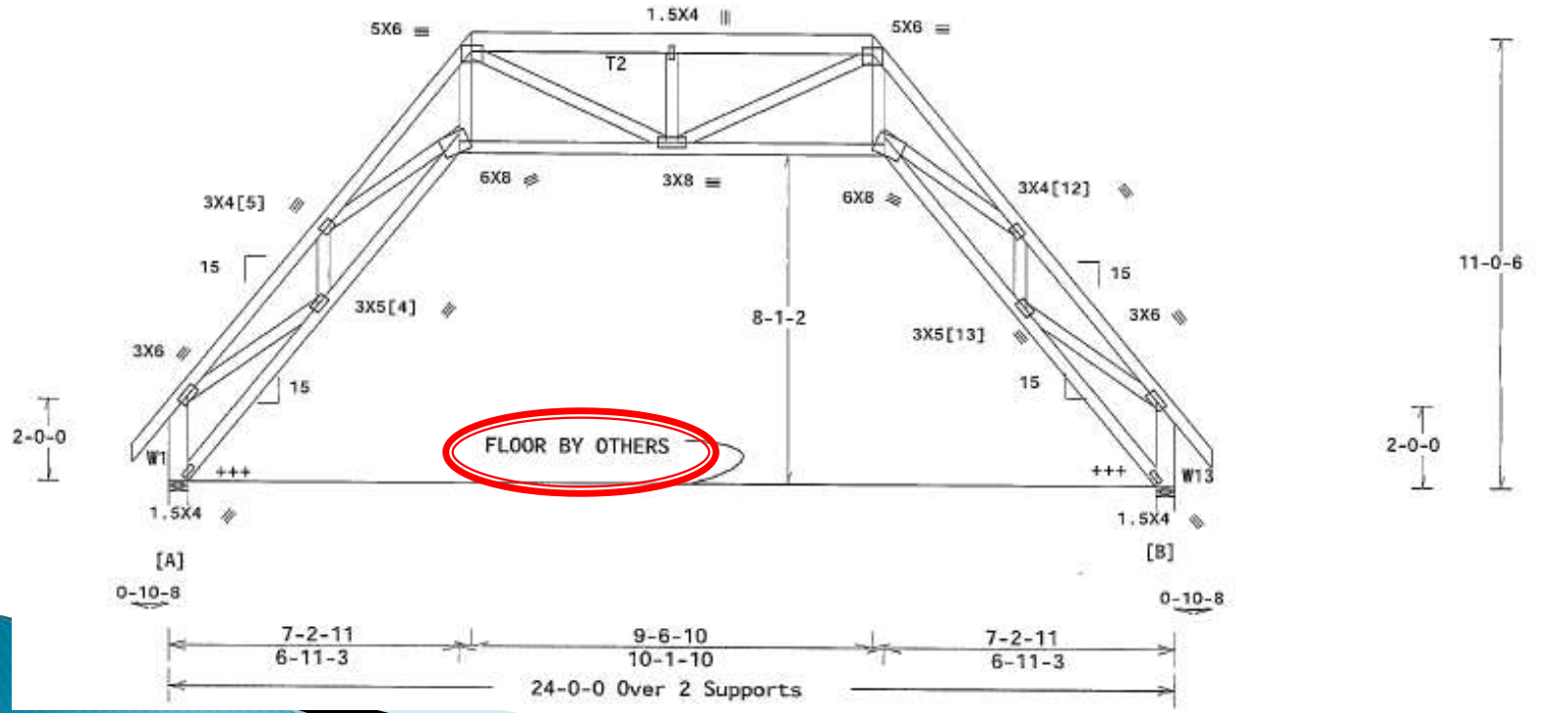
+++ TRUSSES TO BE PROPERLY ANCHORED AT SUPPORTS, BY OTHERS, TO WITHSTAND THE INDICATED VERTICAL AND HORIZONTAL REACTIONS.

DEFLECTION MEETS L/360.00 LIVE LOAD AND L/240.00 TOTAL LOAD.

IN LIEU OF STRUCTURAL PANELS USE PURLINS TO BRACE ALL FLAT TC @ 24.00" OC. PURLINS TO BE ATTACHED TO PERMANENT BUILDING BRACING. DESIGN OF PURLIN, PURLIN ATTACHMENT & PERMANENT BRACING SYSTEM AS PER PROJECT ENGINEER OF RECORD.

LOADING SPEC'D BY AUTH. HAVING JURISDICTION @ TIME OF DESIGN.

2sx PLATE POSITIONING TOLERANCE.

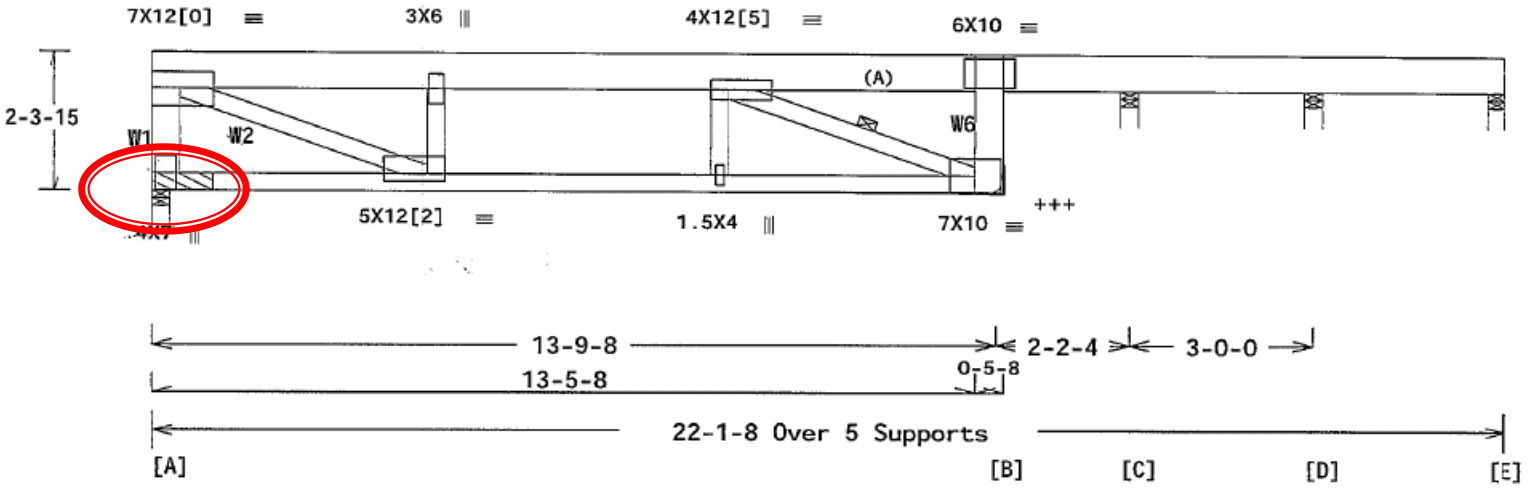


Bearing Conditions – Bearing Blocks Required

Bearing blocks: Nail type: 3.0"_common_nails

BRG	X-LOC	#BLOCKS	LENGTH/BLK	#NAILS/BLK
1	0.000'	1	12"	9

Bearing block to be same size and species as bottom chord.
Refer to drawing CNBRGBLK0207 for additional information.



Bearing Block Notes:

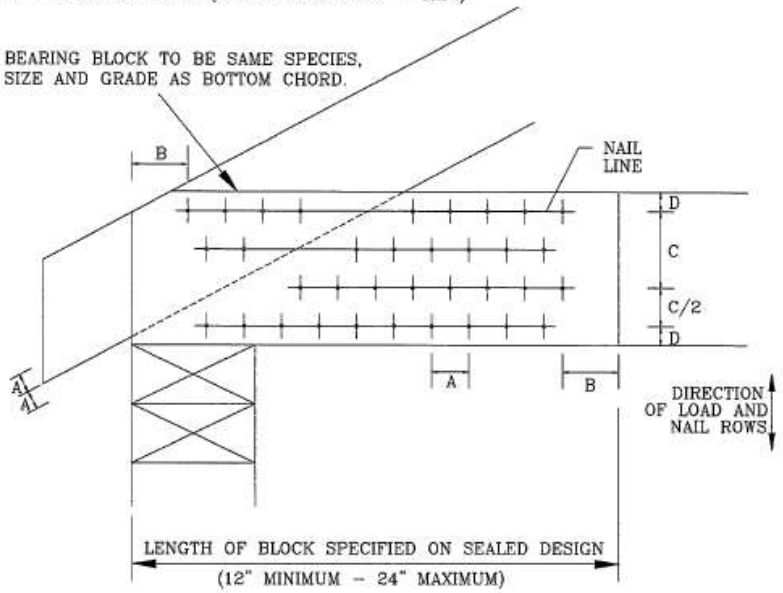
BEARING BLOCK NAIL SPACING DETAIL

(SPF & NORTHERN SPECIES LUMBER)

VALUES FROM CSA 086-01 ENGINEERING DESIGN IN WOOD

MINIMUM SPACING FOR SINGLE BEARING BLOCK IS SHOWN. DOUBLE NAIL SPACINGS AND STAGGER NAILING FOR TWO BLOCKS. GREATER SPACING MAY BE REQUIRED TO AVOID SPLITTING.

A – SPACING PARALLEL TO GRAIN (16 NAIL DIAMETERS – MIN.)
B – END DISTANCE (12 NAIL DIAMETERS – MIN.)
C – SPACING OF NAILS IN A ROW (8 NAIL DIAMETERS – MIN.)
D – EDGE DISTANCE (4 NAIL DIAMETERS – MIN.)



MAXIMUM NUMBER OF NAIL LINES PARALLEL TO GRAIN

NAIL TYPE	DIAM.	CHORD SIZE 2X4	2X6	2X8	2X10	2X12
2.5" COMMON NAIL	0.128"	5	8	11	15	18
3.0" COMMON NAIL	0.144"	4	7	10	13	17
3.5" COMMON NAIL	0.160"	3	6	9	12	15
2.5" SPIRAL NAIL	0.109"	6	11	15	19	24
3.0" SPIRAL NAIL	0.122"	6	10	13	17	21
3.5" SPIRAL NAIL	0.152"	4	7	10	13	17
3.25" GUN NAIL	0.128"	5	8	11	15	18

MINIMUM NAIL SPACING DISTANCES ++

NAIL TYPE	DIAM.	DISTANCES A	B	C	D
2.5" COMMON NAIL	0.128"	2-1/8"	1-5/8"	1-1/8"	5/8"
3.0" COMMON NAIL	0.144"	2-3/8"	1-3/4"	1-1/4"	5/8"
3.5" COMMON NAIL	0.160"	2-5/8"	2"	1-3/8"	3/4"
2.5" SPIRAL NAIL	0.109"	1-3/4"	1-3/8"	7/8"	1/2"
3.0" SPIRAL NAIL	0.122"	2"	1-1/2"	1"	1/2"
3.5" SPIRAL NAIL	0.152"	2-1/2"	1-7/8"	1-1/4"	5/8"
3.25" GUN NAIL	0.128"	2-1/8"	1-5/8"	1-1/8"	5/8"

++ – CSA 086-01 ALLOWABLES ROUNDED UP TO NEAREST 1/8'

ALPINE

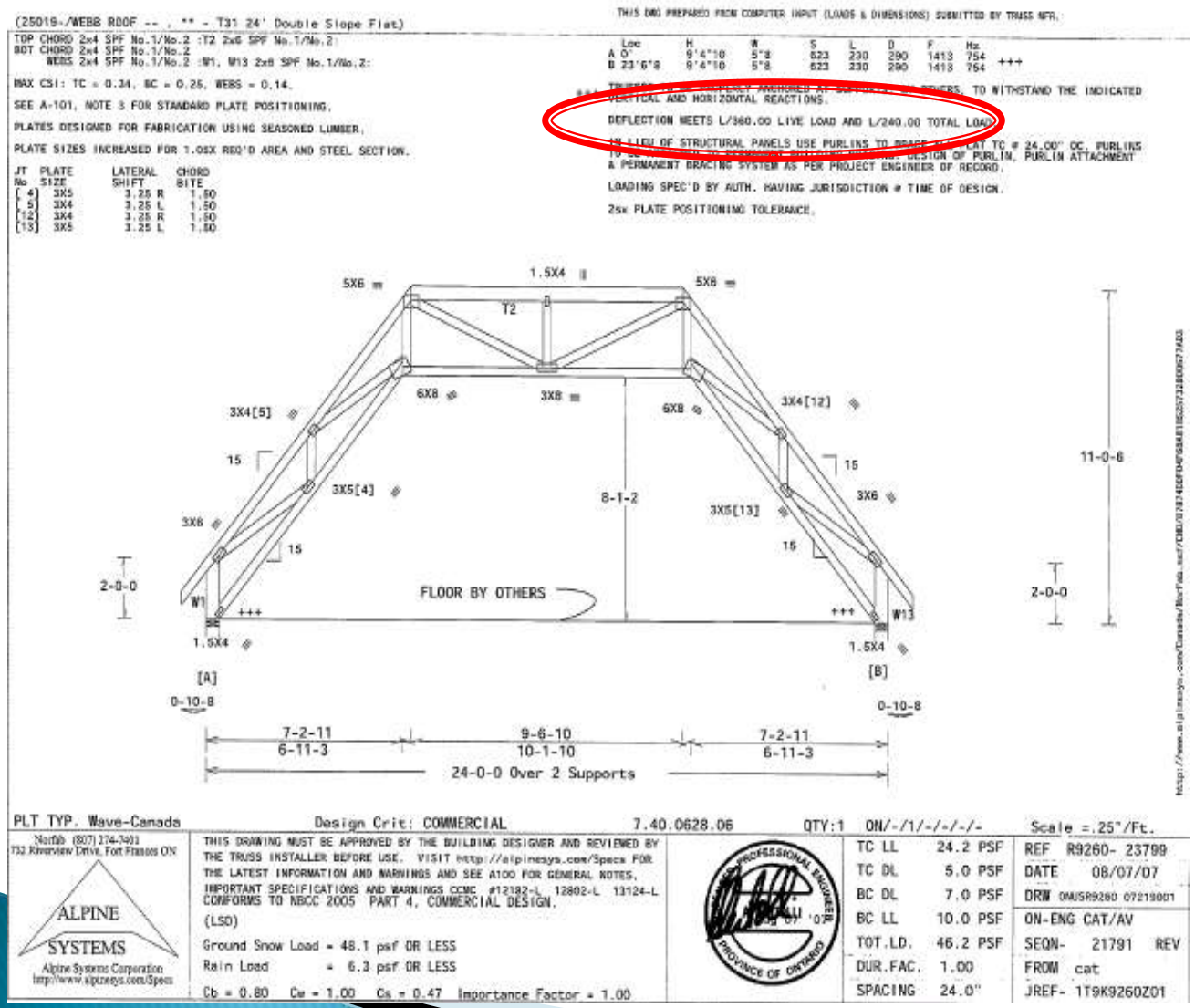
ALPINE SYSTEMS CORPORATION
CONCORD, ONTARIO
COQUITLAM, BC
http://www.alpinesys.com/Specs

WARNING TRUSSES REQUIRE EXTREME CARE IN FABRICATING, HANDLING, SHIPPING, INSTALLING AND BRACING. REFER TO BCSI 1-03 (HANDLING, INSTALLING AND BRACING), PUBLISHED BY TPI (TRUSS PLATE INSTITUTE, 583 D'ONOFRIO DR., SUITE 236, MADISON, WI 53719) FOR SAFETY PRACTICES PRIOR TO PERFORMING THESE FUNCTIONS. UNLESS OTHERWISE INDICATED, TOP CHORD SHALL HAVE PROPERLY ATTACHED STRUCTURAL PANELS AND BOTTOM CHORD SHALL HAVE A PROPERLY ATTACHED RIGID CEILING.
IMPORTANT FURNISH A COPY OF THIS DESIGN TO THE INSTALLATION CONTRACTOR. ALPINE SYSTEMS CORPORATION SHALL NOT BE RESPONSIBLE FOR ANY DEVIATION FROM THIS DESIGN, ANY FAILURE TO BUILD THE TRUSSES IN CONFORMANCE WITH TPIC), OR FABRICATING, HANDLING, SHIPPING, INSTALLING AND BRACING OF TRUSSES. DESIGN CONFORMS WITH APPLICABLE PROVISIONS OF CSA 086-01 (CANADIAN STANDARDS ASSOCIATION), NBCC (LATEST EDITION), AND TPIC. ALPINE CONNECTORS ARE MADE OF 20GA ASTM A653 GR40 GALV. STEEL EXCEPT AS NOTED. APPLY CONNECTORS TO EACH FACE OF TRUSS AND, UNLESS OTHERWISE LOCATED ON THIS DESIGN, POSITION CONNECTORS PER DRAWINGS 160 A-2. THE SEAL ON THIS DRAWING INDICATES ACCEPTANCE OF PROFESSIONAL ENGINEERING RESPONSIBILITY SOLELY FOR THE TRUSS COMPONENT DESIGN SHOWN. THE SUITABILITY AND USE OF THIS COMPONENT FOR ANY PARTICULAR BUILDING IS THE RESPONSIBILITY OF THE BUILDING DESIGNER, PER TPIC 96.

LICENSED PROFESSIONAL ENGINEER
A. ...TO
PROVINCE OF ONTARIO

REF	BEARING BLOCK
DATE	12/04/03
DRWG	CNBRGBLK1103
-ENG	TB/AV

Deflection



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LOADS WERE DERIVED FROM USER INPUT
NO FURTHER MODIFICATIONS WERE MADE

SPECIFIED LOADS:

TOP CH	LL =	32.7	PSF
	DL =	7.0	PSF
BOT CH	LL =	10.0	PSF
	DL =	10.0	PSF
TOTAL LOAD	=	59.7	PSF

SPACING = 24.0 IN. C/C

LOADING IN FLAT SECTION BASED ON A SLOPE OF 6.00/12

*** NON STANDARD GIRDER ***
ADDTL USER-DEFINED LOADS APPLIED TO ALL LOAD CASES.

THIS TRUSS IS DESIGNED FOR RESIDENTIAL OR SMALL BUILDING REQUIREMENTS OF PART 9, NBCC 2005

THIS DESIGN COMPLIES WITH:
- PART 9 OF OBC 2006 , BCBC 2006 , ABC 2006
- CSA 086-01
- TPIC 2007

(55 % OF 48.1 P.S.F. G.S.L. PLUS
6.3 P.S.F. RAIN LOAD EQUALS
32.7 P.S.F. SPECIFIED ROOF LIVE LOAD

ALLOWABLE DEFL. = L/360 (1.20")
CALCULATED VERT. DEFL.(TL) = L/ 999 (0.48")

CSI. TC=0.36 (3-4:1) , BC=0.55 (16-16:1) ,
WB=0.97 (6-15:1) , SSI=0.94 (16-16:1)

DOL LUMBER=1.00 NAIL=1.00 LS BEND=1.00
COMP=1.00 SHEAR=1.00 TENS= 1.00

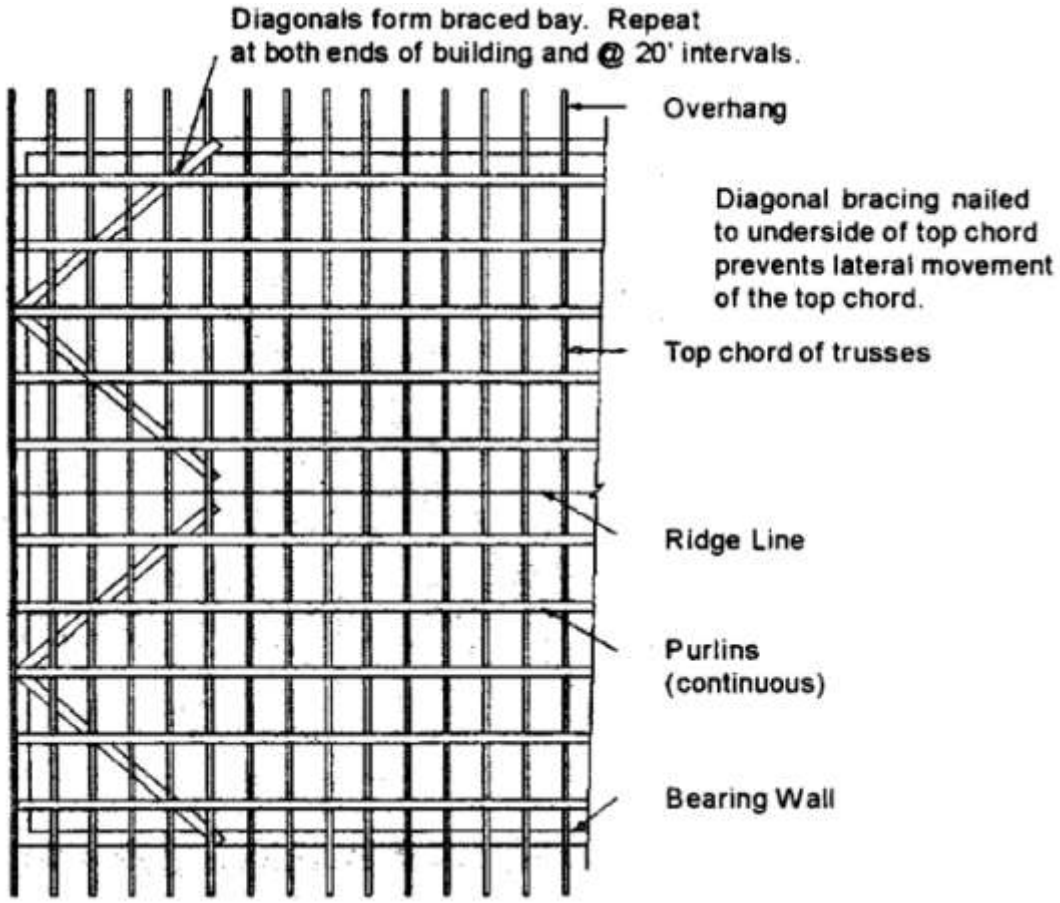
COMPANION LIVE LOAD FACTOR = 0.50

Building Bracing of Trusses

- Permanent bracing is designed and specified for the structural safety of the building. The building designer should indicate the size, location and attachments for all permanent bracing
- The builder must still install the required permanent bracing, when missed by the building designer
- Typical permanent bracing to be specified by the building designer is as follows:

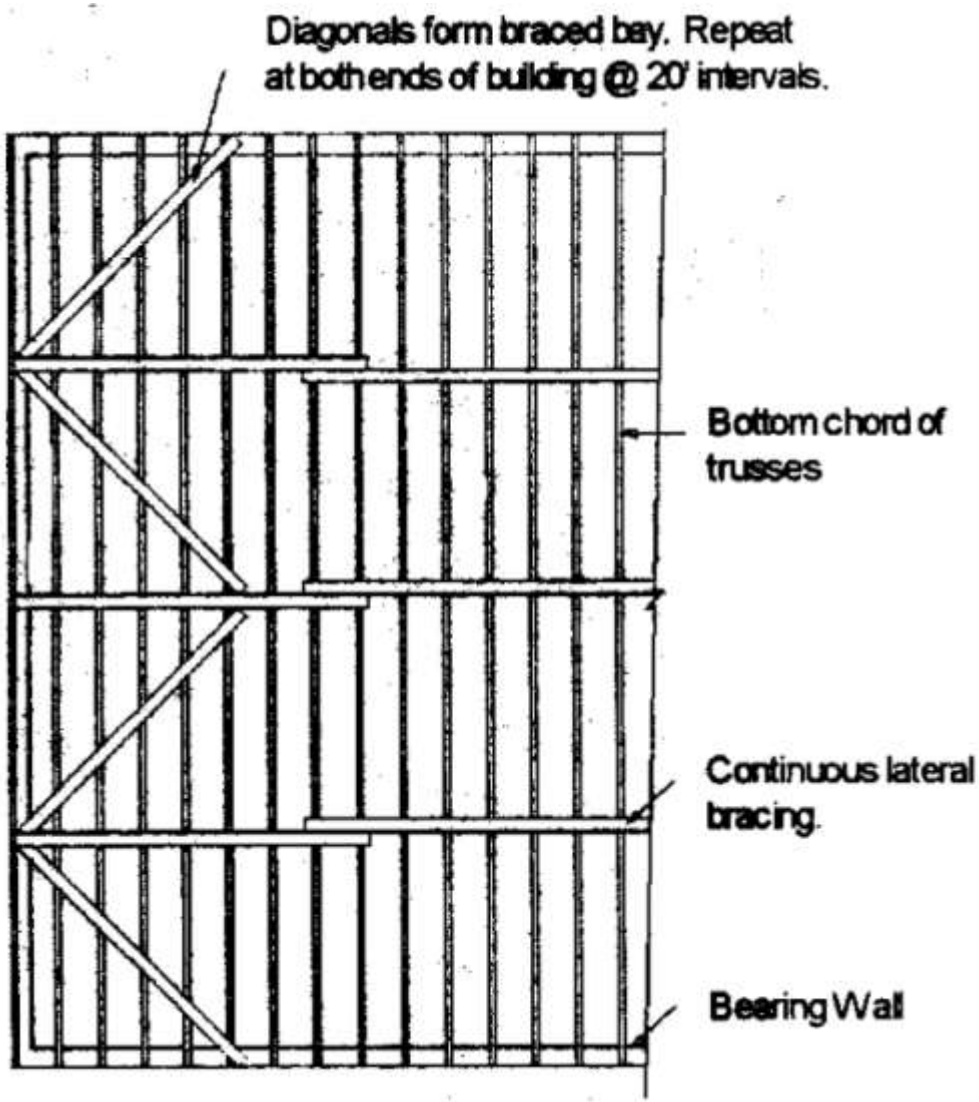
Top Chord Bracing– no rigid roof sheathing

- If purlins are used, it is recommended that diagonal bracing be applied to the underside of the top chord as shown.



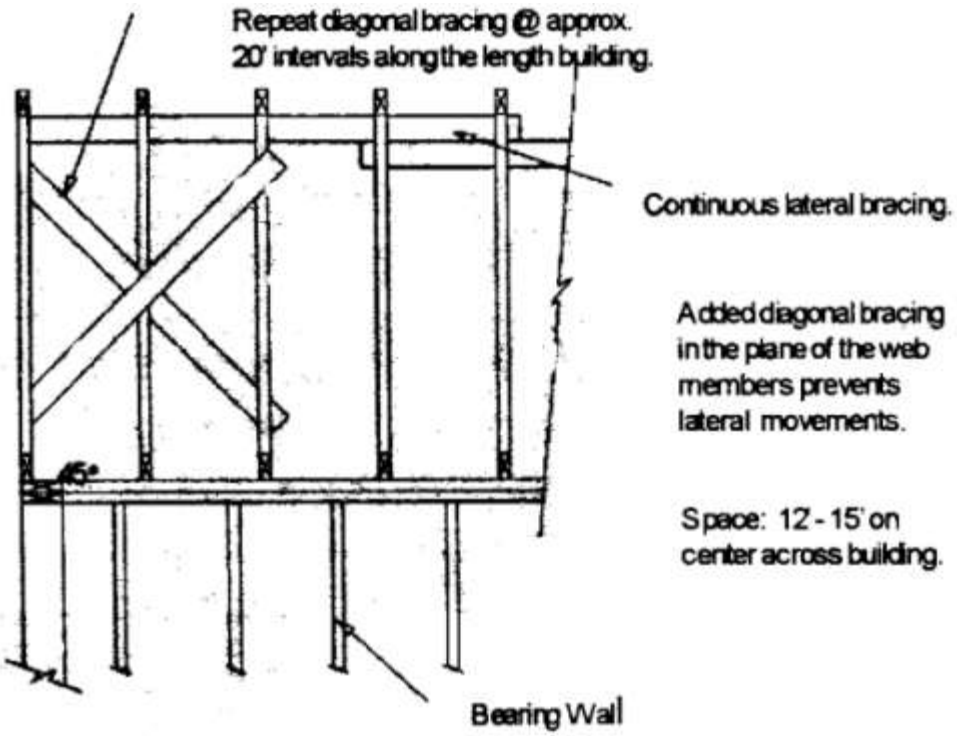
Bottom Chord Bracing – no rigid ceiling

- This lateral and diagonal bracing is required to maintain the proper truss spacing and to transfer force due to lateral forces into the side walls, shear walls or other resisting structural elements.



Diagonal Web Bracing

- The diagonal web bracing specified by the building designer is used to hold the trusses in a vertical position, to maintain the proper spacing, to distribute unequal loading to adjacent trusses and to transfer lateral forces to the diaphragms and shear walls.



Possible Problems

- Trusses not installed according to truss drawings (spacing, field connections, nailing of girders, bracing wrong or missing, trusses installed backwards or upside down)

- Eg. This truss arrived on site in 2 pcs and was installed similarly to 2x12 rafters (butted at the peak with blocking)

Installed Incorrectly

TOP CHORD 2x4 SPF No.1/No.2
BOT CHORD 2x4 SPF 1650f-1.5E
WEBS 2x4 SPF No.1/No.2

MAX CSI: TC = 0.22, BC = 0.33, WEBS = 0.28.

SEE A-101, NOTE 3 FOR STANDARD PLATE POSITIONING.

NIE AS PER CLAUSE 5.5.13.5 OF CSA-086-01 FOR TRUSS DESIGN.

PLATES DESIGNED FOR FABRICATION USING SEASONED LUMBER.

4sx PLATE POSITIONING TOLERANCE.

THIS DWG. PREPARED BY THE ALPINE JOB DESIGNER PROGRAM FROM TRUSS MFR'S LAYOUT

	Loc	H	W	S	L	D	F	Hz
A	0"	8'1"2	3"8	458	119	125	904	0
B	23'8"8	8'1"2	3"8	396	119	119	804	0

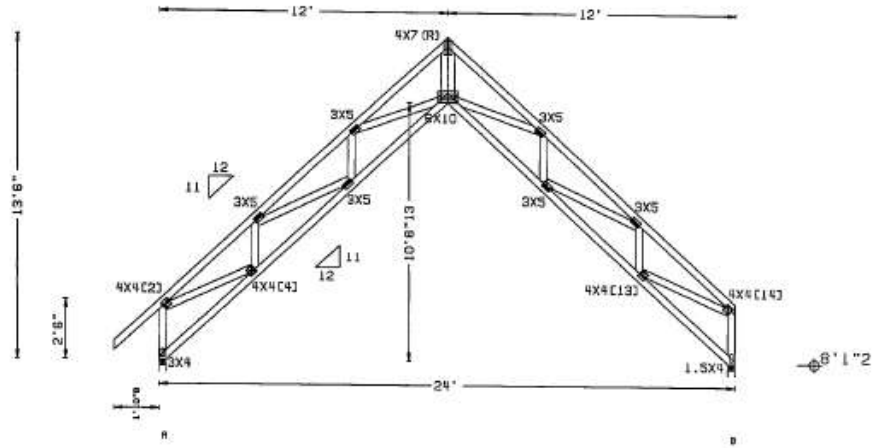
CALCULATED HORIZONTAL DEFLECTION OF 0.51" DUE TO LIVE LOAD AND 0.15" DUE TO DEAD LOAD AT ONE SUPPORT.

DEFLECTION MEETS L/360.00 TOTAL LOAD.

TRUSSES TO BE SPACED AT 12.0" O.C. MAXIMUM.

LOADING SPEC'D BY AUTH. HAVING JURISDICTION @ TIME OF DESIGN.

JT No	PLATE SIZE	LATERAL SHIFT	CHORD BITE
[2]	4X4	1.75 R	1.50
[4]	4X4	2.25 R	1.50
[13]	4X4	1.75 R	1.50
[14]	4X4	2.25 R	1.50



LEFT RAKE = 2'6"8

PLT. TYP.-WAVE-CANADA DESIGN CRIT=RESIDENTIAL QTY= 15 TOTAL= 15 REV. 9.02.02.0514. SEQ = 36961 SCALE =0.1667

THIS DRAWING MUST BE REVIEWED BY A REGISTERED PROFESSIONAL ENGINEER BEFORE USE. VISIT www.alpinesys.com/specs FOR THE LATEST INFORMATION AND WARNINGS AND SEE A100 FOR GENERAL NOTES, IMPORTANT SPECIFICATIONS AND WARNINGS. CCMC #12182-L, 12802-L, 13124-L

Ground Snow Load = 48.70 psf OR LESS
Rain Load = 6.26 psf OR LESS

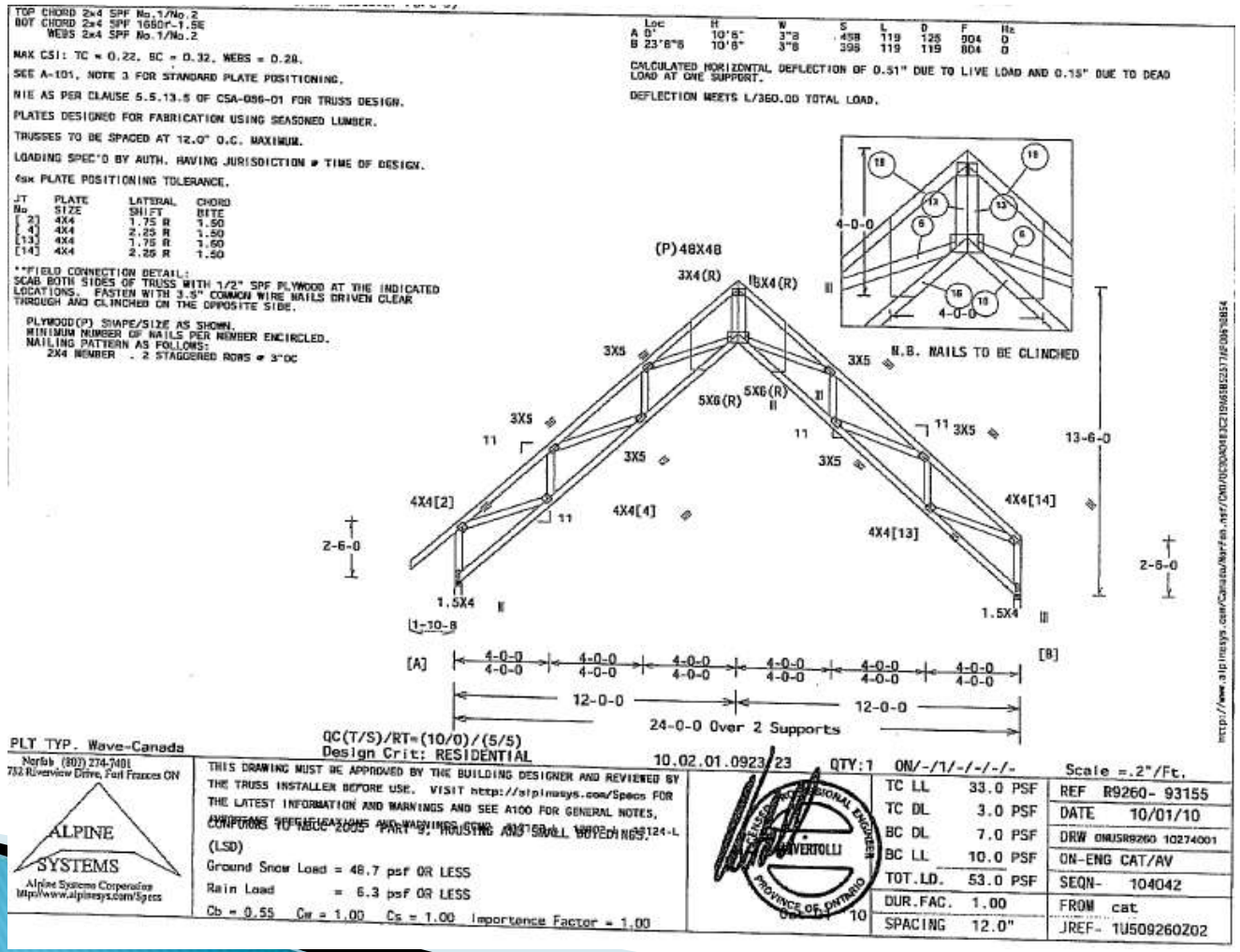
(Cb = 0.55 Cw = 1.00 Cs = 1.00, Importance Factor= 1.00)

CONFORMS TO NBCC 2005 PART 9 HOUSING AND SMALL BUILDINGS.

TC LL	33.0psf	REF	
TC DL	3.0psf	DATE	09-08-2009
BC DL	7.0psf	DRWG	
BC LL	10.0psf		CG
TOT.LD	53.0psf	O/A LEN.	24
DUR.FAC.	1.00	JOB #:	29050
SPACING	12.0"	TYPE	FLOS

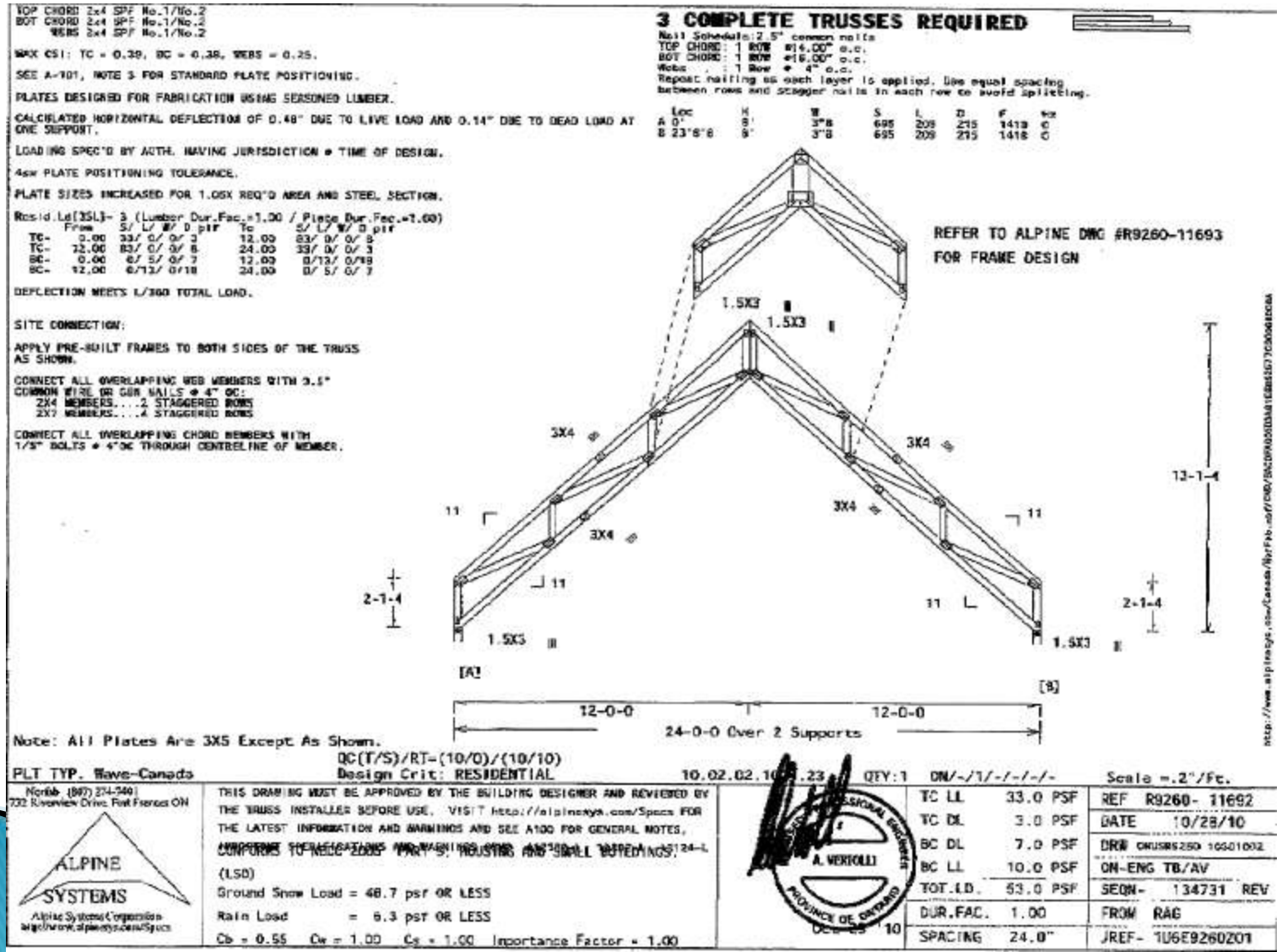
Corrections

- Info missing on site, no field connection detail supplied to builder, add field connection



Corrections Cont'd

- Girder truss required a frame and bolts



Design Problem

- Trusses designed incorrectly by manufacturer (usually incorrect loading, wrong type of building or wrong bearing type)
- Eg: This example shows a truss design mistake
- During a site visit the trusses were on site, so I asked to see the truss drawings
- Can you spot the problem?

TOP CHORD 2x4 SPF No.1/No.2
BOT CHORD 2x6 SPF No.1/No.2
WEBS 2x4 SPF No.1/No.2

MAX CSI: TC = 0.95, BC = 0.96, WEBS = 0.21.

SEE A-101, NOTE 3 FOR STANDARD PLATE POSITIONING.

NIE AS PER CLAUSE 5.5.13.5 OF CSA-086-01 FOR TRUSS DESIGN.

PLATES DESIGNED FOR FABRICATION USING SEASONED LUMBER.

LOADING SPEC'D BY AUTH. HAVING JURISDICTION @ TIME OF DESIGN.

4sx PLATE POSITIONING TOLERANCE.

***** BEARING ANALOG MODIFIED! *****

	Loc	H	W	S	L	D	F	Hz
A	0"	8"	5"8	1037	279	291	2060	1326
B	27'6"8	8"	5"8	1037	279	291	2060	1326

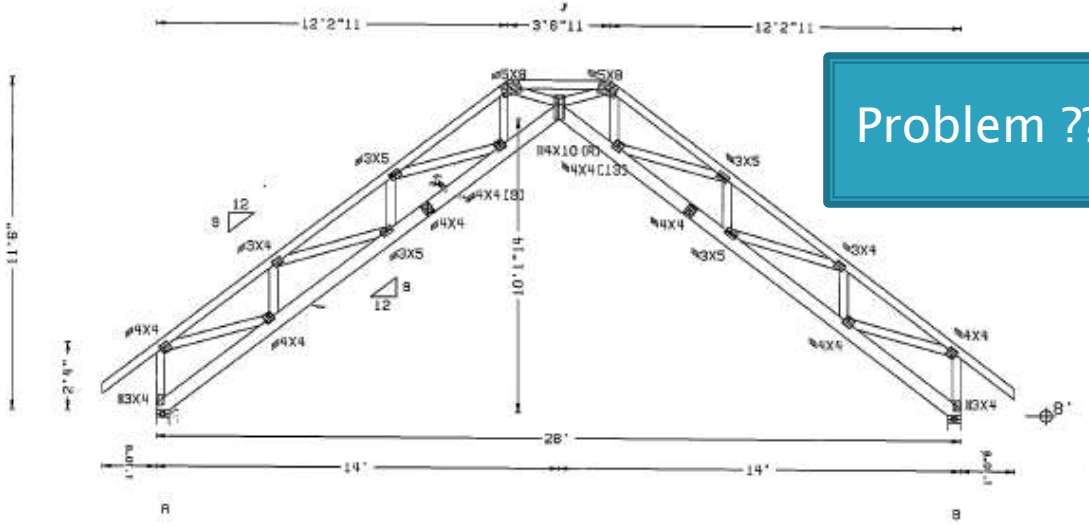
TRUSSES TO BE PROPERLY ANCHORED AT SUPPORTS, BY OTHERS, TO WITHSTAND THE INDICATED VERTICAL AND HORIZONTAL REACTIONS.

DEFLECTION MEETS L/360.00 TOTAL LOAD.

In lieu of structural panels or rigid ceiling use purlins:

CHORD	SPACING(IN OC)	START(FT)	END(FT)
TC	58	-2.51	11.58
TC	43	11.58	15.14
TC	58	15.14	28.24
BC	73	-0.64	27.36

JT No	PLATE SIZE	LATERAL SHIFT	CHORD BITE
[9]	4X4	2.50 R	1.50
[13]	4X4	2.50 L	1.50



Problem ???

LEFT RAKE = 2'4"2

RIGHT RAKE = 2'4"2

PLT. TYP.-WAVE-CANADA | DESIGN CRIT-RESIDENTIAL | QTY= 14 TOTAL= 14 | REV. 9.05.02.0303.2 | SEQ = 117017 | SCALE -0.1875

THIS DRAWING MUST BE REVIEWED BY A REGISTERED PROFESSIONAL ENGINEER BEFORE USE. VISIT www.alpineqs.com/specs FOR THE LATEST INFORMATION AND WARNINGS AND SEE A100 FOR GENERAL NOTES, IMPORTANT SPECIFICATIONS AND WARNINGS. CCMC #12192-L, 12802-L, 13124-L

Ground Snow Load = 48.02 psf OR LESS
Rain Load = 6.26 psf OR LESS

(Cb = 0.55 Cw = 1.00 Cs = 1.00, Importance Factor= 1.00)

CONFORMS TO NBCC 2005 PART 9 HOUSING AND SMALL BUILDINGS.

TC LL	32.7psf	REF
TC DL	3.0psf	DATE 09-22-2010
BC DL	7.0psf	DRWG
BC LL	10.0psf	RAG
TOT.LD	52.7psf	O/A LEN. 28
DUR.FAC.	1.00	JOB #: 29888
SPACING	24.0"	TYPE SCIS

TOP CHORD 2x4 SPF No.1/No.2
BOT CHORD 2x6 SPF No.1/No.2
WEBS 2x4 SPF No.1/No.2

MAX CSI: TC = 0.95, BC = 0.96, WEBS = 0.21.

SEE A-101, NOTE 3 FOR STANDARD PLATE POSITIONING.

NIE AS PER CLAUSE 5.5.13.5 OF CSA-086-01 FOR TRUSS DESIGN.

PLATES DESIGNED FOR FABRICATION USING SEASONED LUMBER.

LOADING SPEC'D BY AUTH. HAVING JURISDICTION @ TIME OF DESIGN.

4sx PLATE POSITIONING TOLERANCE.

***** BEARING ANALOG MODIFIED! *****

Loc	H	W	S	L	D	F	Hz
A 0'	8'	5"8	1037	279	291	208	1326
B 27'6"8	8'	5"8	1037	279	291	208	1326

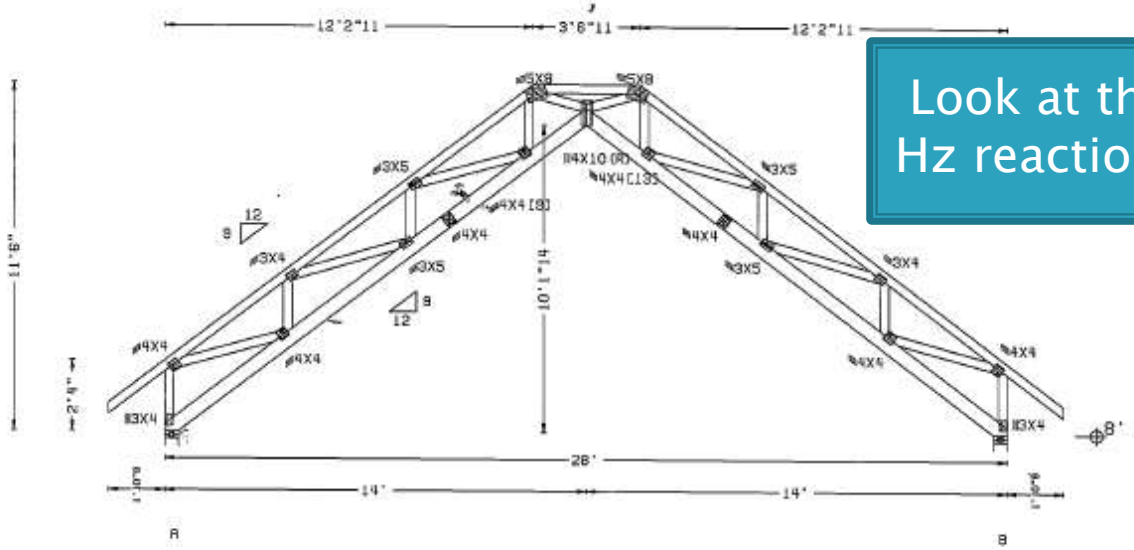
TRUSSES TO BE PROPERLY ANCHORED AT SUPPORTS, BY OTHERS, TO WITHSTAND THE INDICATED VERTICAL AND HORIZONTAL REACTIONS.

DEFLECTION MEETS L/360.00 TOTAL LOAD.

In lieu of structural panels or rigid ceiling use purlins:

CHORD	SPACING(IN OC)	START(FT)	END(FT)
TC	58	-2.51	11.58
TC	43	11.58	15.14
TC	58	15.14	29.24
BC	73	-0.64	27.36

JT No	PLATE SIZE	LATERAL SHIFT	CHORD BITE
[9]	4X4	2.50 R	1.50
[13]	4X4	2.50 L	1.50



Look at the Hz reactions

LEFT RAKE = 2'4"2

RIGHT RAKE = 2'4"2

PLT. TYP.-WAVE-CANADA | DESIGN CRIT-RESIDENTIAL | QTY= 14 TOTAL= 14 | REV. 9.05.02.0303.2 | SEQ = 117017 | SCALE -0.1875

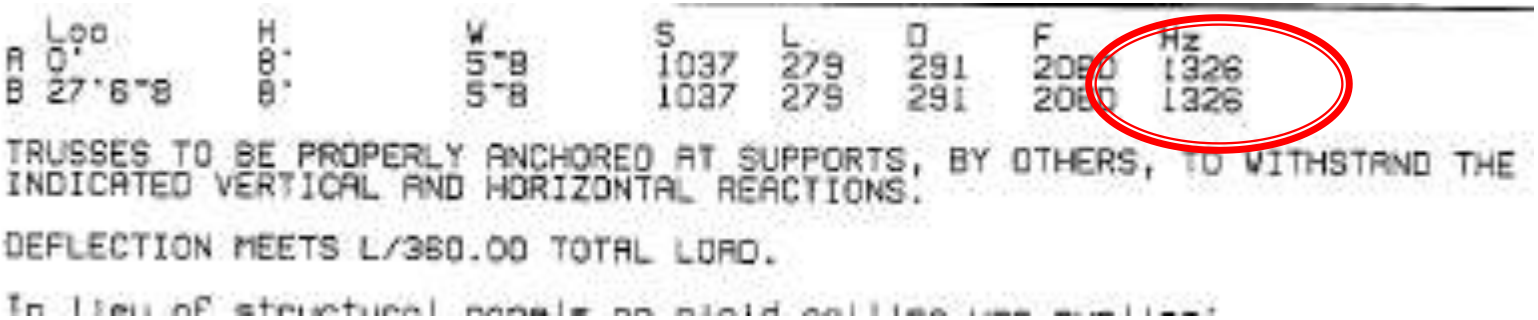
THIS DRAWING MUST BE REVIEWED BY A REGISTERED PROFESSIONAL ENGINEER BEFORE USE. VISIT www.alpinesys.com/specs FOR THE LATEST INFORMATION AND WARNINGS AND SEE A100 FOR GENERAL NOTES, IMPORTANT SPECIFICATIONS AND WARNINGS. CCMC #12182-L, 12802-L, 13124-L

Ground Snow Load = 48.02 psf OR LESS
Rain Load = 6.26 psf OR LESS

(Cb = 0.55 Cw = 1.00 Cs = 1.00, Importance Factor= 1.00)

CONFORMS TO NBCC 2005 PART 9 HOUSING AND SMALL BUILDINGS.

TC LL	32.7psf	REF	
TC DL	3.0psf	DATE	09-22-2010
BC DL	7.0psf	DRWG	
BC LL	10.0psf		RAG
TOT.LD	52.7psf	O/A LEN.	28
DUR.FAC.	1.00	JOB #:	29888
SPACING	24.0"	TYPE	SCIS



	Loc	H	W	S	L	D	F	Hz
A	0'	8'	5"8	1037	279	291	2080	1326
B	27'6"8	8'	5"8	1037	279	291	2080	1326

TRUSSES TO BE PROPERLY ANCHORED AT SUPPORTS, BY OTHERS, TO WITHSTAND THE INDICATED VERTICAL AND HORIZONTAL REACTIONS.

DEFLECTION MEETS L/360.00 TOTAL LOAD.

In lieu of structural panels or rigid ceiling use purlins:

The 1326 pound horizontal reaction indicates that this truss is designed to sit on a continuous floor which will prevent the horizontal forces from the truss forcing the walls out. On site, there is no floor for these trusses to sit on. The design is not appropriate for the building.

Correction: New trusses required!

OP CHORD 2x6 SPF No.1/No.2 :T3 2x4 SPF 2100f-1.8E:
OT CHORD 2x6 SPF No.1/No.2 :B2 2x6 SPF 1650f-1.5E:
WEBS 2x4 SPF No.1/No.2
Lt Splice Block 2x4 SPF No.1/No.2::Rt Splice Block 2x4 SPF No.1/No.2:

AX CSI: TC = 0.39, BC = 0.68, WEBS = 0.69.

EE A-101, NOTE 3 FOR STANDARD PLATE POSITIONING.

NIE AS PER CLAUSE 5.5.13.5 OF CSA-086-01 FOR TRUSS DESIGN.

LATES DESIGNED FOR FABRICATION USING SEASONED LUMBER.

...SUBMITTED BY TRUSS MFR.

Loc	H	W	S	L	D	F	Hz
A 0"	8"	5"8	1049	279	291	2077	0
B 27'6"8	8"	5"8	1049	279	291	2077	0

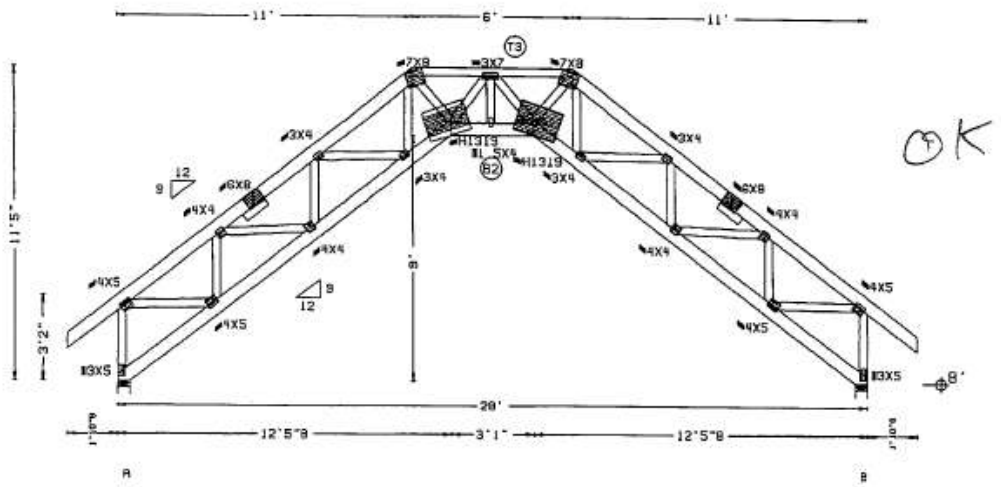
CALCULATED HORIZONTAL DEFLECTION OF 0.58" DUE TO LIVE LOAD AND 0.16" DUE TO DEAD LOAD AT ONE SUPPORT.

DEFLECTION MEETS L/360.00 TOTAL LOAD.

IN LIEU OF STRUCTURAL PANELS USE PURLINS TO BRACE ALL FLAT TC @ 24.00" OC.

LOADING SPEC'D BY AUTH. HAVING JURISDICTION @ TIME OF DESIGN.

4gx PLATE POSITIONING TOLERANCE.



OK

LEFT RAKE = 2'4"2

RIGHT RAKE = 2'4"2

PLT. TYP.-WAVE-CANADA | DESIGN CRIT-RESIDENTIAL | QTY- 14 TOTAL- 14 | REV. 9.05.02.0303.2E | SEQ = 118608 | SCALE =0.1875

THIS DRAWING MUST BE REVIEWED BY A REGISTERED PROFESSIONAL ENGINEER BEFORE USE. VISIT www.alpineeys.com/specs FOR THE LATEST INFORMATION AND WARNINGS AND SEE ALSO FOR GENERAL NOTES, IMPORTANT SPECIFICATIONS AND WARNINGS. CCMC #12182-L, 12802-L, 13124-L

Ground Snow Load = 48.70 psf OR LESS ✓

Rain Load = 6.26 psf OR LESS ✓

(Cb = 0.55 Cw = 1.00 Cs = 1.00, Importance Factor= 1.00) ✓

CONFORMS TO NBCC 2005 PART 9 HOUSING AND SMALL BUILDINGS.

TC LL	✓ 33.0psf	REF	
TC DL	✓ 3.0psf	DATE	10-14-2010
BC DL	✓ 7.0psf	DRWG	
BC LL	✓ 10.0psf		RAG
TOT.LD	✓ 53.0psf	O/A LEN.	28
DUR.FAC	✓ 1.00	JOB #:	29888
SPACING	✓ 24.0"	TYPE	SCIH

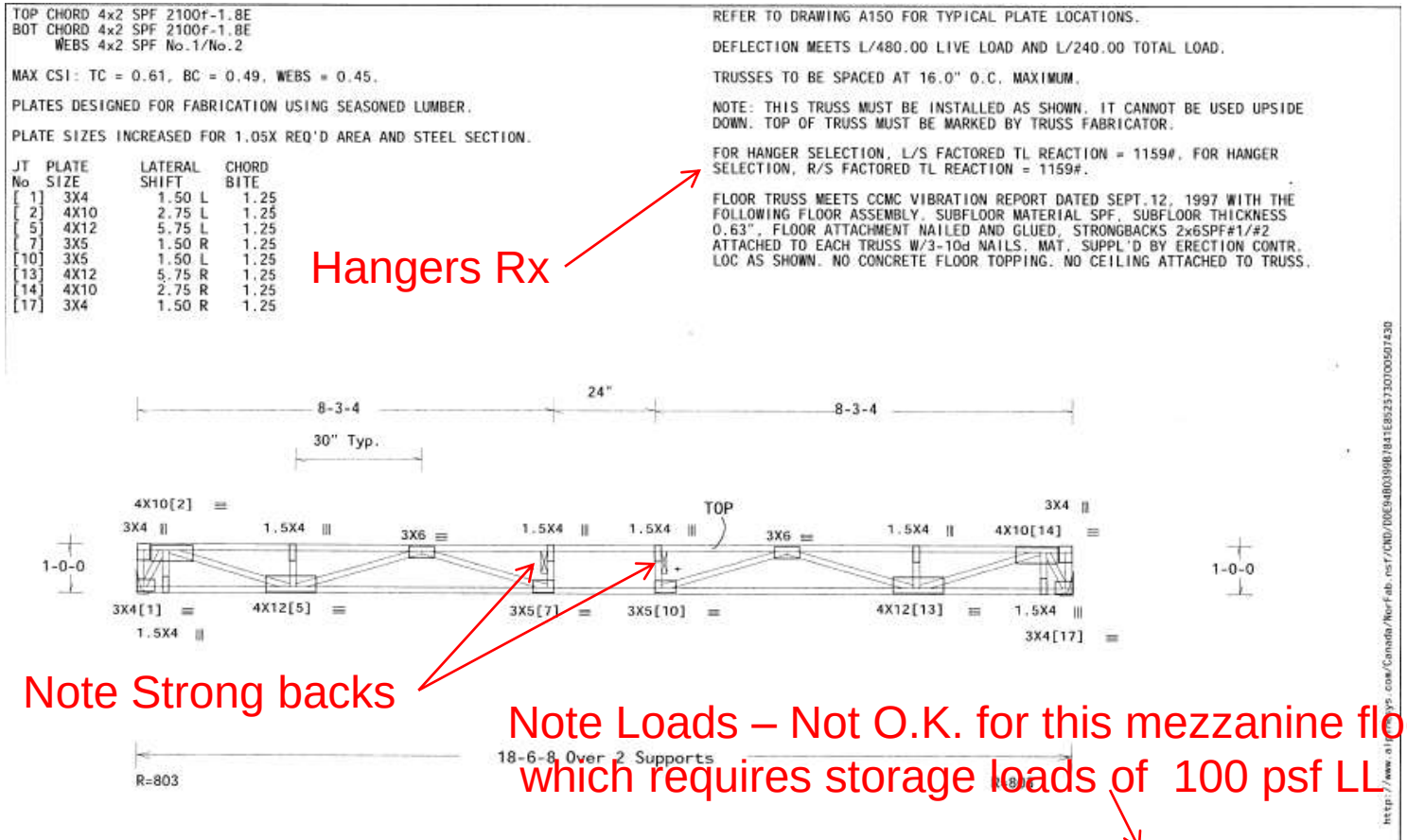
Other Code Issues

- Roof insulation – minimum R12 at inside face of exterior walls
- Roof Venting – minimum 1” clearance space when using pre-formed baffles, 2.5” otherwise
- The result of the above – minimum truss depth at the exterior wall must be 8” to 12” depending on the insulation used

Floor Trusses – Take care to check

- Loads, spacing, bearing locations, hangers
- Lateral bracing 2x6 strong backs
- All specified on truss drawings

Floor Truss Drawing



TOP CHORD 4x2 SPF 2100f-1.8E
BOT CHORD 4x2 SPF 2100f-1.8E
WEBS 4x2 SPF No.1/No.2

MAX CSI: TC = 0.61, BC = 0.49, WEBS = 0.45.

PLATES DESIGNED FOR FABRICATION USING SEASONED LUMBER.

PLATE SIZES INCREASED FOR 1.05X REQ'D AREA AND STEEL SECTION.

JT No	PLATE SIZE	LATERAL SHIFT	CHORD BITE
[1]	3X4	1.50 L	1.25
[2]	4X10	2.75 L	1.25
[5]	4X12	5.75 L	1.25
[7]	3X5	1.50 R	1.25
[10]	3X5	1.50 L	1.25
[13]	4X12	5.75 R	1.25
[14]	4X10	2.75 R	1.25
[17]	3X4	1.50 R	1.25

REFER TO DRAWING A150 FOR TYPICAL PLATE LOCATIONS.

DEFLECTION MEETS L/480.00 LIVE LOAD AND L/240.00 TOTAL LOAD.

TRUSSES TO BE SPACED AT 16.0" O.C. MAXIMUM.

NOTE: THIS TRUSS MUST BE INSTALLED AS SHOWN. IT CANNOT BE USED UPSIDE DOWN. TOP OF TRUSS MUST BE MARKED BY TRUSS FABRICATOR.

FOR HANGER SELECTION, L/S FACTORED TL REACTION = 1159#. FOR HANGER SELECTION, R/S FACTORED TL REACTION = 1159#.

FLOOR TRUSS MEETS CCMC VIBRATION REPORT DATED SEPT.12, 1997 WITH THE FOLLOWING FLOOR ASSEMBLY. SUBFLOOR MATERIAL SPF, SUBFLOOR THICKNESS 0.63", FLOOR ATTACHMENT NAILED AND GLUED, STRONGBACKS 2x6SPF#1/#2 ATTACHED TO EACH TRUSS W/3-10d NAILS. MAT. SUPPL'D BY ERECTION CONTR. LOC AS SHOWN. NO CONCRETE FLOOR TOPPING. NO CEILING ATTACHED TO TRUSS.

Hangers Rx

8-3-4 | 24" | 8-3-4

30" Typ.

4X10[2] 3X4 1.5X4 3X6 1.5X4 1.5X4 TOP 3X6 1.5X4 4X10[14] 3X4

1-0-0 1-0-0

3X4[1] 1.5X4 4X12[5] 3X5[7] 3X5[10] 4X12[13] 1.5X4 3X4[17]

Note Strong backs

18-6-8 Over 2 Supports

R=803

Note Loads – Not O.K. for this mezzanine floor which requires storage loads of 100 psf LL

PLT TYP. Wave-Canada | Design Crit: FLOOR | 7.31.1205.22 | QTY:14 AB/-/1/ -/-/- | Scale =.375"/Ft.

Norfab (807) 274-7401
732 Riverview Drive, Fort Frances ON

ALPINE SYSTEMS
Alpine Systems Corporation
http://www.alpinesys.com/Specs

THIS DRAWING MUST BE APPROVED BY THE BUILDING DESIGNER AND REVIEWED BY THE TRUSS INSTALLER BEFORE USE. VISIT http://alpinesys.com/Specs FOR THE LATEST INFORMATION AND WARNINGS AND SEE A100 FOR GENERAL NOTES.
IMPORTANT SPECIFICATIONS AND WARNINGS CCMC #12182-L 12802-L 13124-L
CONFORMS TO NBCC 1995 PART 4, FLOOR TRUSS DESIGN (LSD)

FLOOR LOADING AS SHOWN

PROFESSIONAL ENGINEER ALBERTA

TC LL	50.0 PSF	REF	R9260- 86053
TC DL	[illegible] PSF	DATE	07/03/07
BC DL	5.0 PSF	DRW	ONUSR9260 07184001
BC LL	0.0 PSF	ON-ENG	DS/CT
TOT.LD.	65.0 PSF	SEQN-	45461
DUR.FAC.	1.00	FROM	RM
SPACING	16.0"	JREF-	1T8K9260Z01

http://www.alpinesys.com/Canada/NorFab.nsf/CND/DDE94803998/1841E8525730070050743O

Correction: Add Trusses to get 8”o.c

TOP CHORD 4x2 SPF 2100F 1.8E
BOT CHORD 4x2 SPF 2100F 1.8E
WEBS 4x2 SPF No.1/No.2

MAX CSI: TC = 0.55, BC = 0.44, WEBS = 0.40.

PLATES DESIGNED FOR FABRICATION USING SEASONED LUMBER.

PLATE SIZES INCREASED FOR 1.05X REQ'D AREA AND STEEL SECTION.

JT NO.	PLATE SIZE	LATERAL SHIFT	CHORD BITE
[1]	3X4	1.50 L	1.25
[2]	4X10	3.25 L	1.25
[7]	3X5	1.50 R	1.25
[10]	3X5	1.50 L	1.25
[14]	4X10	3.25 R	1.25
[17]	3X4	1.50 R	1.25

REFER TO DRAWING ALSO FOR TYPICAL PLATE LOCATIONS.

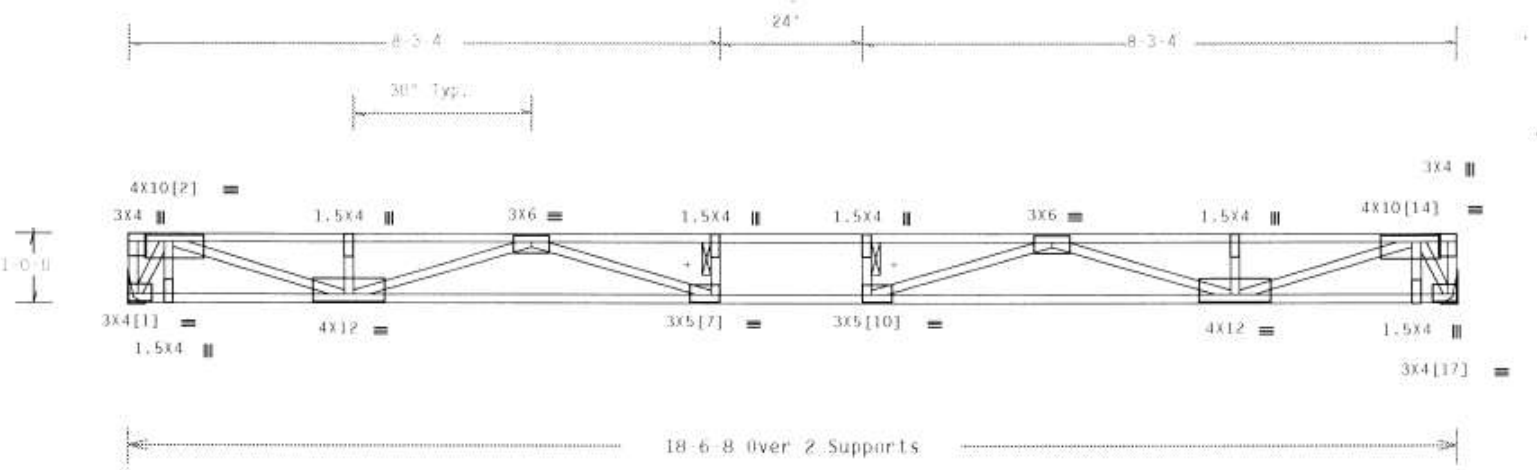
DEFLECTION MEETS L/480.00 LIVE LOAD AND L/360.00 TOTAL LOAD.

TRUSSES TO BE SPACED AT 8.0" O.C. MAXIMUM.

NOTE: THIS TRUSS MUST BE INSTALLED AS SHOWN. IT CANNOT BE USED UPSIDE DOWN. TOP OF TRUSS MUST BE MARKED BY TRUSS FABRICATOR.

FOR HANGER SELECTION, L/S FACTORED TL REACTION = 1043#. FOR HANGER SELECTION, R/S FACTORED TL REACTION = 1043#.

FLOOR TRUSS MEETS CCMC VIBRATION REPORT DATED SEPT.12, 1997 WITH THE FOLLOWING FLOOR ASSEMBLY. SUBFLOOR MATERIAL SPF, SUBFLOOR THICKNESS 0.65", FLOOR ATTACHMENT NAILED AND GLUED, STRONGBACKS 2x6SPF#1/#2 ATTACHED TO EACH TRUSS W/3-10d NAILS, MAT, SUPPL'D BY ERECTION CONTR. LUC AS SHOWN. NO CONCRETE FLOOR TOPPING. NO CEILING ATTACHED TO TRUSS.



PLT TYP. Wave Canada | Design Crit: FLOOR | 7.35.0313.22 | QTY:14 ON/ /1/ / / | Scale -.45"/Ft.

Norfab (807) 274-7401
732 Riverview Drive, Fort Frances ON

ALPINE SYSTEMS
Alpine Systems Corporation
http: www.alpinesys.com Specs

THIS DRAWING MUST BE APPROVED BY THE BUILDING DESIGNER AND REVIEWED BY THE TRUSS INSTALLER BEFORE USE. VISIT http://alpinesys.com/specs FOR THE LATEST INFORMATION AND WARNINGS AND SEE ADD FOR GENERAL NOTES. IMPORTANT SPECIFICATIONS AND WARNINGS (CCMC #12192-L, 12402-L, 13124-L) CONFORMS TO NBCC 1995, PART 4, FLOOR TRUSS DESIGN. (LSD)

FLOOR LOADING AS SHOWN

LICENSED PROFESSIONAL ENGINEER K.C. CHEUNG PROVINCE OF ONTARIO

TC LL	100.0 PSF
TC DL	10.0 PSF
BC DL	5.0 PSF
BC LL	0.0 PSF
TOT.LD.	115.0 PSF
DUR.FAC.	1.00
SPACING	8.0"

REF R9260 43134
DATE 08/23/07
DRW
ON ENG DS/MC
SEQN- 10967 REV
FROM PM
JREF- IT59260/01

Truss Installation: Summary

- Examine Trusses on site for correct types, quantities, hangers, damage, stamped truss drawings and layout drawings.
- Arrange for Hoisting, review all drawings, assemble bracing materials
- Make note of trusses which appear symmetrical but may not be. Such as cantilevers, interior bearings, point loads, etc. –these must be installed correctly
- Check for proper orientation of flat trusses – do not install upside down or with wrong end placement

Truss Installation: Summary

- Decide if multi-ply trusses will be nailed together on the ground or when on the walls
- Mark out truss locations on wall plates according to truss and layout drawings – never exceed the required truss spacing
- Install trusses plumb with straight tops and bottoms – 3 Nails per bearing (3-1/4”), or on supplied hangers, add temporary and permanent bracing to secure the trusses, do not nail trusses to partitions
- Attach purlins as specified or use sheathing

Truss Installation: Summary

- On trusses without rigid ceilings, install bottom chord bracing as specified in drawings
- Install web bracing as specified in drawings
- Install permanent building bracing in trusses as specified by building designer or as discussed earlier
- Do not add concentrated loads to trusses (no lifts of plywood, no large stacks of shingles)
- Avoid damage to trusses by mechanical contractors, excessive moisture

Questions?

Recommendations?

Stories?

Ideas?