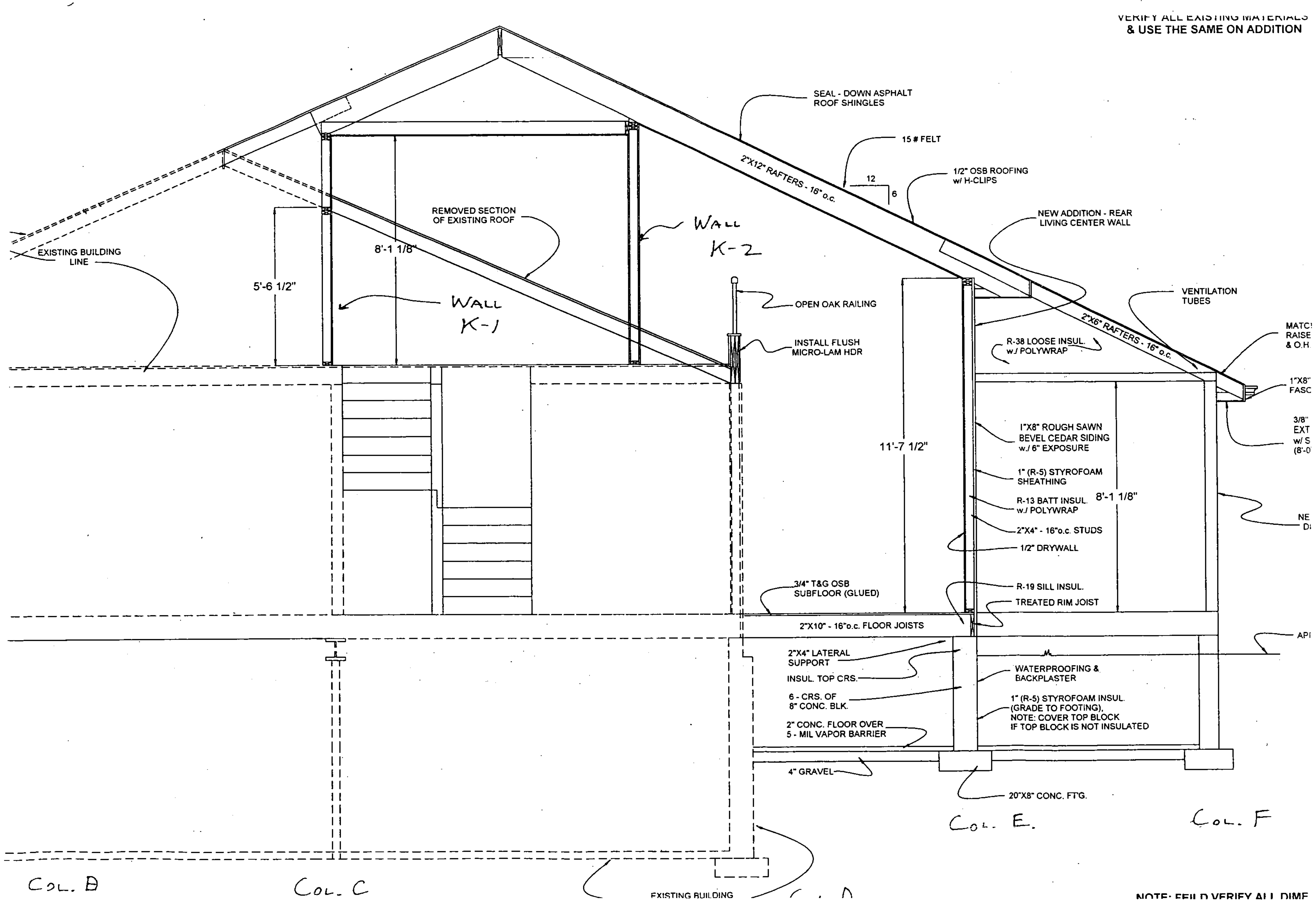
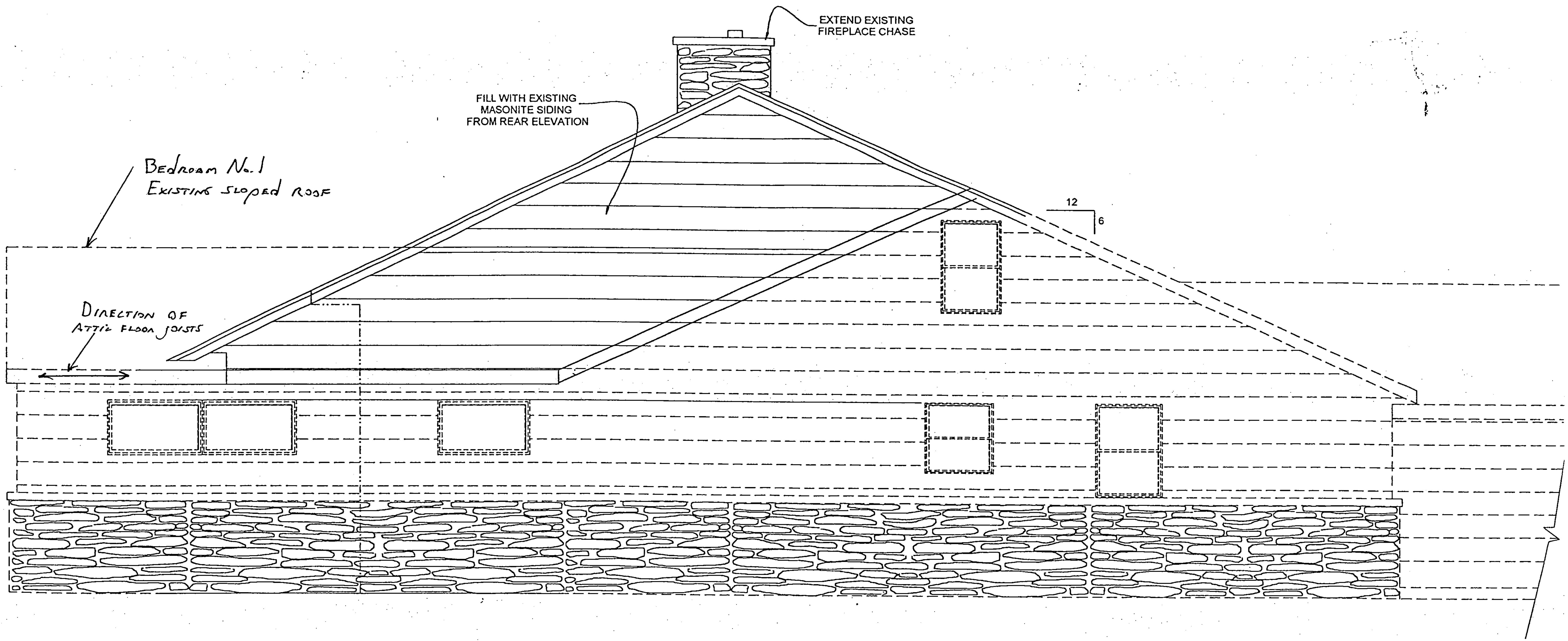
FIG. 3


VERIFY ALL EXISTING MATERIALS
& USE THE SAME ON ADDITION
SEAL - DOWN ASPHALT
ROOF SHINGLES
15 # FELT
1/2" OSB ROOFING
w/ H-CLIPS
12
6
2"X12" RAFTERS - 16" o.c.
NEW ADDITION - REAR
LIVING CENTER WALL
REMOVED SECTION
OF EXISTING ROOF
WALL
K-2
WALL
K-1
8'-1 1/8"
5'-6 1/2"
EXISTING BUILDING
LINE
OPEN OAK RAILING
INSTALL FLUSH
MICRO-LAM HDR
VENTILATION
TUBES
2"X6" RAFTERS - 16" o.c.
R-38 LOOSE INSUL.
w./ POLYWRAP
11'-7 1/2"
1"X8" ROUGH SAWN
BEVEL CEDAR SIDING
w./ 6" EXPOSURE
1" (R-5) STYROFOAM
SHEATHING
R-13 BATT INSUL.
w./ POLYWRAP
8'-1 1/8"
2"X4" - 16"o.c. STUDS
1/2" DRYWALL
3/4" T&G OSB
SUBFLOOR (GLUED)
R-19 SILL INSUL.
TREATED RIM JOIST
2"X10" - 16"o.c. FLOOR JOISTS
2"X4" LATERAL
SUPPORT
INSUL. TOP CRS.
6 - CRS. OF
8" CONC. BLK.
2" CONC. FLOOR OVER
5 - MIL VAPOR BARRIER
4" GRAVEL
WATERPROOFING &
BACKPLASTER
1" (R-5) STYROFOAM INSUL.
(GRADE TO FOOTING),
NOTE: COVER TOP BLOCK
IF TOP BLOCK IS NOT INSULATED
20"X8" CONC. FT'G.
COL. E.
COL. F
COL. B
COL. C
EXISTING BUILDING
NOTE: FEILD VERIFY ALL DIME



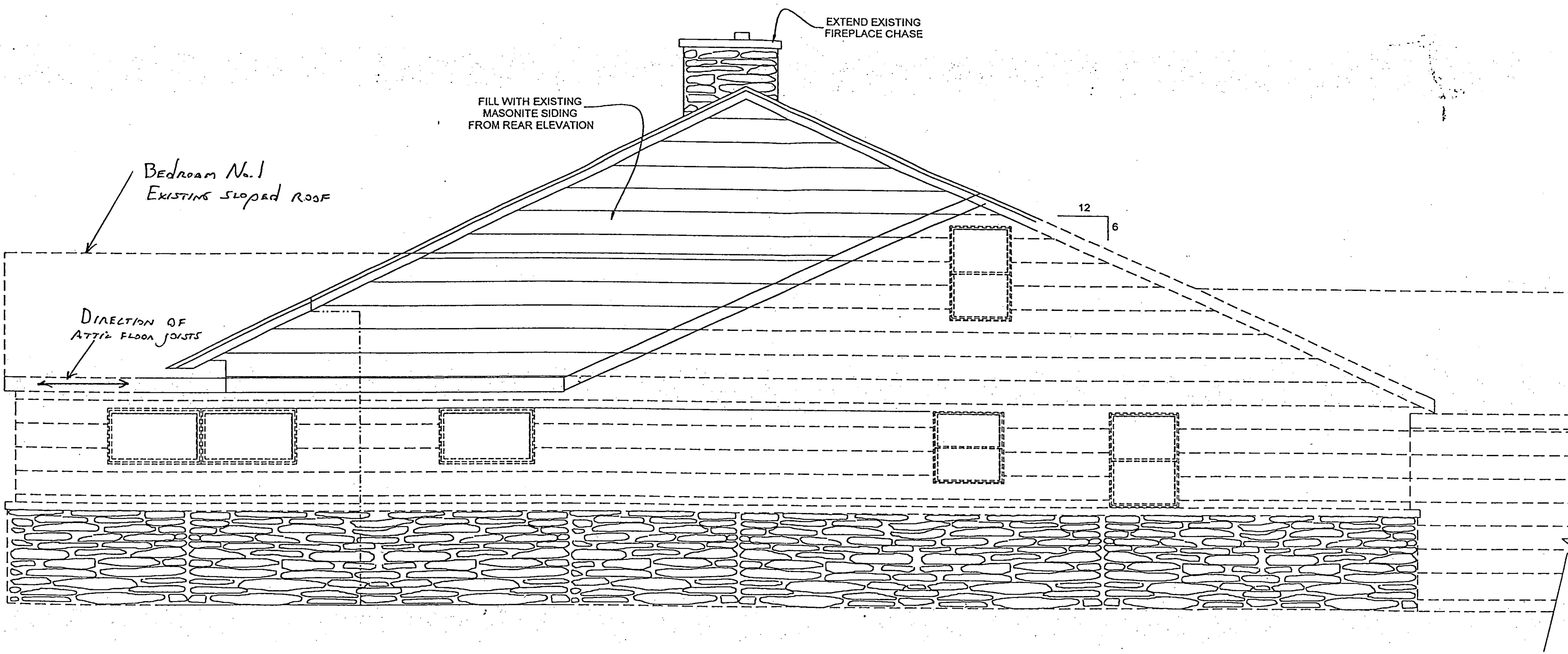
LEFT ELEVATION

NOTE: IF MATCHING 12" MASONITE SIDING CANNOT BE OBTAINED THEN ENTIRE LEFT & RIGHT ELEVATIONS TO BE SIDED w./ 6" EXPOSURE BEVEL CEDAR SIDING

NOTE: FEILD VERIFY ALL DIMENSIONS

NOTE:
VERIFY ALL EXISTING MATERIALS
& USE THE SAME ON ADDITION

Figure 1



LEFT ELEVATION

NOTE: IF MATCHING 12" MASONITE SIDING CANNOT BE OBTAINED THEN ENTIRE LEFT & RIGHT ELEVATIONS TO BE SIDED w./ 6" EXPOSURE BEVEL CEDAR SIDING

NOTE: FEILD VERIFY ALL DIMENSIONS

NOTE:
VERIFY ALL EXISTING MATERIALS
& USE THE SAME ON ADDITION

Give to Fox Point

INSP. SCOTT
STATE Licence #
10883

ENGINEERING STUDY

Date: Monday, April 9, 2001

For: CS Recknagel Construction
12003 West Brown Deer Rd.
Milwaukee, WI. 53224

From: Kevin J. Bond, P.E.

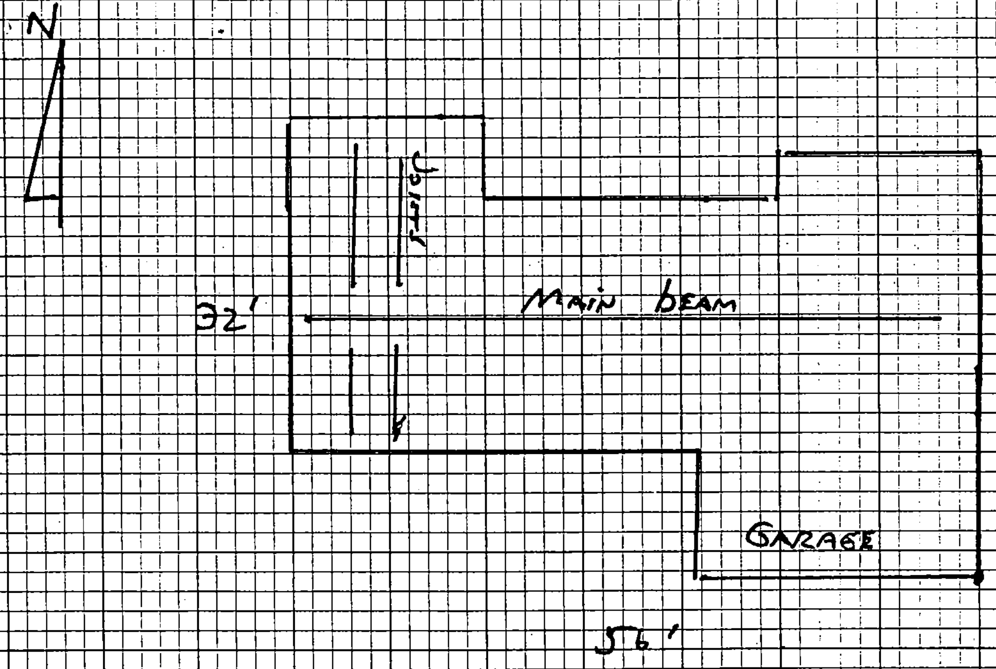
Subject: Determine size of vertical steel columns (Tubing) to provide reinforcement to the basement walls for the following residence:

1006 Churchill Lane
Fox Point, WI. 53217

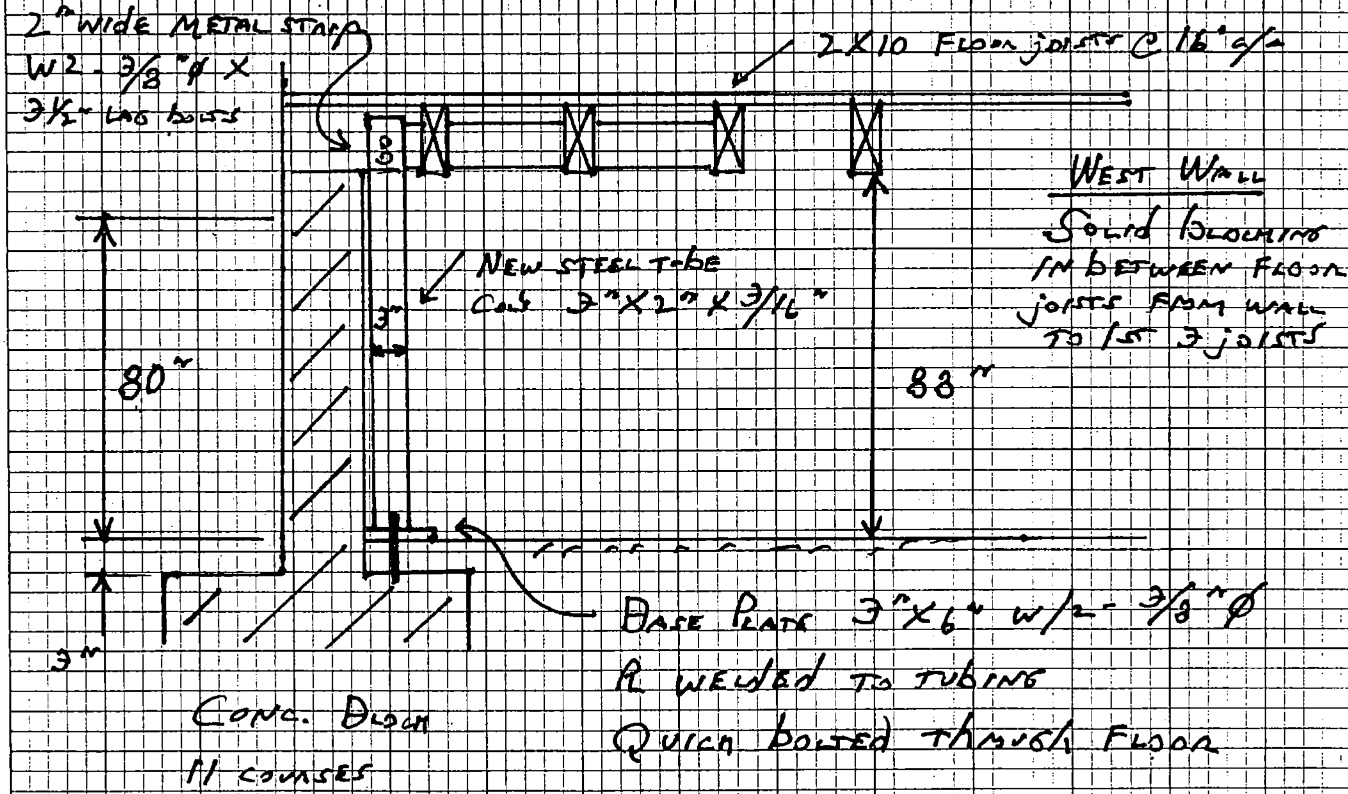
WISCONSIN
KEVIN JAMES
BOND
E-20499
MILW.,
WI
PROFESSIONAL ENGINEER

4/9/01

SHEET 1 OF 3 THRU SHEET 3 OF 3



Residence
1006 Churchill Ln.
Fox Point, WI 53217



West Wall Section

1006 Churchill Ln

No. 5510 - 81/2" x 11"

PROPERTIES OF STEEL TUBE
3" X 2" X 3/16"

$A = 1.64 \text{ in}^2$ $I_y = 0.977 \text{ in}^4$ $r_x = 1.06 \text{ in}$

$I_x = 1.86 \text{ in}^4$ $S_y = 0.977 \text{ in}^4$ $r_y = 0.771 \text{ in}$

$S_x = 1.24 \text{ in}^2$

WEST WALL — TUBING REQUIREMENTS & SIZING

WALL = 88" = 7.33' CLEAR UNSUPPORTED LENGTH

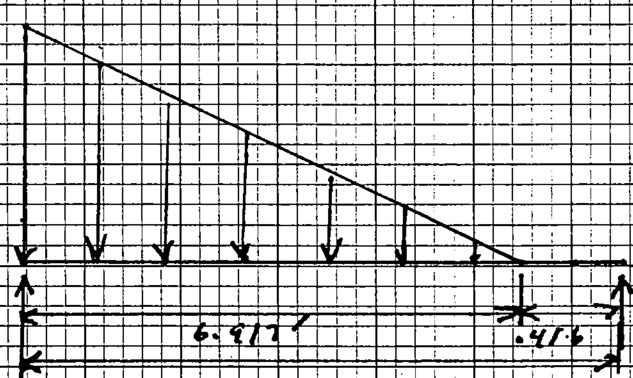
$p = .1975\, wh$ ← SOIL WT NO EXCAVATION

$p = .1975\,(120)(6.917)$ ← 80" + 3" = 6.917' TO FOOTING ACTING ON COLUMN

$p = .1975\,(120)(6.917)$

$p = 164.0$ #/FT² OR #/FT PER LIN. FT. OF WALL

$H = ph/2 = 164.0 \times 6.917'/2 = 567.4$ #'s

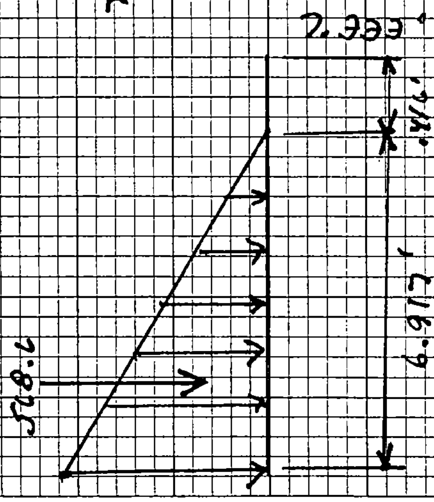


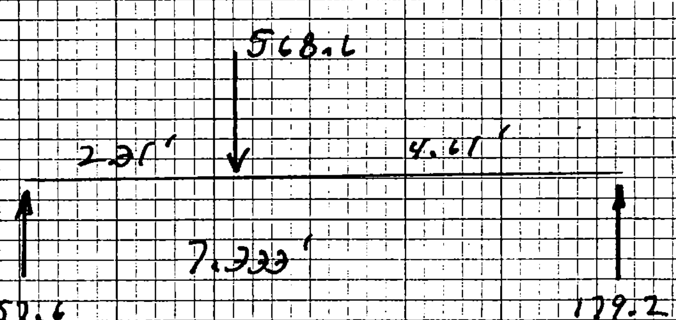
$164.0 \times 6.917/2 = 567.4$

$567.4 \times 6.917/3 = 1314.1$

$R_A = \dfrac{1314.1}{7.333} = 179.2$

$536.8 - 179.2 = 357.6$





$6.917' / 3 = 2.31$

$6.917 - 2.31 = 4.61'$

$\frac{4.61}{7.333} \times 568.6 = 357.6$

$\frac{2.31'}{7.333} \times 568.6 = 179.2$

$M = 357.6 \times 2.31' = 826$ '#s

$M = 179.2 \times 4.61' = 826$ '#s

$S_{REQ} = \frac{826'\# \times 12}{27{,}000 \text{ psi}} = 0.3673$

TUBE $3 \times 2 \times 3/16$ $S_x = 1.24 \text{ IN}^3$

SPACING $1.24 \text{ IN}^3 / 0.3673 = 3.376$ FT

OR **40.5" MAXIMUM SPACING**

SUMMARY

WEST WALL – 26 FT OUT OF PLUMB

USE STEEL TUBE

3" × 2" × 3/16" – 40" MAXIMUM SPACING BETWEEN TUBES

SOLID BLOCKING IN BETWEEN FLOOR JOISTS FROM WALL TO FIRST 3 JOISTS.

2" WIDE METAL STRAPS ON TOP OF BEAM WITH 2 - 3/8" φ LAG BOLTS × 3 1/2"

KEVIN JAMES BOND
E-20469
MILW,
WI

[signature] .../01

ENGINEERING STUDY

Date: Friday, April 13, 2001

From: Kevin J. Bond, P.E.

Subject: Verify load status of interior walls for 2nd story addition at the following residence:

Ford Residence
1006 Churchill Lane
Fox Point, WI. 53217

WISCONSIN
KEVIN JAMES BOND
E-20499
MILW.,
WI
PROFESSIONAL ENGINEER

4/13/01
sheet 1 of 4 thru sheet 4 of 4

Date: April 13, 2001

Prepared by: Kevin J. Bond, P.E.
(414) 259-1540
kevinb@kronesusa.com

Subject: Verify load status of interior walls for 2nd story addition at the following residence:

Ford Residence
1006 Churchill Lane
Fox Point, WI. 53217

Background: The purpose of this engineering study is to provide a structural analysis of a planned 2nd story addition for the residence referenced above. Specifically, a proposed interior, wood - framed wall has been questioned as to its load bearing requirements with respect to the addition of sloped 2" X 12" wood rafters bearing on it. A sectional view of the proposed addition, Fig. 3 (drawn by others), has been attached to this report for reference.

Analysis: In order to provide an analysis of the structural requirements for this proposed 2nd story interior wall, an assessment of the past structural requirements (existing) and new structural requirements (remodeled) must be ascertained.

Structural Requirements - Existing

The residence was originally built as a single story, wood-framed structure, with load bearing exterior walls and a concrete block foundation. A combination of 11 course basement and crawl spaces comprised the below grade area. As shown on Fig.1, the column lines have been labeled A through F for the north-south orientation of the structure.

The original sloped roof line was comprised of 2" X 6" wood rafters. The roof loads (dead load, snow load, etc.) are transmitted from the roof itself, to the rafters, to the exterior load bearing walls at col. lines A and D, and down to the respective footings at these column lines. At column lines B and C, the footings support the dead and live loads present in the attic floor and the main floor of the structure. No roof loads are transmitted to these column lines.

Structural Requirements - Remodeled

As shown on the attached drawing, Fig. 3, the addition of a second story by adding to the roof line at the existing peak, will present a new set of structural requirements.

At the existing roof's peak, the 2" X 6" wood rafters will be extended until column line C. At that point, 2" x 16" rafters will be mated to the 2" X 6" rafters up to the new peak, and continued on the down sloped side of the roof, to column line F.

A new 2nd story interior wood framed wall will be constructed at column line C to support the new 2" X 12" rafters at their origination. As shown in Fig. 2, this interior wall (K-1) will provide support for the existing 2" X 6" rafters and the extended 2" X 12" rafters up to the peak. Because this interior wall acts as a load bearing member for the transmitted roof loads from these rafters, it is necessary to transmit these loads to the existing steel beam in the basement at col. line C.

Concerning the new 2" X 12" roof rafters on the down sloped roof side, from the roof peak to col. line E, the roof rafters are supported at the peak and at the new interior wall which spans the 1st and 2nd stories at col. line E. Similar to the rafters on the existing roof where the supports were only at the peak and at the exterior walls, these new 2" X 12" rafters do not depend on any additional supports beside those mentioned above. Subsequently, the new 2nd story interior wall (K-2) opposite the 2nd story interior wall (K-1) is not a load bearing member. Their unintended purpose is to add additional laterally stability to the 2" X 12" rafters above them.

Results: The 2nd story wood-framed interior wall (K-2) is not a roof load bearing member, and subsequently, it is not necessary to relocate the wall to a column line for transmission of roof loads to the concrete footings.

2"X6" ROOF RAFTERS SUPPORTED @ COL A, COL D, AND AT ROOF PEAK

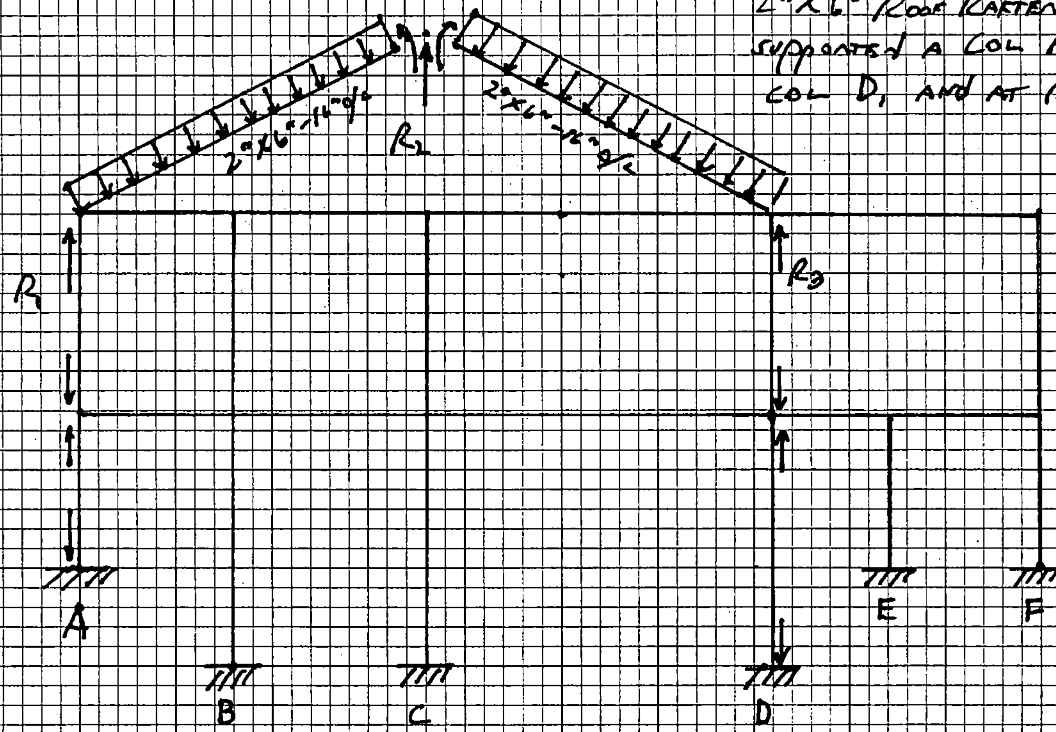


FIG. 1 - EXISTING STRUCTURAL REQUIREMENTS

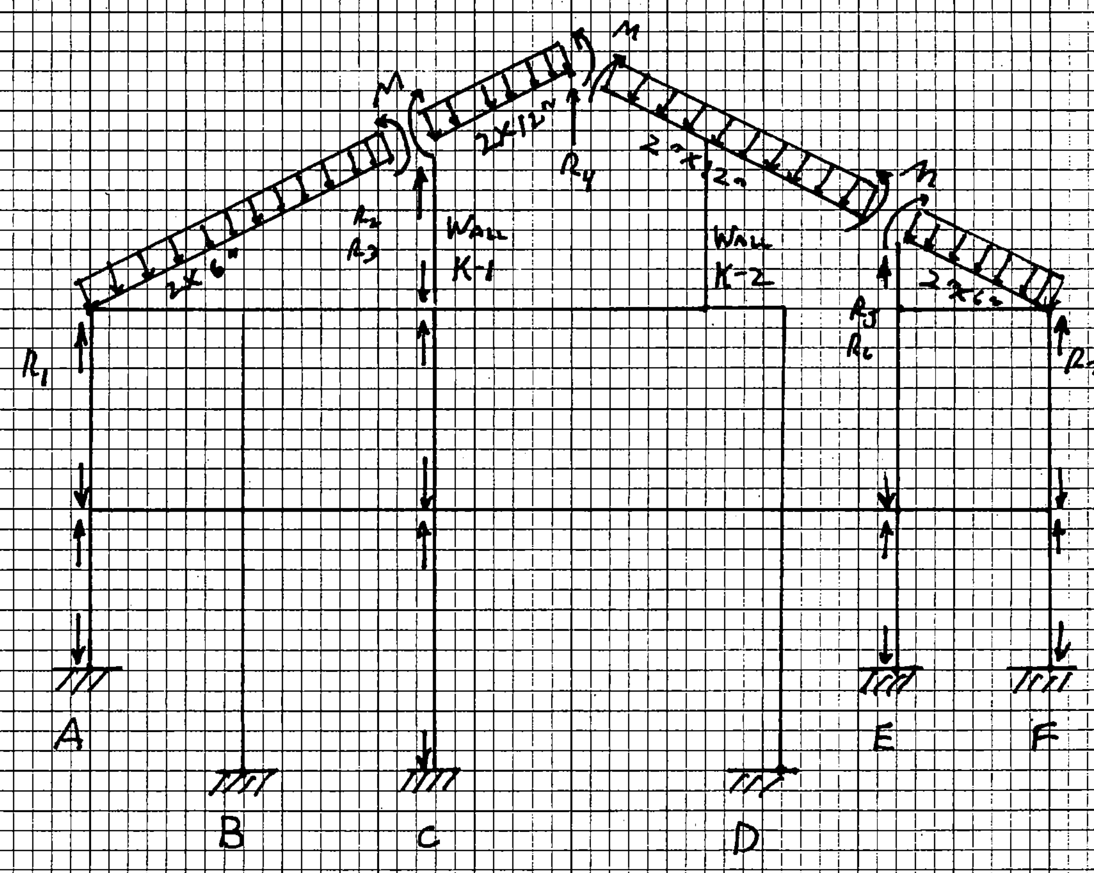


FIG. 2 - REMODELED STRUCTURAL REQUIREMENTS

ENGINEERING STUDY

Date: Wednesday, September 05, 2001

From: Kevin J. Bond, P.E.

Subject: Affect of removing existing attic floor joists to create a cathedral ceiling for the following residence:

Ford Residence
1006 Churchill Lane
Fox Point, WI. 53217

WISCONSIN
KEVIN JAMES
BOND
E-20499
PROFESSIONAL ENGINEER

9/5/01
SHEET 1 OF 6 THRU SHEET 6 OF 6

Date: September 5, 2001

Prepared by: Kevin J. Bond, P.E.
(414) 259-1540
kevinb@kronesusa.com

Subject: Affect of removing existing attic floor joists to create a cathedral ceiling for the following residence:

Ford Residence
1006 Churchill Lane
Fox Point, WI. 53217

Background: During remodeling, the owner determined that a "cathedral" ceiling In Bedroom No. 1 would be more aestetically pleasing then the existing flat ceiling. In order to accomplish this change, the existing ceiling in Bedroom No. 1 was removed, and the attic floor joists which supported this ceiling were also removed.

With the removal of the attic floor joists, it has been questioned if the support of the existing sloped roof has been compromised. Specifically, is it necessary to install horizontal members and / or provide bracing to prevent the existing sloped roof from deflecting outward under loading conditions?

Analysis: As shown on the attached drawing (drawn by others), the attic floor joists ran parallel to the existing roof peak in Bedroom No.1. These joists supported the attic floor and their subsequent live loads, and the ceiling below it. Because of their orientation, these floor joists did not provide support for the existing sloped roof, nor provide any bracing to resist lateral loads or prevent sidesway in the respective direction.

Chapter 5 of the "Residential Structural Design Guide" addresses this issue and reaches the following conclusions.

As noted in this reference, because the existing floor joists were not directly connected to the existing rafters to create a rafters / ceiling joist frame truss system, then other means to brace the structure have been incorporated into the original design. Please find attached calculations which determine the adequancy of the existing rafters to accept the dead and live loads relative to this area.

As an added precaution, if the existing rafters are adequately “tied-down” to resist uplift from wind, the existing ridge board cannot deform upward without deforming the entire sloped roof diaphragm and the rafter to wall connection. I therefore recommend that a more secure connection be installed at the rafters and ridge board intersections. Figure 2, (attached) depicts my recommendation for this connection.

Simply Supported Sloped Rafter Design

Given

One-story

Rafters 2"x6" in on 16" o/c

Rafter Horizontal Span is 10 FT (Actual sloped span 11.2 FT)

Roof Slope = 6:12

Design Loads

Dead Load = 15 psf (with ceiling)

Roof Snow Load = 30 psf (Milwaukee)

Wind = 80 mph gust 12.7 psf (outward)

= 7.4 psf (inward)

Roof Live Load = 10 psf

Find

Adequacy of existing rafters to support load

Solution

Evaluate Load Combinations

$D + (L_r \text{ or } S)$ Controls inward bending direction
Ignore L_r: Snow load is greater

$0.6D + W_u$ Controls in outward bending direction

$D + W$ Not controlling because snow load is greater in the inward direction

Determine relevant lumber properties

$F_b = 900 psi$

$F_v = 95 psi$

$E = 1.6 \times 10^6 psi$

DETERMINE RELEVANT ADJUSTMENTS TO PROPERTY VALUES ASSUMING A 2X6 IS USED

$C_D = 1.6$ (WIND LOAD COMBINATIONS)

$= 1.25$ (SNOW LOAD COMBINATIONS)

$C_R = 1.15$

$C_H = 2.0$

$C_F = 1.2$

$C_L = 1.0$ (INWARD BENDING, D+S,)

0.32 (OUTWARD BENDING 0.6D+W)

$$l_e = 1.63\, l_u + 3d$$
$$= 1.63\,(11.2) + 3(5.75)(1\text{in}/12')$$
$$= 18.25 + 1.4375$$
$$= 19.7\ \text{FT}$$

$$R_B = \sqrt{\frac{l_e d}{b^2}} = \sqrt{\frac{(19.7)(12\text{in}/\text{FT})(5.25\text{ in})}{(1.5\text{in})^2}}$$
$$= 24.5 < 50 \quad \text{OK}$$

$K_{bE} = 0.439$

$$F_{bE} = \frac{K_{bE}\,E'}{R_B^2} = \frac{0.439\,(1.6\times10^6\,\text{psi})}{(24.5)^2} = 1170\,\text{psi}$$

$$F_b' = F_b\,C_D\,C_r\,C_F$$
$$= 900\text{psi}\,(1.6)(1.15)(1.2) = 1{,}987\,\text{psi}$$

$$C_L = \frac{1+(F_{be}/F_b^*)}{1.9} - \sqrt{\left[\frac{1+(F_{be}/F_b^*)}{1.9}\right]^2 - \frac{F_{be}/F_b^*}{0.95}}$$

$C_L = 0.36$

DETERMINE RAFTER TRANSVERSE BENDING LOAD, SHEAR, AND MOMENT FOR WIND UPLIFT

$W_D = W_{d} (\cos \theta)$

$= (10 psf)(1.33')(\cos 26.6)$

$= 11.9 plf$

$W_{w_{TRANSVERSE}} = 12.7 psf \times 1.33 = 17 plf$ (UPLIFT)

$W_{TOTAL_{TRANSVERSE}} = 17 plf - 11.9 plf = 5.1 plf$ (NET UPLIFT)

SHEAR, $V_{MAX} = \frac{WL}{2} = \frac{(5.1 plf)(11.2)}{2} = 28.6$ LBS

MOMENT, $M_{MAX} = \frac{1}{8} WL^2$

$= \frac{1}{8}(5.1 plf)(11.2')^2 = 80$ FT-LBS

DETERMINE BENDING LOAD, SHEAR & MOMENT FOR THE GRAVITY LOAD CASE (D+S)

$W_D = (10 psf)(11.2')(1.33)/12$ FT $= 12.4 plf$

$W_S = (30 psf)(12')(1.33')/12 = 40 plf$

$W_{TOTAL} = 52.4 plf$

SHEAR $= \frac{(52.4)(10.0')}{2} = 262$ LBS

MOMENT $= \frac{1}{8}(52.4)(10)^2 = 655$ LBS

CHECK BENDING STRESS FOR BOTH LOADING CASES

OUTWARD BENDING $(0.6 D + W_D)$

$f_b = M/S$

$= 80\,\text{FT-LB} / 12.4\,\text{IN}^3\,(12\,\text{IN/FT}) = 77\,\text{PSI}$

$F_b' = F_b\, C_d\, C_F\, C_p\, C_L$

$= 900\,\text{PSI}\,(1.6)(1.15)(1.2)(0.36) = 715\,\text{PSI}$

$f_b \le F_b'$ OK 2X6 @ 16" C/C WORKS

INWARD BENDING (D+S)

$f_b = M/S$

$= 655\,\text{FT-LBS} / 12.4\,\text{IN}^3\,(12\,\text{IN/FT}) = 633\,\text{PSI}$

$F_b' = F_b\, C_d\, C_F\, C_p\, C_L$

$= 900\,(1.25)(1.15)(1.2)(1.0) = 1{,}555\,\text{PSI}$

$f_b \le F_b'$ OK ✓ 2X6 @ 16" C/C WORKS

Check shear

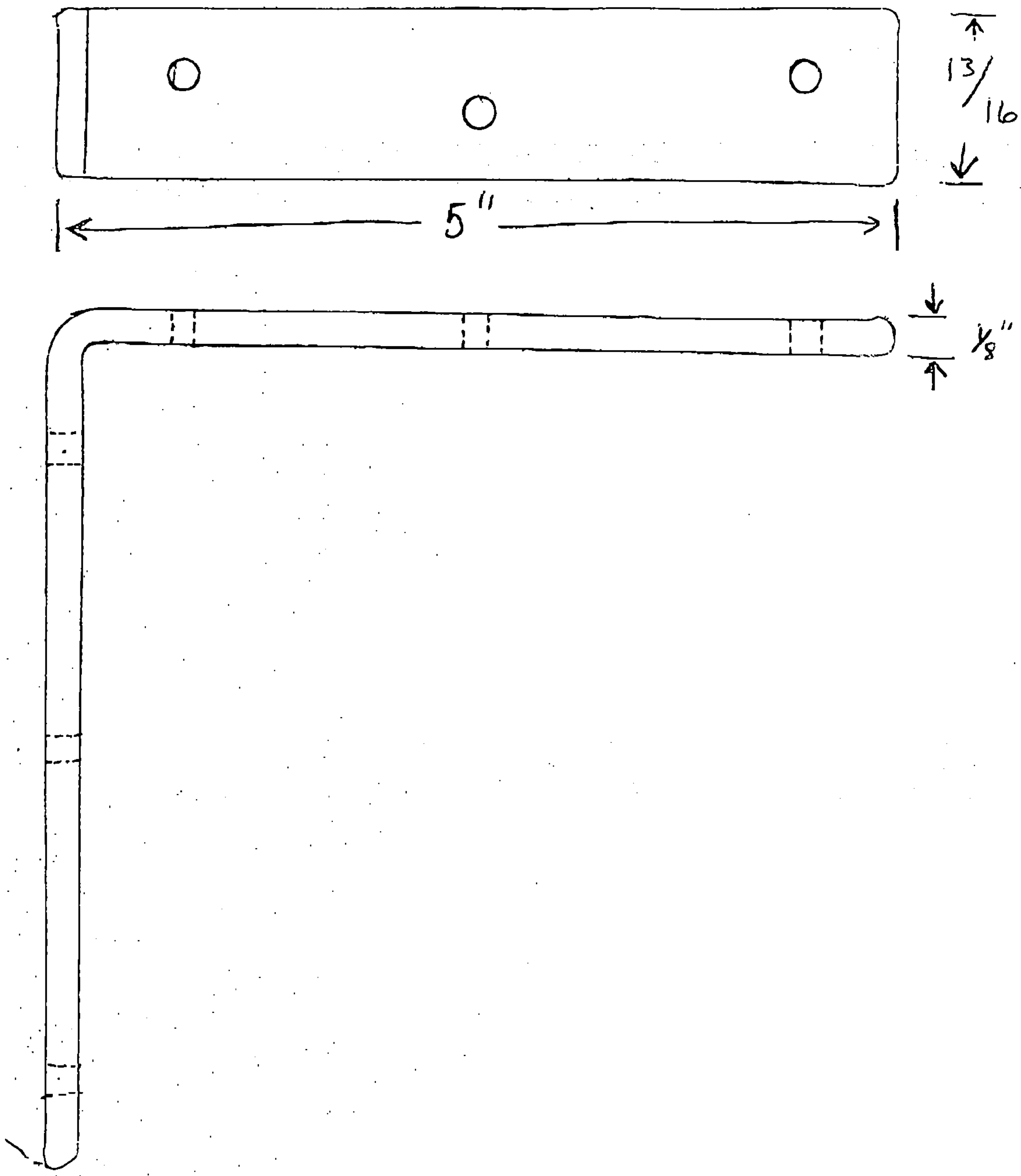
$V_{MAX} = 262\,\text{LBS}$

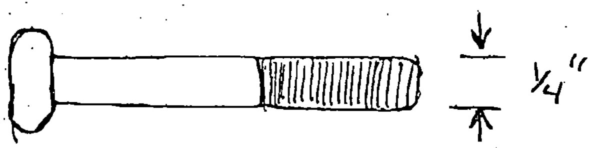
$f_v = \dfrac{3V}{2A} = \dfrac{3(262)}{2(1.5)(5.25)} = 45.5\,\text{PSI}$

$F_v' = F_v\, C_D\, C_H = 95\,\text{PSI}\,(1.25)(2.0) = 233\,\text{PSI}$

$f_v \le F_v'$ OK

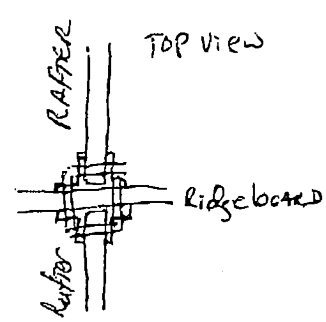
Figure 2





HEX BOLT

WASHERS BOTH Sides



Thru bolt ALL Four Corners

ENGINEERING STUDY ADDENDUM

Date: Friday, June 15, 2001

From: Kevin J. Bond, P.E.

Subject: Verify bearing strength of intermediate 2" X 6" roof rafters for the following residence:

Ford Residence
1006 Churchill Lane
Fox Point, WI. 53217

WISCONSIN
KEVIN JAMES
BOND
E-20499
MILW.,
WI
PROFESSIONAL ENGINEER

6/15/01

sheet 1 of 2 thru sheet 2 of 2

Date: June 15, 2001

Prepared by: Kevin J. Bond, P.E.
(414) 259-1540
kevinb@kronesusa.com

Subject: Addendum to Ford Residence engineering study dated April 13,2001

Ford Residence
1006 Churchill Lane
Fox Point, WI. 53217

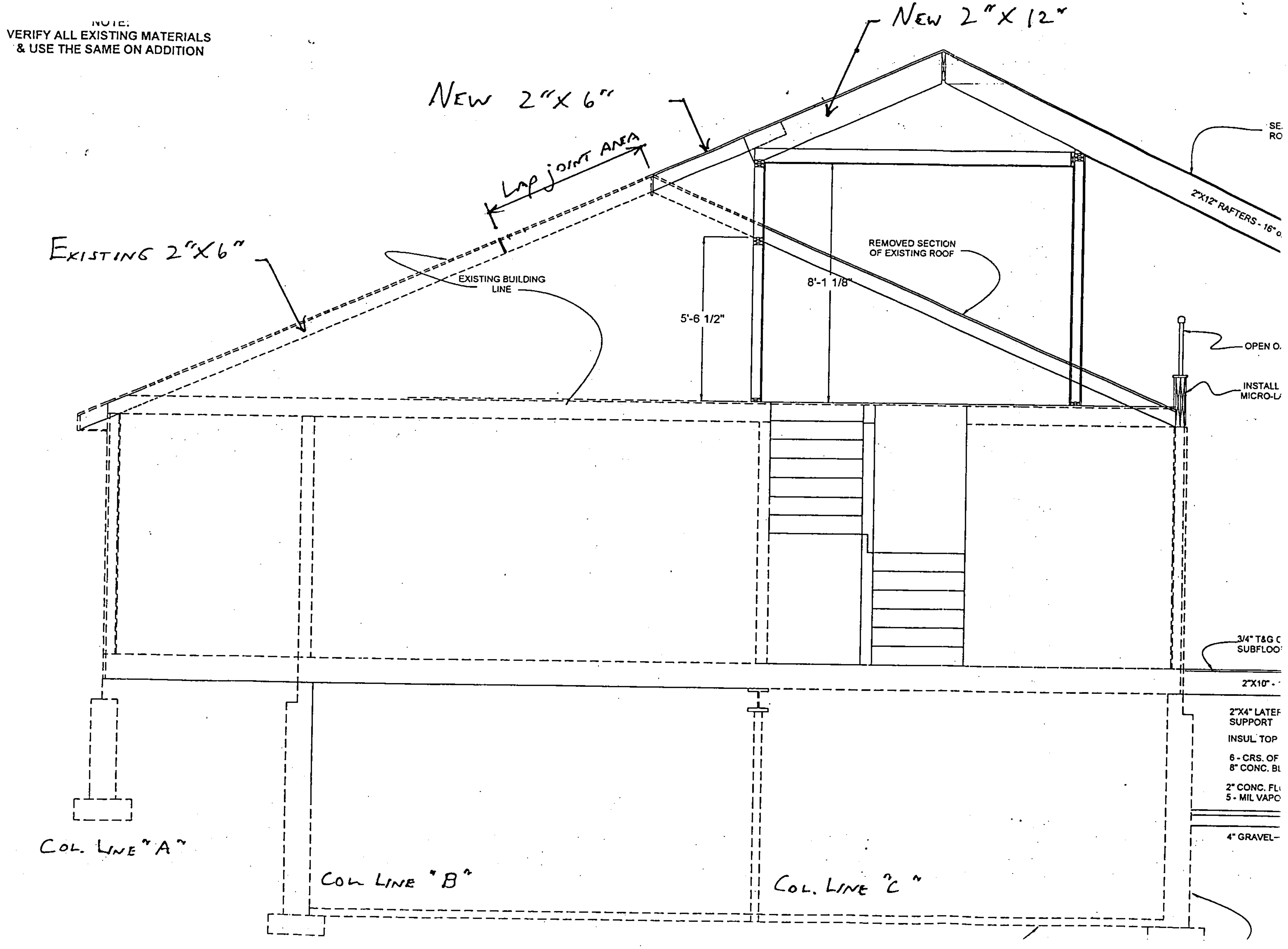
Background: As part of the analysis provided in the first engineering study dated April 13, 2001, the sectional view of the proposed addition, Fig. 1, (drawn by others) is attached. As shown on the drawing, at the existing roof's peak, the 2" X 6" roof rafters are extended by mating new 2" X 6"'s to these existing rafters until they overlay onto the new 2" X 12" roof rafters. Because the new 2" X 6"'s do not extend fully back to the exterior bearing wall (Col. Line A), the structural stability of this arrangement has been questioned.

Analysis: The proposed "new rafter" which forms the new roof line, is a composite of the existing 2" X 6's, new 2" X 12"'s, and an intermediate member – the new 2" X 6"'s tying both sections together. These 2" X 6"'s are lap joined to each section to form this "new rafter". As a composite member, the ability to transfer the increased loads (dead load, snow load, etc.) acting on this "new rafter", forms the framework of this discussion.

Per the engineering study dated 4/13/01, the new 2" X 12" roof rafters are supported at the new roof's peak and at Col. Line "C". The existing 2" X 6" roof rafters and the new 2" X 6"'s which connect both sections are supported at the bearing wall at Col. Line "A" and at Col. Line "C". The new 2" X 6" rafters must transfer their applied loads to Col. Line "C" and also to the existing 2" X 6"'s.

Results: After a review of the area during my site visit, I have concluded that the lap joint connecting the existing 2" X 6" roof rafters with the new 2" X 6"'s is of sufficient bearing strength to transfer the applied loads. It is not necessary to extend these new 2" X 6" rafters fully back to the bearing wall at Col. Line "A".

Fig. 1



NOTE:
VERIFY ALL EXISTING MATERIALS
& USE THE SAME ON ADDITION
New 2"x 12"
New 2"x 6"
Lap joint AREA
Existing 2"x6"
EXISTING BUILDING LINE
REMOVED SECTION OF EXISTING ROOF
8'-1 1/8"
5'-6 1/2"
INSUL. TOP
Col. Line "A"
Col. Line "B"
Col. Line "C"

ENGINEERING STUDY

Date: Monday, June 18, 2001

From: Kevin J. Bond, P.E.

Subject: Affect of removing existing attic floor joists to create a cathedral ceiling for the following residence:

Ford Residence
1006 Churchill Lane
Fox Point, WI. 53217

WISCONSIN
KEVIN JAMES BOND
E-20499
MILW.,
WI
PROFESSIONAL ENGINEER

6/18/01
Sheet 1 of 2 thru Sheet 2 of 2

Date: June 18, 2001

Prepared by: Kevin J. Bond, P.E.
(414) 259-1540
kevinb@kronesusa.com

Subject: Affect of removing existing attic floor joists to create a cathedral ceiling for the following residence:

Ford Residence
1006 Churchill Lane
Fox Point, WI. 53217

Background: During remodeling, the owner determined that a "cathedral" ceiling In Bedroom No. 1 would be more aestetically pleasing then the existing flat ceiling. In order to accomplish this change, the existing ceiling in Bedroom No. 1 was removed, and the attic floor joists which supported this ceiling were also removed.

With the removal of the attic floor joists, it has been questioned if the support of the existing sloped roof has been compromised. Specifically, is it necessary to install horizontal members and / or provide bracing to prevent the existing sloped roof from deflecting outward under loading conditions?

Analysis: As shown on the attached drawing (drawn by others), the attic floor joists ran parallel to the existing roof peak in Bedroom No.1. These joists supported the attic floor and their subsequent live loads, and the ceiling below it. Because of their orientation, these floor joists did not provide support for the existing sloped roof, nor provide any bracing to resist lateral loads or prevent sidesway in the respective direction. Additionally, the height of the bedroom walls, the square footage under consideration, and the span of the existing sloped roof are at a minimum, where an analysis of an unbraced gabled frame is not warranted.

Results: Removing the existing floor joists in Bedroom No. 1 will have no detrimental effect on the existing sloped roof's structural integrity. No additional cross bracing is necessary in Bedroom No. 1.

SAMPLE STRUCTURAL CALCULATIONS

STRUCTURAL
DIMENSION inc
STRUCTURAL ENGINEERS

Project:	Architect:
Ford Dormer 1006 E. Churchill Lane Fox Point, WI	JLDesign, LLC Milwaukee, WI

WISCONSIN
PATRICK D.
REYNOLDS
E-36645
WAUWATOSA
WI
PROFESSIONAL ENGINEER

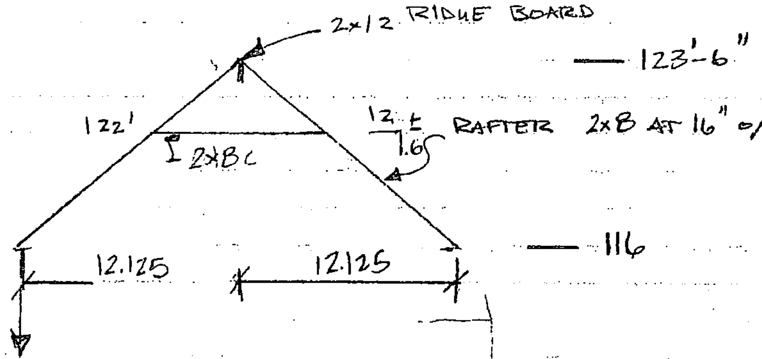
6/20/12

4035 NORTH 127TH STREET BROOKFIELD, WISCONSIN 53005 P: 262.373.0680 F: 262.373.0860

DL = 15 psf (ROOF)

SL = 30 psf

DL_{WALL} = 10 psf



DL_{WALL} = 10 psf × 8' = 80 plf (VARIABLE OVER 9')

DL_{ROOF} = 15(12.125) = 182

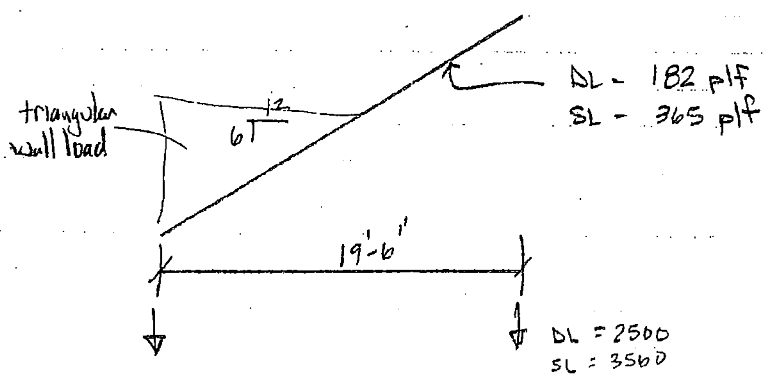
302

SL_{ROOF} = 30 (12.125) = 365 plf

RAFTER

SPA AT 16" o/c 2x8 SPF No. 1 / No. 2 OK

RAFTER SUPPORT BEAM



FLOOR FRAMING

DL = 10 psf
LL = 40 psf

SPAN = 19'-5"

OPTIONS

DFL No 1 or BETTER 2x12 AT 12" o/c

1 3/4 x 11 1/4 LVL AT 16" o/c

RXNS = DL = 98 plf
LL = 390 plf

VERIFY Existing 2x12 headers 2 ply

max SPAN w/ LOADING
→ 8'-6"

LOADING AT EXIST. INT
DL = 98 + 10(7') = 170
LL = 390 + 40 (7') = 670
} max 6'-6"

TOPS 35502

WoodWorks® SOFTWARE FOR WOOD DESIGN	COMPANY	PROJECT
	June 20, 2012 09:08	Rafter

Design Check Calculation Sheet

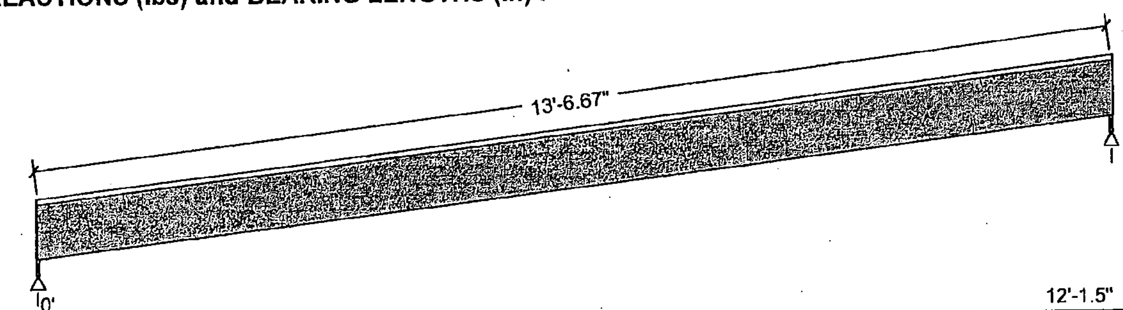
Sizer 7.0

LOADS (lbs, psf, or plf) :

Load	Type	Distribution	Magnitude Start	Magnitude End	Location [ft] Start	Location [ft] End	Units
Load1	Dead	Full Area	15.00	(16.0)*			psf
Load2	Snow	Full Area	30.00	(16.0)*			psf

*Tributary Width (in)

MAXIMUM REACTIONS (lbs) and BEARING LENGTHS (in) :



	0'	12'-1.5"
Dead	147	147
Live	242	242
Total	390	390
Bearing:		
F'theta	493	1387
Load Comb	#2	#2
Length	0.53	0.50*

*Min. bearing length for joists is 1/2" for exterior supports

Lumber-soft, S-P-F, No.1/No.2, 2x8"

Spaced at 16" c/c; Slope: 26.6 deg; Total length: 13'-6.67"; Self-weight of 2.2 plf included in loads;
Lateral support: top= full, bottom= at supports; Repetitive factor: applied where permitted (refer to online help);

Analysis vs. Allowable Stress (psi) and Deflection (in) using NDS 2005 :

Criterion	Analysis Value	Design Value	Analysis/Design
Shear	fv = 44	Fv' = 155	fv/Fv' = 0.28
Bending(+)	fb = 1088	Fb' = 1389	fb/Fb' = 0.78
Live Defl'n	0.36 = L/446	0.68 = L/240	0.54
Total Defl'n	0.70 = L/231	0.90 = L/180	0.78

ADDITIONAL DATA:

FACTORS:	F/E	CD	CM	Ct	CL	CF	Cfu	Cr	Cfrt	Ci	Cn	LC#
Fv'	135	1.15	1.00	1.00	-	-	-	-	1.00	1.00	1.00	2
Fb'+	875	1.15	1.00	1.00	1.000	1.200	1.00	1.15	1.00	1.00	-	2
Fcp'	425	-	1.00	1.00	-	-	-	-	1.00	1.00	-	-
E'	1.4 million		1.00	1.00	-	-	-	-	1.00	1.00	-	2
Emin'	0.51 million		1.00	1.00	-	-	-	-	1.00	1.00	-	2

```
Shear      : LC #2  = D+S, V =    351, V design =    320 lbs
Bending(+) : LC #2  = D+S, M =   1191 lbs-ft
Deflection: LC #2   = D+S  EI=     67e06 lb-in2
Total Deflection = 1.50(Dead Load Deflection) + Live Load Deflection.
Bearing: Allowable bearing at an angle F'theta  calculated for each support
as per NDS 3.10.3
  (D=dead  L=live  S=snow  W=wind  I=impact  C=construction  CLd=concentrated)
  (All LC's are listed in the Analysis output)
Load combinations: ICC-IBC
```

DESIGN NOTES:

1. Please verify that the default deflection limits are appropriate for your application.
2. Sawn lumber bending members shall be laterally supported according to the provisions of NDS Clause 4.4.1.
3. SLOPED BEAMS: level bearing is required for all sloped beams.

WoodWorks® SOFTWARE FOR WOOD DESIGN	COMPANY	PROJECT
	June 20, 2012 09:07	Rafter Support Beam

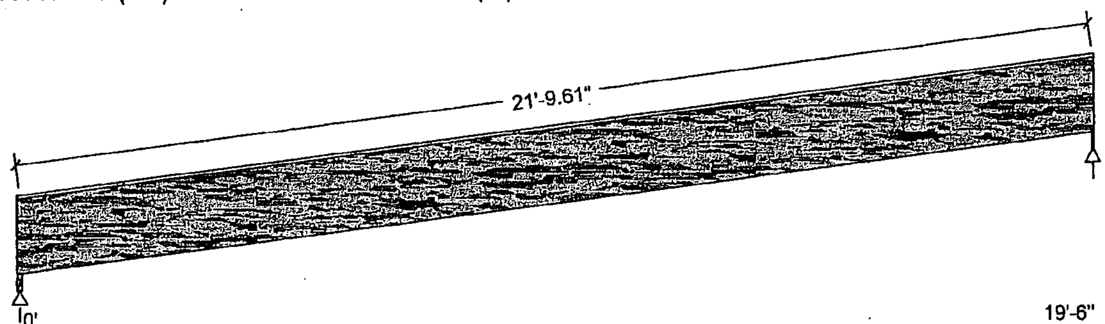
Design Check Calculation Sheet

Sizer 7.0

LOADS (lbs, psf, or plf) :

Load	Type	Distribution	Magnitude Start	Magnitude End	Location [ft] Start	Location [ft] End	Units
Load1	Dead	Full UDL	182.0				plf
Load2	Snow	Full UDL	365.0				plf
Load3	Dead	Triangular	80.0	0.0	0.00	9.00	plf

MAXIMUM REACTIONS (lbs) and BEARING LENGTHS (in) :



	0'		19'-6"
Dead	2534		2261
Live	3559		3559
Total	6092		5820
Bearing:			
F'theta	883		3027
Load Comb	#2		#2
Length	1.31		0.50*

*Min. bearing length for beams is 1/2" for exterior supports

LVL n-ply, 2.0E, 2500Fb, 1-3/4x16", 3-Plys

Slope: 26.6 deg; Total length: 21'-9.61"; Self-weight of 24.21 plf included in loads;
End notches: right end, bottom (depth = 0, length = Lb); Lateral support: top= full, bottom= at supports;

Analysis vs. Allowable Stress (psi) and Deflection (in) using NDS 2005 :

Criterion	Analysis Value	Design Value	Analysis/Design
Shear	fv = 93	Fv' = 328	fv/Fv' = 0.28
Bending(+)	fb = 1550	Fb' = 2876	fb/Fb' = 0.54
Live Defl'n	0.41 = L/631	0.73 = L/360	0.57
Total Defl'n	0.83 = L/315	1.09 = L/240	0.76

ADDITIONAL DATA:

FACTORS:	F/E	CD	CM	Ct	CL	CV	Cfu	Cr	Cfrt	Ci	Cn	LC#
Fv'	285	1.15	-	1.00	-	-	-	-	1.00	-	1.00	2
Fb'+	2500	1.15	-	1.00	1.000	0.96	-	1.04	1.00	-	-	2
Fcp'	750	-	-	1.00	-	-	-	-	1.00	-	-	-
E'	2.0 million		-	1.00	-	-	-	-	1.00	-	-	2
Emin'	1.04 million		-	1.00	-	-	-	-	1.00	-	-	2

```
Shear       : notched end did not control
Shear       : LC #2  = D+S, V =    5249, V design =    5228 lbs
Bending(+): LC #2  = D+S, M =   28928 lbs-ft
Deflection: LC #2  = D+S  EI=    1195e06 lb-in2/ply
Total Deflection = 1.50(Dead Load Deflection) + Live Load Deflection.
Bearing: Allowable bearing at an angle F'theta  calculated for each support
as per NDS 3.10.3
  (D=dead  L=live  S=snow  W=wind  I=impact  C=construction  CLd=concentrated)
  (All LC's are listed in the Analysis output)
Load combinations: ICC-IBC
```

WoodWorks®
SOFTWARE FOR WOOD DESIGN

COMPANY	PROJECT
June 20, 2012 09:06	existing header

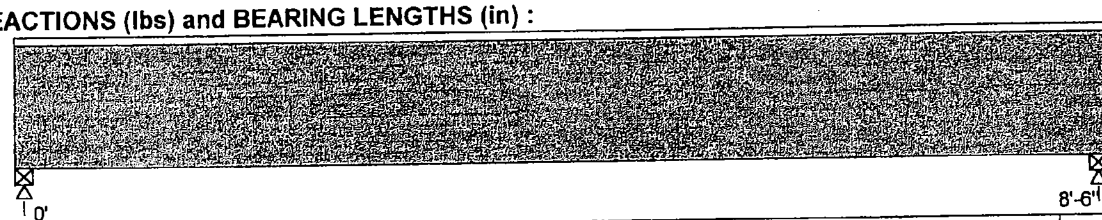
Design Check Calculation Sheet

Sizer 7.0

LOADS (lbs, psf, or plf) :

Load	Type	Distribution	Magnitude Start	Magnitude End	Location [ft] Start	Location [ft] End	Units
Load1	Dead	Full UDL	98.0				plf
Load2	Live	Full UDL	390.0				plf

MAXIMUM REACTIONS (lbs) and BEARING LENGTHS (in) :



	0'	8'-6"
Dead	445	445
Live	1657	1657
Total	2103	2103
Bearing:		
Load Comb	#2	#2
Length	1.65	1.65

Lumber n-ply, S-P-F, No.1/No.2, 2x12", 2-Plys

Self-weight of 6.82 plf included in loads;
Lateral support: top= full, bottom= at supports;

Analysis vs. Allowable Stress (psi) and Deflection (in) using NDS 2005 :

Criterion	Analysis Value	Design Value	Analysis/Design
Shear	fv = 73	Fv' = 135	fv/Fv' = 0.54
Bending(+)	fb = 847	Fb' = 875	fb/Fb' = 0.97
Live Defl'n	0.09 = <L/999	0.28 = L/360	0.32
Total Defl'n	0.13 = L/790	0.43 = L/240	0.30

ADDITIONAL DATA:

FACTORS:	F/E	CD	CM	Ct	CL	CF	Cfu	Cr	Cfrt	Ci	Cn	LC#
Fv'	135	1.00	1.00	1.00	-	-	-	-	1.00	1.00	1.00	2
Fb'+	875	1.00	1.00	1.00	1.000	1.000	1.00	1.00	1.00	1.00	-	2
Fcp'	425	-	1.00	1.00	-	-	-	-	1.00	1.00	-	-
E'	1.4 million		1.00	1.00	-	-	-	-	1.00	1.00	-	2
Emin'	0.51 million		1.00	1.00	-	-	-	-	1.00	1.00	-	2

```
Shear     : LC #2  = D+L, V =   2103, V design =  1639 lbs
Bending(+): LC #2  = D+L, M =   4469 lbs-ft
Deflection: LC #2  = D+L  EI=    249e06 lb-in2/ply
Total Deflection = 1.50(Dead Load Deflection) + Live Load Deflection.
  (D=dead  L=live  S=snow  W=wind  I=impact  C=construction  CLd=concentrated)
  (All LC's are listed in the Analysis output)
Load combinations: ICC-IBC
```

DESIGN NOTES:

1. Please verify that the default deflection limits are appropriate for your application.
2. Sawn lumber bending members shall be laterally supported according to the provisions of NDS Clause 4.4.1.
3. BUILT-UP BEAMS: it is assumed that each ply is a single continuous member (that is, no butt joints are present) fastened together securely at intervals not exceeding 4 times the depth and that
each ply is equally top-loaded. Where beams are side-loaded, special fastening details may be required.

WoodWorks® SOFTWARE FOR WOOD DESIGN	COMPANY	PROJECT
	June 20, 2012 09:07	floor joists

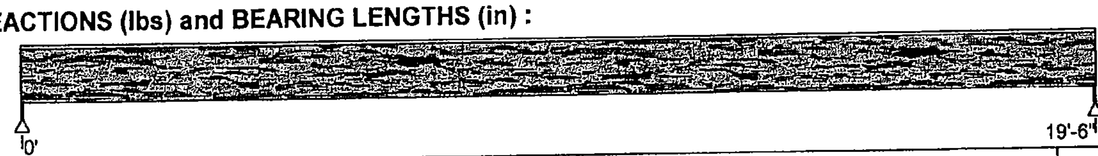
Design Check Calculation Sheet

Sizer 7.0

LOADS (lbs, psf, or plf) :

Load	Type	Distribution	Magnitude Start	Magnitude End	Location [ft] Start	Location [ft] End	Units
Load1	Dead	Full UDL	13.3				plf
Load2	Live	Full UDL	55.0				plf

MAXIMUM REACTIONS (lbs) and BEARING LENGTHS (in) :



	0'	19'-6"
Dead	185	185
Live	536	536
Total	722	722
Bearing:		
Load Comb	#2	#2
Length	0.55	0.55

LVL n-ply, 1.8E, 2600Fb, 1-3/4x11-1/4", 1-ply

Self-weight of 5.67 plf included in loads;
Lateral support: top= full, bottom= at supports;

Analysis vs. Allowable Stress (psi) and Deflection (in) using NDS 2005 :

Criterion	Analysis Value	Design Value	Analysis/Design
Shear	fv = 50	Fv' = 285	fv/Fv' = 0.17
Bending(+)	fb = 1143	Fb' = 2647	fb/Fb' = 0.43
Live Defl'n	0.48 = L/488	0.65 = L/360	0.74
Total Defl'n	0.73 = L/321	0.97 = L/240	0.75

ADDITIONAL DATA:

FACTORS:	F/E	CD	CM	Ct	CL	CV	Cfu	Cr	Cfrt	Ci	Cn	LC#
Fv'	285	1.00	-	1.00	-	-	-	-	1.00	-	1.00	2
Fb'+	2600	1.00	-	1.00	1.000	1.01	-	1.00	1.00	-	-	2
Fcp'	750	-	-	1.00	-	-	-	-	1.00	-	-	-
E'	1.8 million		-	1.00	-	-	-	-	1.00	-	-	2
Emin'	0.93 million		-	1.00	-	-	-	-	1.00	-	-	2

```
Shear      : LC #2  = D+L, V =     722, V design =    652 lbs
Bending(+) : LC #2  = D+L, M =    3517 lbs-ft
Deflection: LC #2  = D+L  EI=    374e06 lb-in2
Total Deflection = 1.50(Dead Load Deflection) + Live Load Deflection.
  (D=dead  L=live  S=snow  W=wind  I=impact  C=construction  CLd=concentrated)
  (All LC's are listed in the Analysis output)
Load combinations: ICC-IBC
```

DESIGN NOTES:

1. Please verify that the default deflection limits are appropriate for your application.
2. SCL-BEAMS (Structural Composite Lumber): the attached SCL selection is for preliminary design only. For final member design contact your local SCL manufacturer.
3. Size factors vary from one manufacturer to another for SCL materials. They can be changed in the database editor.
4. BUILT-UP SCL-BEAMS: contact manufacturer for connection details when loads are not applied equally to all plys.

WoodWorks® SOFTWARE FOR WOOD DESIGN	COMPANY	PROJECT
	June 20, 2012 09:06	existing header_interior

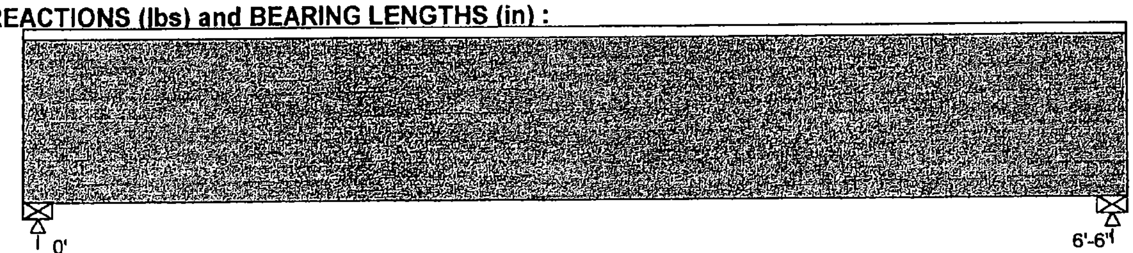
Design Check Calculation Sheet

Sizer 7.0

LOADS (lbs, psf, or plf) :

Load	Type	Distribution	Magnitude Start	Magnitude End	Location [ft] Start	Location [ft] End	Units
Load1	Dead	Full UDL	170.0				plf
Load2	Live	Full UDL	670.0				plf

MAXIMUM REACTIONS (lbs) and BEARING LENGTHS (in) :



	0'	6'-6"
Dead	575	575
Live	2177	2177
Total	2752	2752
Bearing:		
Load Comb	#2	#2
Length	2.16	2.16

Lumber n-ply, S-P-F, No.1/No.2, 2x12", 2-Plys

Self-weight of 6.82 plf included in loads;
Lateral support: top= full, bottom= at supports;

Analysis vs. Allowable Stress (psi) and Deflection (in) using NDS 2005 :

Criterion	Analysis Value	Design Value	Analysis/Design
Shear	fv = 87	Fv' = 135	fv/Fv' = 0.64
Bending(+)	fb = 848	Fb' = 875	fb/Fb' = 0.97
Live Defl'n	0.05 = <L/999	0.22 = L/360	0.25
Total Defl'n	0.08 = <L/999	0.32 = L/240	0.23

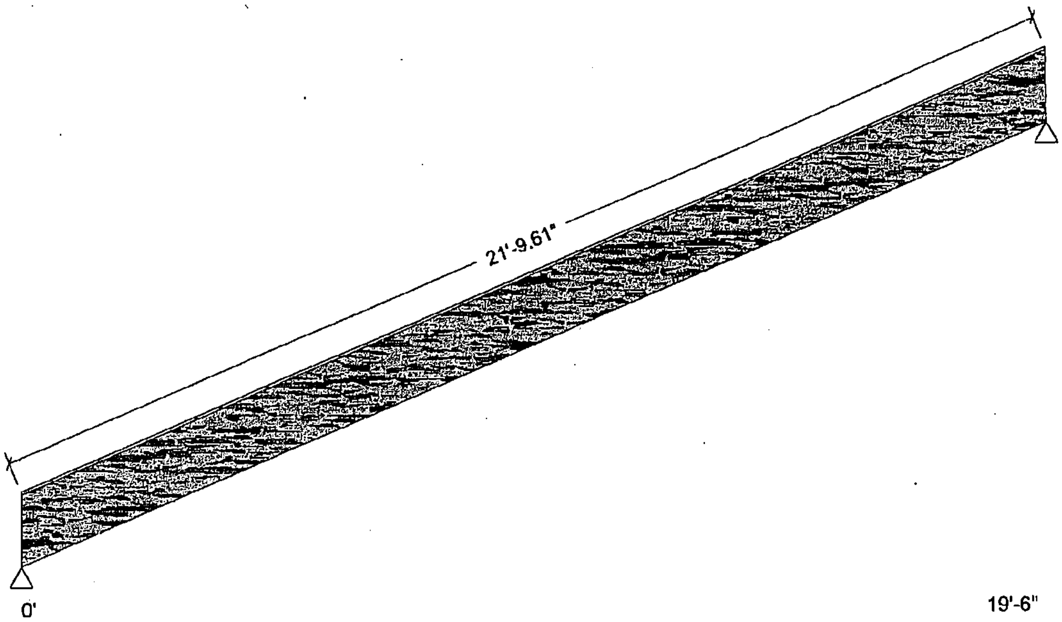
ADDITIONAL DATA:

FACTORS:	F/E	CD	CM	Ct	CL	CF	Cfu	Cr	Cfrt	Ci	Cn	LC#
Fv'	135	1.00	1.00	1.00	-	-	-	-	1.00	1.00	1.00	2
Fb'+	875	1.00	1.00	1.00	1.000	1.000	1.00	1.00	1.00	1.00	-	2
Fcp'	425	-	1.00	1.00	-	-	-	-	1.00	1.00	-	-
E'	1.4 million		1.00	1.00	-	-	-	-	1.00	1.00	-	2
Emin'	0.51 million		1.00	1.00	-	-	-	-	1.00	1.00	-	2

```
Shear      : LC #2  = D+L, V =   2752, V design =   1958 lbs
Bending(+): LC #2  = D+L, M =   4472 lbs-ft
Deflection: LC #2  = D+L  EI=    249e06 lb-in2/ply
Total Deflection = 1.50(Dead Load Deflection) + Live Load Deflection.
  (D=dead  L=live  S=snow  W=wind  I=impact  C=construction  CLd=concentrated)
  (All LC's are listed in the Analysis output)
Load combinations: ICC-IBC
```

DESIGN NOTES:

1. Please verify that the default deflection limits are appropriate for your application.
2. Sawn lumber bending members shall be laterally supported according to the provisions of NDS Clause 4.4.1.
3. BUILT-UP BEAMS: It is assumed that each ply is a single continuous member (that is, no butt joints are present) fastened together securely at intervals not exceeding 4 times the depth and that
each ply is equally top-loaded. Where beams are side-loaded, special fastening details may be required.


21'-9.61"
0'
19'-6"