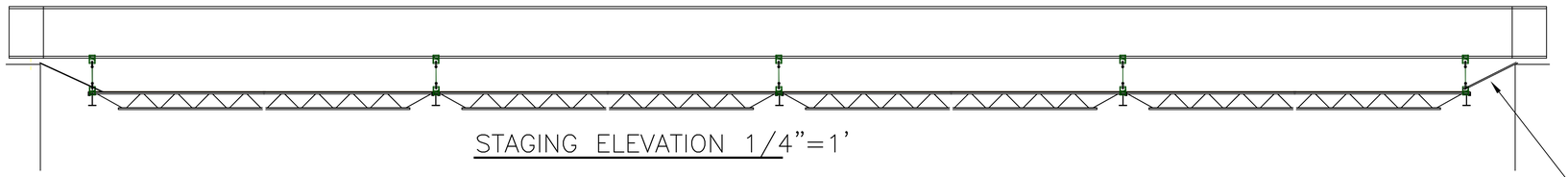
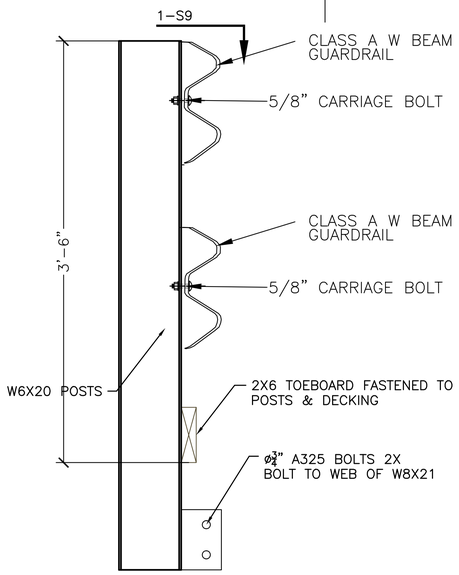
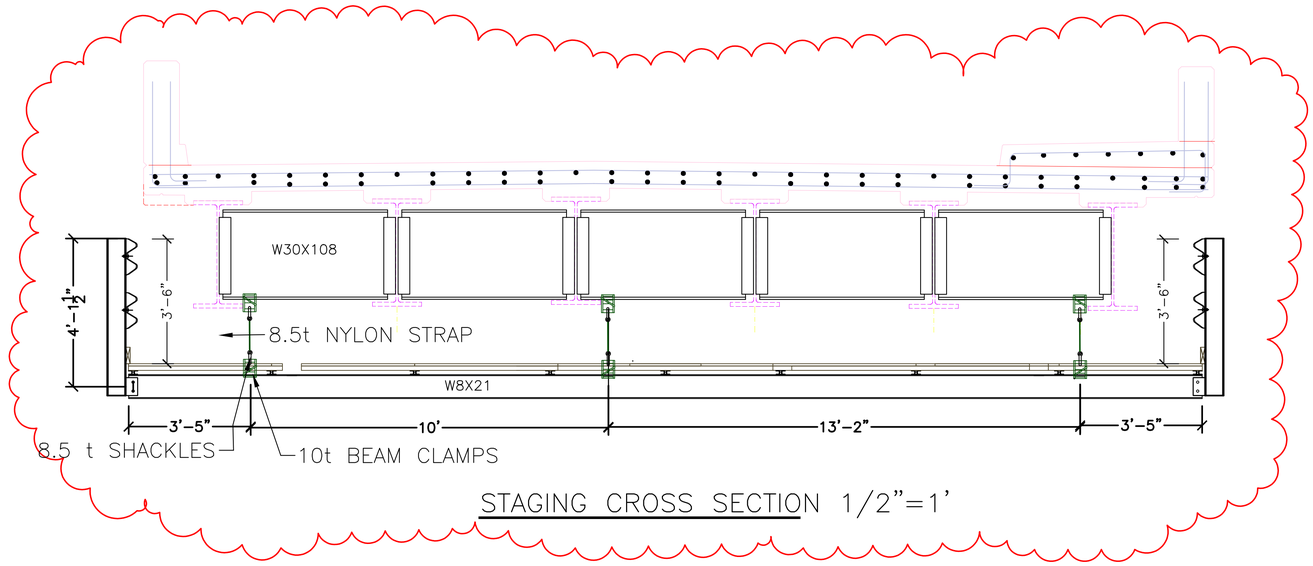


STAGING ELEVATION 1/4"=1'

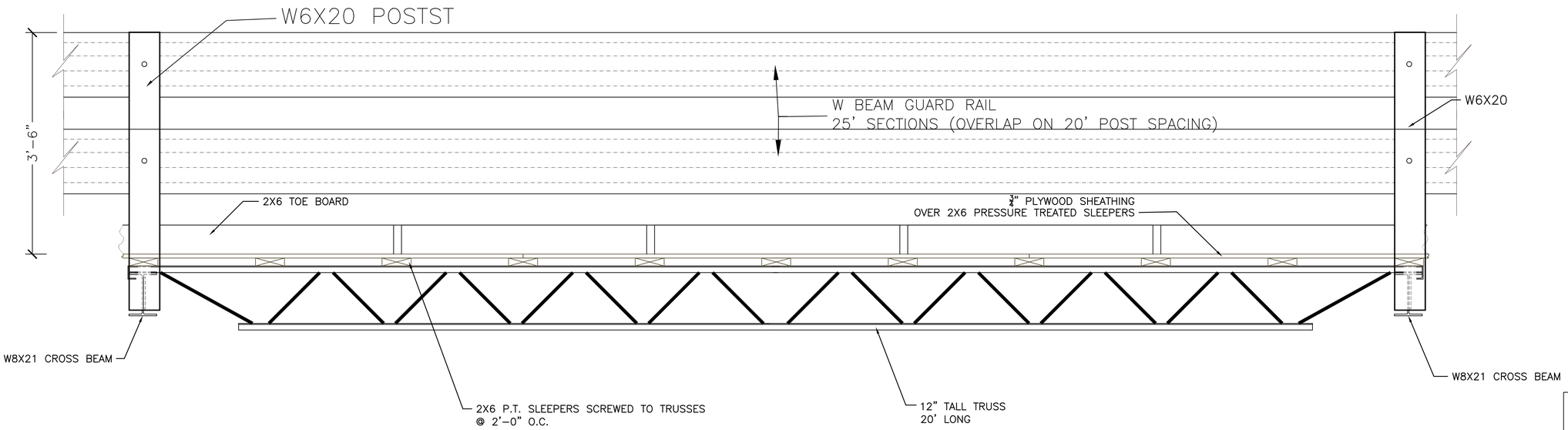
INFILL WITH FRAMING AND 3/4" PLY



RAIL POST DETAIL



STAGING CROSS SECTION 1/2"=1'



STAGING PARTIAL ELEVATION NTS

BELL ENGINEERING
CIVIL & ENVIRONMENTAL
17 ECHO COVE WAY-SPOFFORD, NH 03462
(603) 363-9966
bellengineering@myfairpoint.net

REVISIONS:

6-21-2016	W8X21 STAGING BEAM SUSPENDED FROM DIAPHRAMS
6-01-2016	modify guard rail member and height

OWNER: BRATTLEBORO BF 2000 (26)
ELLIOT STREET
DECK REPLACEMENT

SHEET TITLE: STAGING PLAN

SCALE: AS NOTED

DATE: MAY 13, 2016

SHEET 1

STATE OF VERMONT RONALD R. BELL No. 6894 REGISTERED PROFESSIONAL ENGINEER

BELL ENGINEERING
CIVIL & ENVIRONMENTAL
17 ECHO COVE WAY
SPOFFORD, NEW HAMPSHIRE 03462
(603) 363-9966

PROJECT NAME/ LOCATION: Brattleboro 200(26)
SHEET #: 1 OF 1
CALCULATED BY: Ron Bell DATE: 6-21-2016
CHECKED BY: DATE:
SCALE:

CHECK Flange Local Bending of
W8X103 DIAPHRAMS

AISC eq. J 10-1 $R_n = 6.25 t^2 f_{ys}$

worst case is center where $D_L = 5.704$ KIPS
$L_L = 13.159$ KIPS

$P_u = (1.2)(5.704) + 1.6(13.159) =$ **27.53 KIPS** ← 8.56 unfactored

$R_n = 6.25(0.76)^2 \left(36 \frac{\text{KIPS}}{\text{in}^2}\right)$

$= 129.96$ KIPS

$\phi R_n = (0.9)(129.96 \text{ KIPS}) = 116.964$

Note; When the concentrated force is applied at a distance from the member end that is less than 10 tf then R_n must be reduced by 50% ∴ ~~ϕR_n~~ $R_n = 58.482$

58.482 KIPS >>> 27.53 KIPS OK

No Stiffners required

STATE OF VERMONT
RONALD K. BELL
No. 6994
REGISTERED PROFESSIONAL ENGINEER

Ronald K. Bell

BELL ENGINEERING
CIVIL & ENVIRONMENTAL
17 ECHO COVE WAY-SPOFFORD, NH 03462
(603) 363-9966

Project Title: BRATTLEBORO 2000 (26)
Engineer: RONALD K. BELL, PE
Project Descr: BELOW DECK STAGING
Project ID: 2016-026

Printed: 21 JUN 2016, 5:41PM

Steel Beam

File = C:\Users\Ron\DOCUME~1\ENERCA~1\EL8692~1.EC6
ENERCALC, INC. 1983-2013, Build:6.13.8.31, Ver:6.13.12.31

Lic. # : KW-06009396 — Licensee : Bell Engineering

Description : TRANSVERSE W8X21 STAGING BEAMS SUSPENDED FROM W8X103 DIAPHRAMS

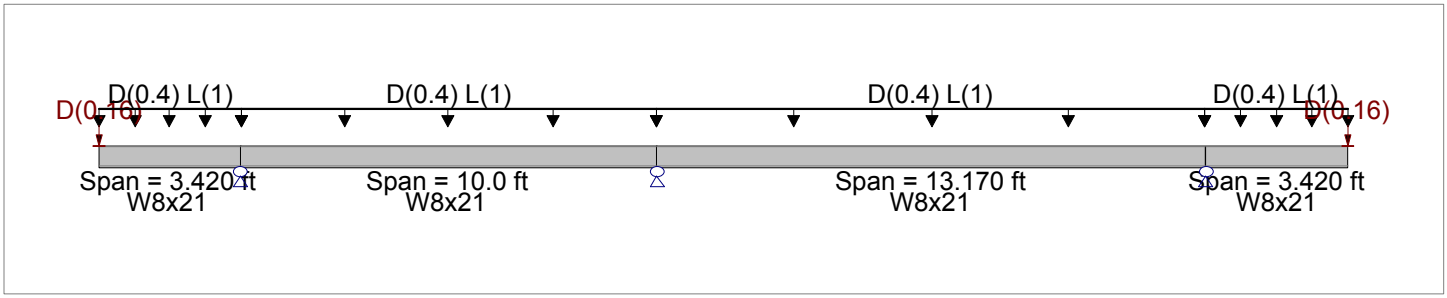
CODE REFERENCES

Calculations per AISC 360-05, IBC 2006, CBC 2007, ASCE 7-05
Load Combination Set : ASCE 7-05

Material Properties

Analysis Method : Load Resistance Factor Design
Beam Bracing : Completely Unbraced
Bending Axis : Major Axis Bending
Load Combination ASCE 7-05

Fy : Steel Yield : 50.0 ksi
E: Modulus : 29,000.0 ksi



Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight calculated and added to loads
Load for Span Number 1
Uniform Load : D = 0.020, L = 0.050 ksf, Tributary Width = 20.0 ft, (WORKERS & CONC. DEBRIS)
Point Load : D = 0.160 k @ 0.0 ft, (GUARD RAIL)
Load for Span Number 2
Uniform Load : D = 0.020, L = 0.050 ksf, Tributary Width = 20.0 ft
Load for Span Number 3
Uniform Load : D = 0.020, L = 0.050 ksf, Tributary Width = 20.0 ft
Load for Span Number 4
Uniform Load : D = 0.020, L = 0.050 ksf, Tributary Width = 20.0 ft
Point Load : D = 0.160 k @ 3.420 ft, (GURAD RAIL)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.403 : 1	Maximum Shear Stress Ratio =	0.245 : 1
Section used for this span	W8x21	Section used for this span	W8x21
Mu : Applied	30.817 k-ft	Vu : Applied	15.218 k
Mn * Phi : Allowable	76.500 k-ft	Vn * Phi : Allowable	62.10 k
Load Combination	+1.20D+0.50Lr+1.60L+1.60H	Load Combination	+1.20D+0.50Lr+1.60L+1.60H
Location of maximum on span	10.000 ft	Location of maximum on span	10.000 ft
Span # where maximum occurs	Span # 2	Span # where maximum occurs	Span # 2

Maximum Deflection

Max Downward L+Lr+S Deflection	0.136 in	Ratio =	1,165
Max Upward L+Lr+S Deflection	-0.087 in	Ratio =	944
Max Downward Total Deflection	0.190 in	Ratio =	831
Max Upward Total Deflection	-0.117 in	Ratio =	702

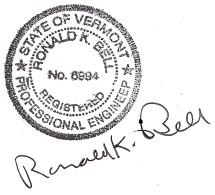
Overall Maximum Deflections - Unfactored Loads

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
D+L	1	0.0345	0.000		0.0000	3.420
L Only	2	0.0030	3.673	D+L	-0.0148	8.367
D+L	3	0.1902	7.257		0.0000	8.367
	4	0.0000	7.257	D+L	-0.1169	3.420

Vertical Reactions - Unfactored

Support notation : Far left is #1 — Values in KIPS

Load Combination	Support 1	Support 2	Support 3	Support 4	Support 5
Overall MAXimum		10.935	18.554	13.474	
D Only		3.410	5.395	4.148	
L Only		7.525	13.159	9.326	
D+L		10.935	18.554	13.474	



BELL ENGINEERING
CIVIL & ENVIRONMENTAL
17 ECHO COVE WAY-SPOFFORD, NH 03462
(603) 363-9966

Project Title: BRATTLEBORO 2000 (26)
Engineer: RONALD K. BELL, PE
Project Descr: BELOW DECK STAGING
Project ID: 2016-026

Printed: 21 JUN 2016, 5:41PM

Steel Beam

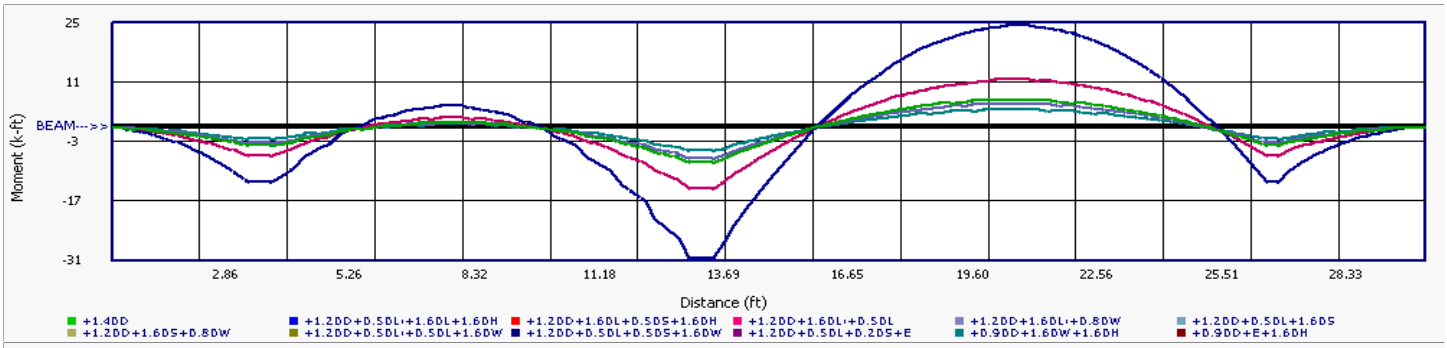
File = C:\Users\Ron\DOCUME~1\ENERCA~1\EL8692~1.EC6
ENERCALC, INC. 1983-2013, Build:6.13.8.31, Ver:6.13.12.31

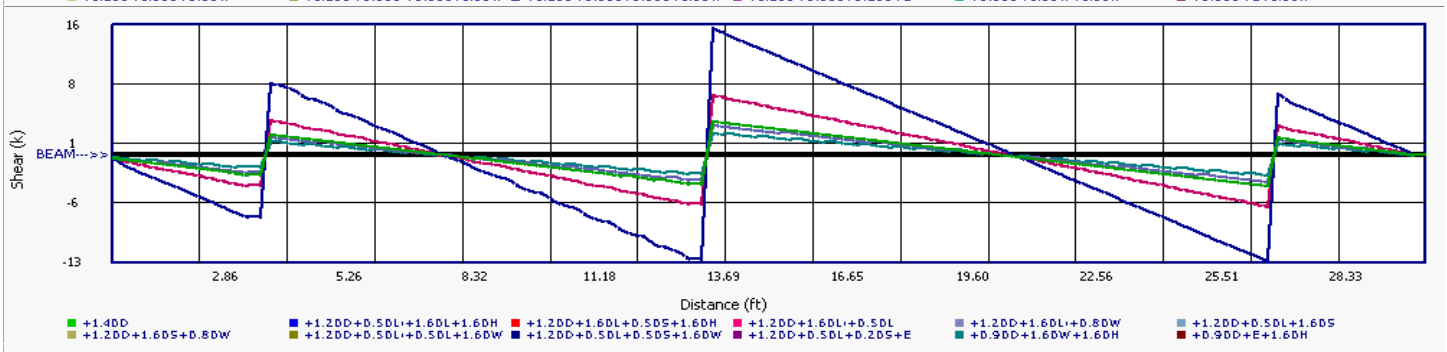
Lic. # : KW-06009396 — **Licensee : Bell Engineering**

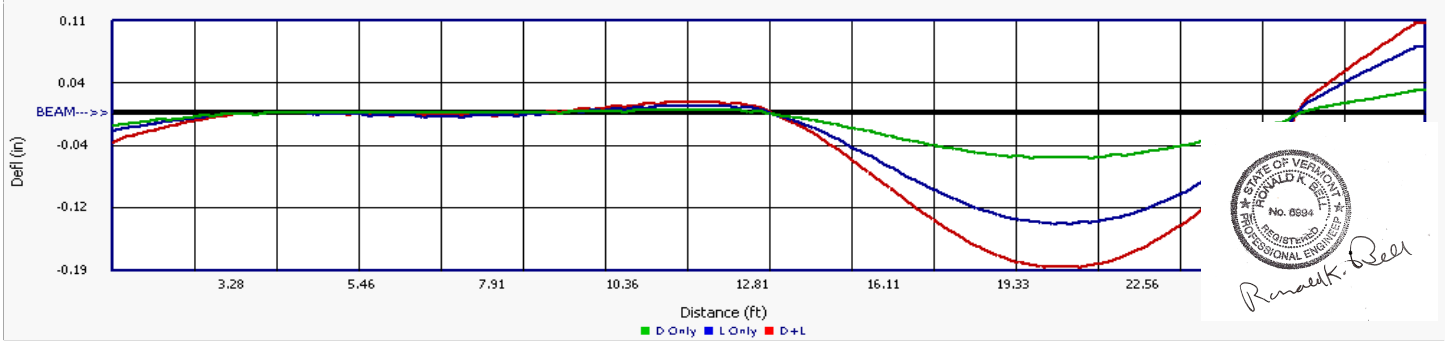
Description : TRANSVERSE W8X21 STAGING BEAMS SUSPENDED FROM W8X103 DIAPHRAMS

Steel Section Properties : W8x21

Depth	=	8.280	in	I xx	=	75.30	in^4	J	=	0.282	in^4
Web Thick	=	0.250	in	S xx	=	18.20	in^3	Cw	=	152.00	in^6
Flange Width	=	5.270	in	R xx	=	3.490	in				
Flange Thick	=	0.400	in	Zx	=	20.400	in^3				
Area	=	6.160	in^2	I yy	=	9.770	in^4				
Weight	=	20.969	plf	S yy	=	3.710	in^3	Wno	=	10.400	in^2
Kdesign	=	0.700	in	R yy	=	1.260	in	Sw	=	5.470	in^4
K1	=	0.563	in	Zy	=	5.690	in^3	Qf	=	3.960	in^3
rts	=	1.460	in	rT	=	1.410	in	Qw	=	10.100	in^3
Ycg	=	4.140	in								







BELL ENGINEERING
CIVIL & ENVIRONMENTAL
17 ECHO COVE WAY-SPOFFORD, NH 03462
(603) 363-9966

Project Title: BRATTLEBORO 2000 (26)
Engineer: RONALD K. BELL, PE
Project Descr: BELOW DECK STAGING
Project ID: 2016-026

Printed: 21 JUN 2016, 5:35PM

Steel Beam

File = C:\Users\Ron\DOCUME~1\ENERCA~1\EL8692~1.EC6
ENERCALC, INC. 1983-2013, Build:6.13.8.31, Ver:6.13.12.31

Lic. # : KW-06009396 — Licensee : Bell Engineering

Description : CHECK CONCENTRATED LOAD ON DIAPHRAM

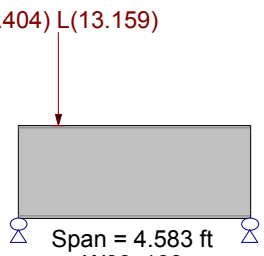
CODE REFERENCES

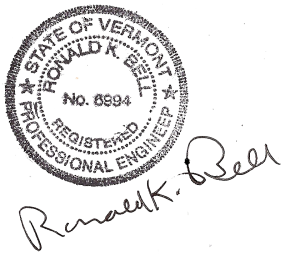
Calculations per AISC 360-05, IBC 2006, CBC 2007, ASCE 7-05
Load Combination Set : ASCE 7-05

Material Properties

Analysis Method : Allowable Strength Design
Beam Bracing : Beam is Fully Braced against lateral-torsional buckling
Bending Axis : Major Axis Bending
Load Combination ASCE 7-05

Fy : Steel Yield : 50.0 ksi
E: Modulus : 29,000.0 ksi





Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight calculated and added to loads
Load(s) for Span Number 1
Point Load : D = 5.404, L = 13.159 k @ 0.7920 ft, (FROM CENTER BEAM CLAM)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.014 : 1	Maximum Shear Stress Ratio =	0.048 : 1
Section used for this span	W30x108	Section used for this span	W30x108
Ma : Applied	12.293 k-ft	Va : Applied	15.602 k
Mn / Omega : Allowable	863.273 k-ft	Vn/Omega : Allowable	324.820 k
Load Combination	+D+L+H	Load Combination	+D+L+H
Location of maximum on span	0.802ft	Location of maximum on span	0.000 ft
Span # where maximum occurs	Span # 1	Span # where maximum occurs	Span # 1

Maximum Deflection

Max Downward L+Lr+S Deflection	0.000 in	Ratio =	0 <360
Max Upward L+Lr+S Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	0.000 in	Ratio =	209043
Max Upward Total Deflection	0.000 in	Ratio =	0 <180

Overall Maximum Deflections - Unfactored Loads

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
D+L	1	0.0003	1.994		0.0000	0.000

Vertical Reactions - Unfactored

Support notation : Far left is #1 — Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	15.602	3.455
D Only	4.717	1.181
L Only	10.885	2.274
D+L	15.602	3.455

Steel Section Properties : W30x108

Depth	=	29.800	in	I xx	=	4,470.00	in^4	J	=	4.990	in^4
Web Thick	=	0.545	in	S xx		299.00	in^3	Cw	=	30900.00	in^6
Flange Width	=	10.500	in	R xx	=	11.900	in				
Flange Thick	=	0.760	in	Zx	=	346.000	in^3				
Area	=	31.700	in^2	I yy	=	146.000	in^4				
Weight	=	107.907	plf	S yy	=	27.900	in^3	Wno	=	76.200	in^2
Kdesign	=	1.410	in	R yy	=	2.150	in	Sw	=	152.000	in^4
K1	=	1.125	in	Zy	=	43.900	in^3	Qf	=	54.900	in^3
rts	=	2.660	in	rT	=	2.610	in	Qw	=	170.000	in^3
Ycg	=	14.900	in								

BELL ENGINEERING
CIVIL & ENVIRONMENTAL
17 ECHO COVE WAY-SPOFFORD, NH 03462
(603) 363-9966

Project Title: BRATTLEBORO 2000 (26)
Engineer: RONALD K. BELL, PE
Project Descr: BELOW DECK STAGING
Project ID: 2016-026

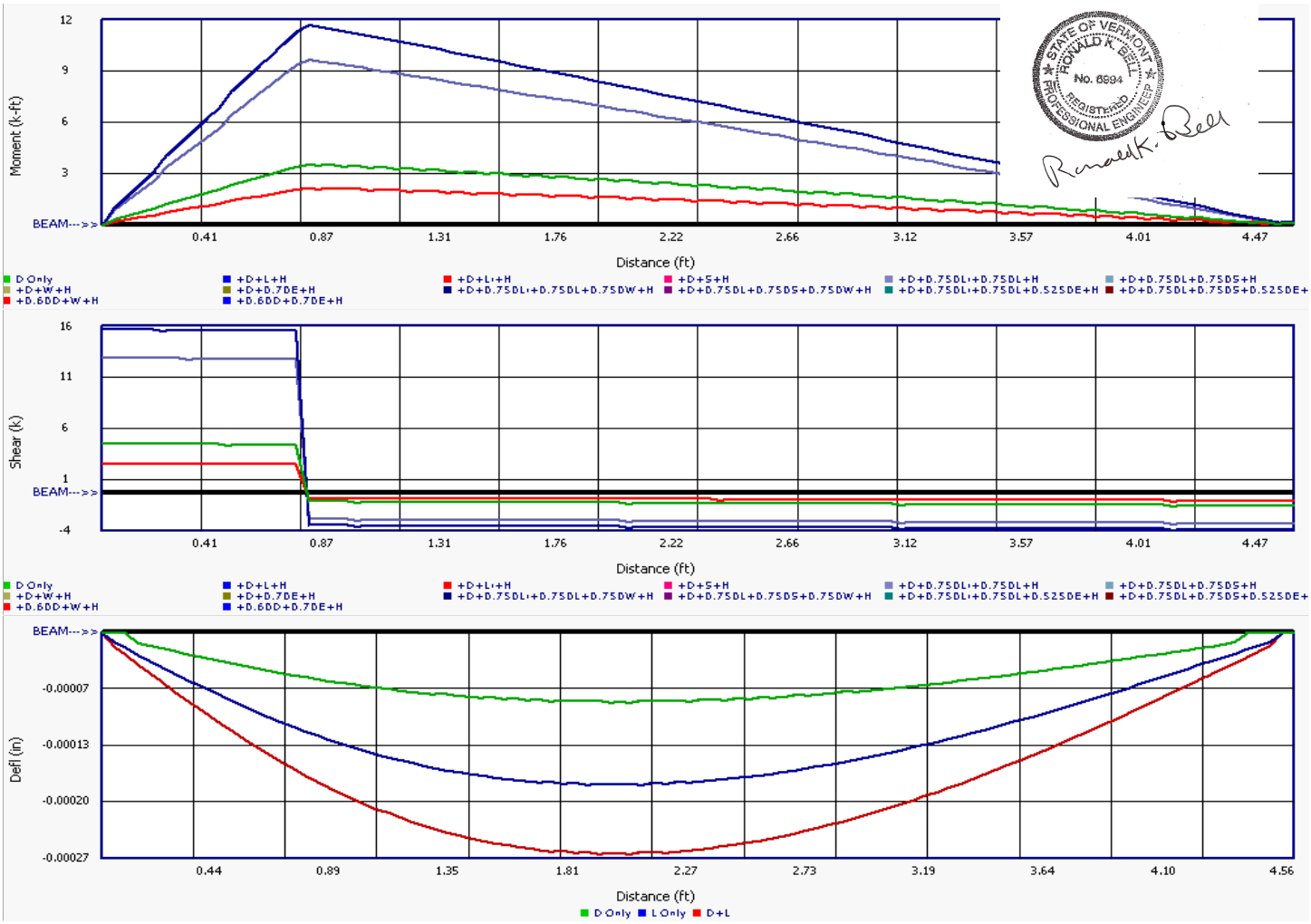
Printed: 21 JUN 2016, 5:35PM

Steel Beam

File = C:\Users\Ron\DOCUME~1\ENERCA~1\EL8692~1.EC6
ENERCALC, INC. 1983-2013, Build:6.13.8.31, Ver:6.13.12.31

Lic. # : KW-06009396 **Licensee : Bell Engineering**

Description : CHECK CONCENTRATED LOAD ON DIAPHRAM



STATE OF VERMONT
RONALD K. BELL
No. 6894
REGISTERED
PROFESSIONAL ENGINEER