APPENDIX A

JOIST CROSS SECTION PROPERTIES

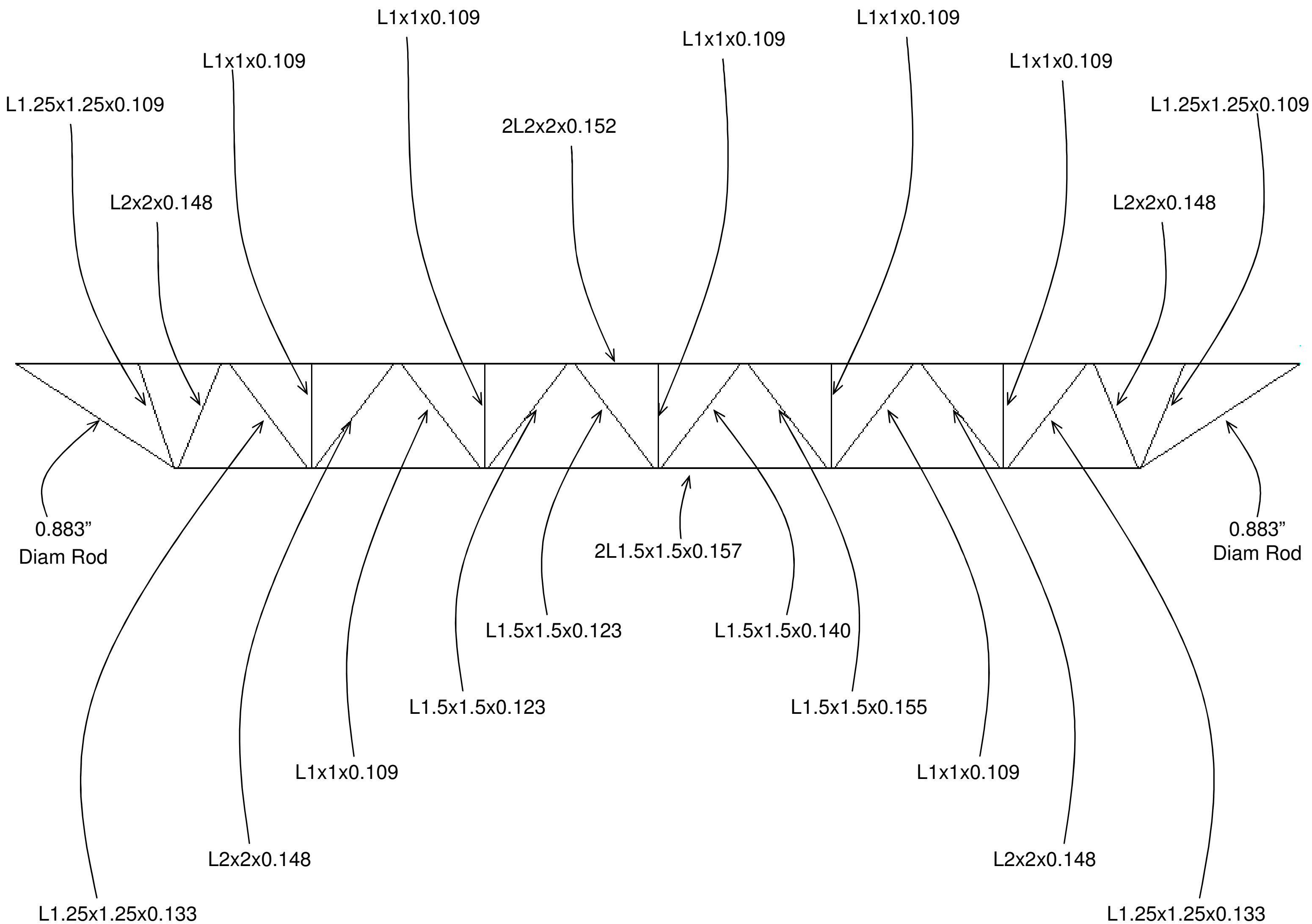


Figure A.1 Single Span Footbridge- Joist 1

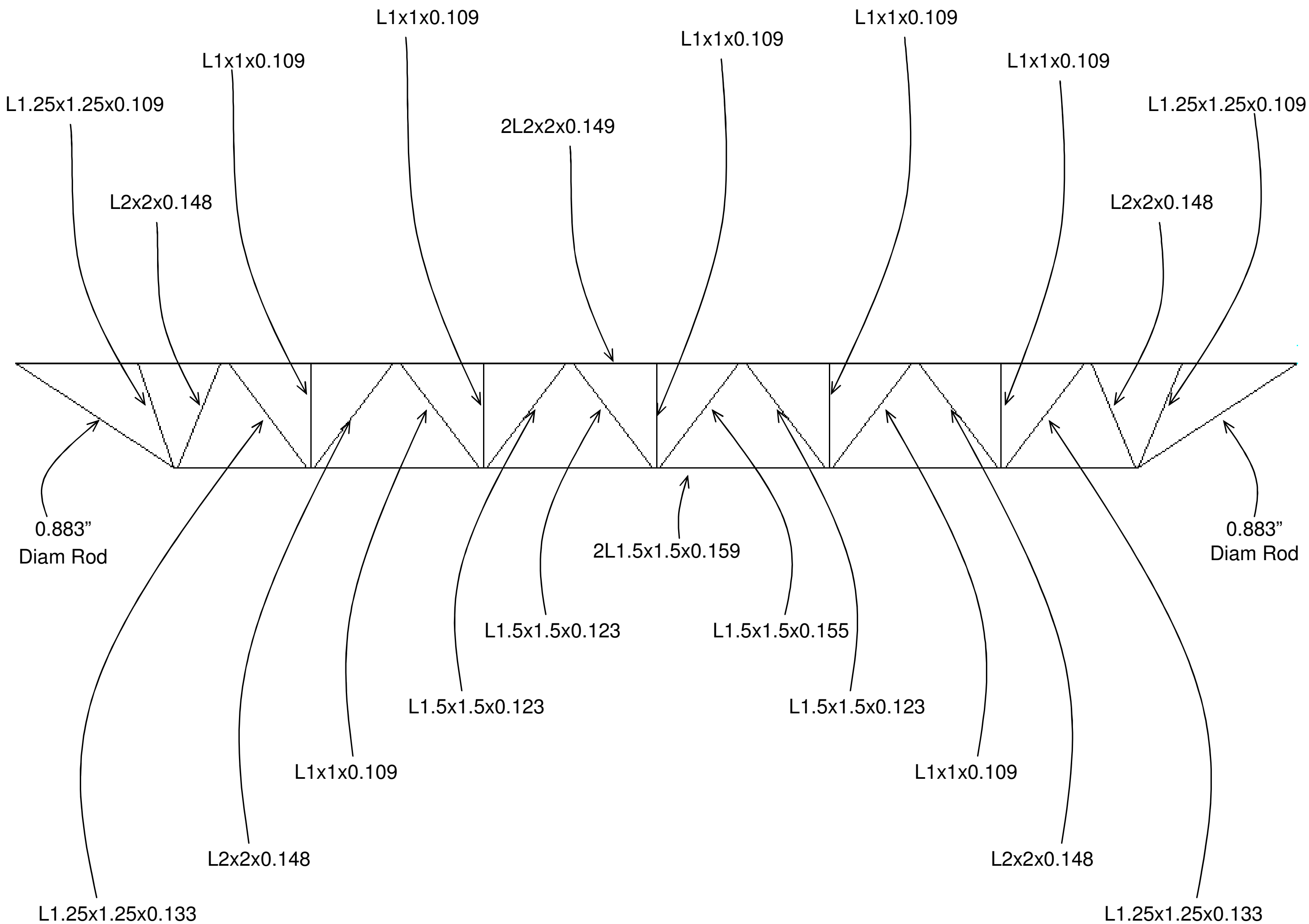


Figure A.2 Single Span Footbridge- Joist 2

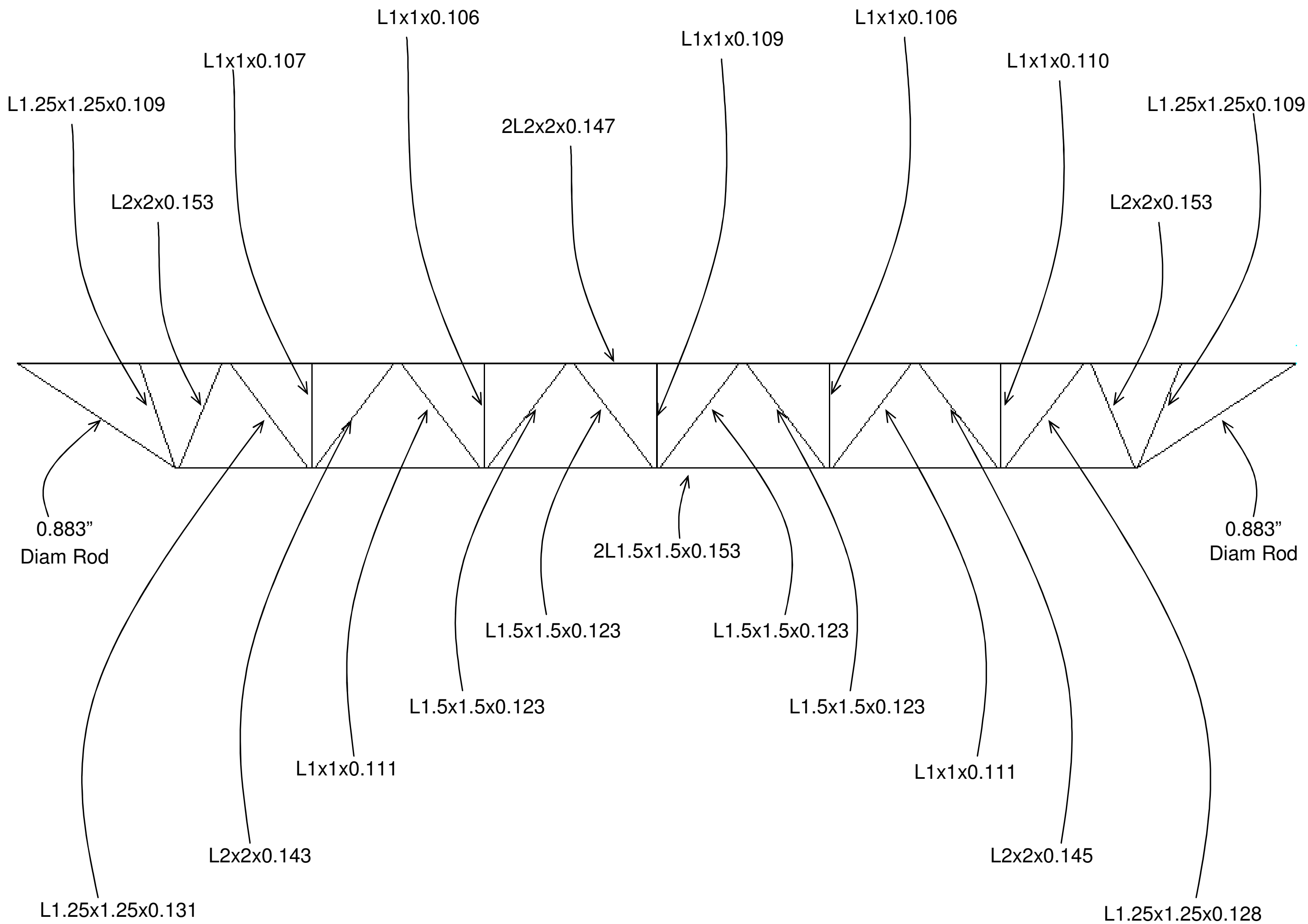


Figure A.3 Three Span Footbridge- Joist 1

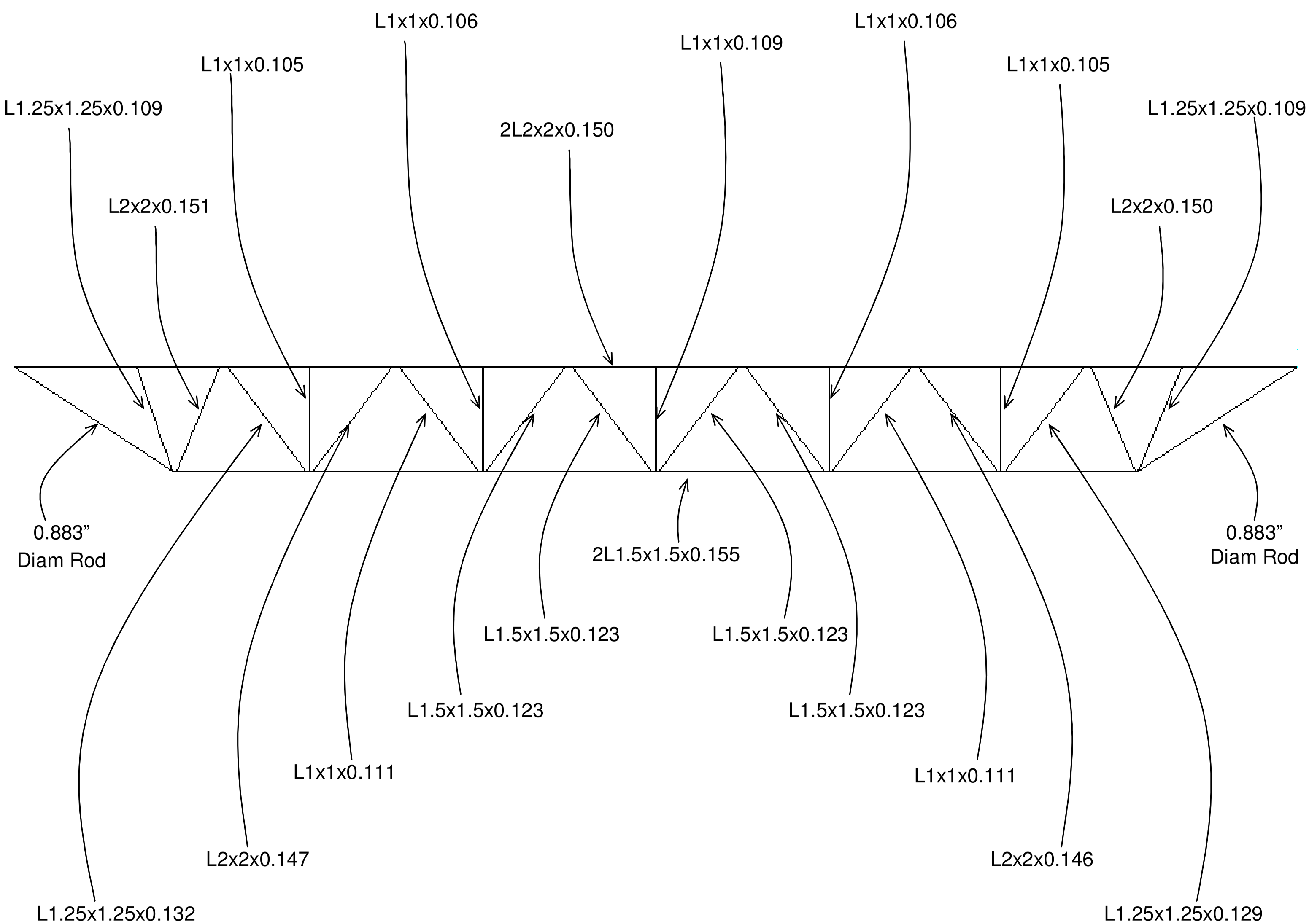


Figure A.4 Three Span Footbridge- Joist 2

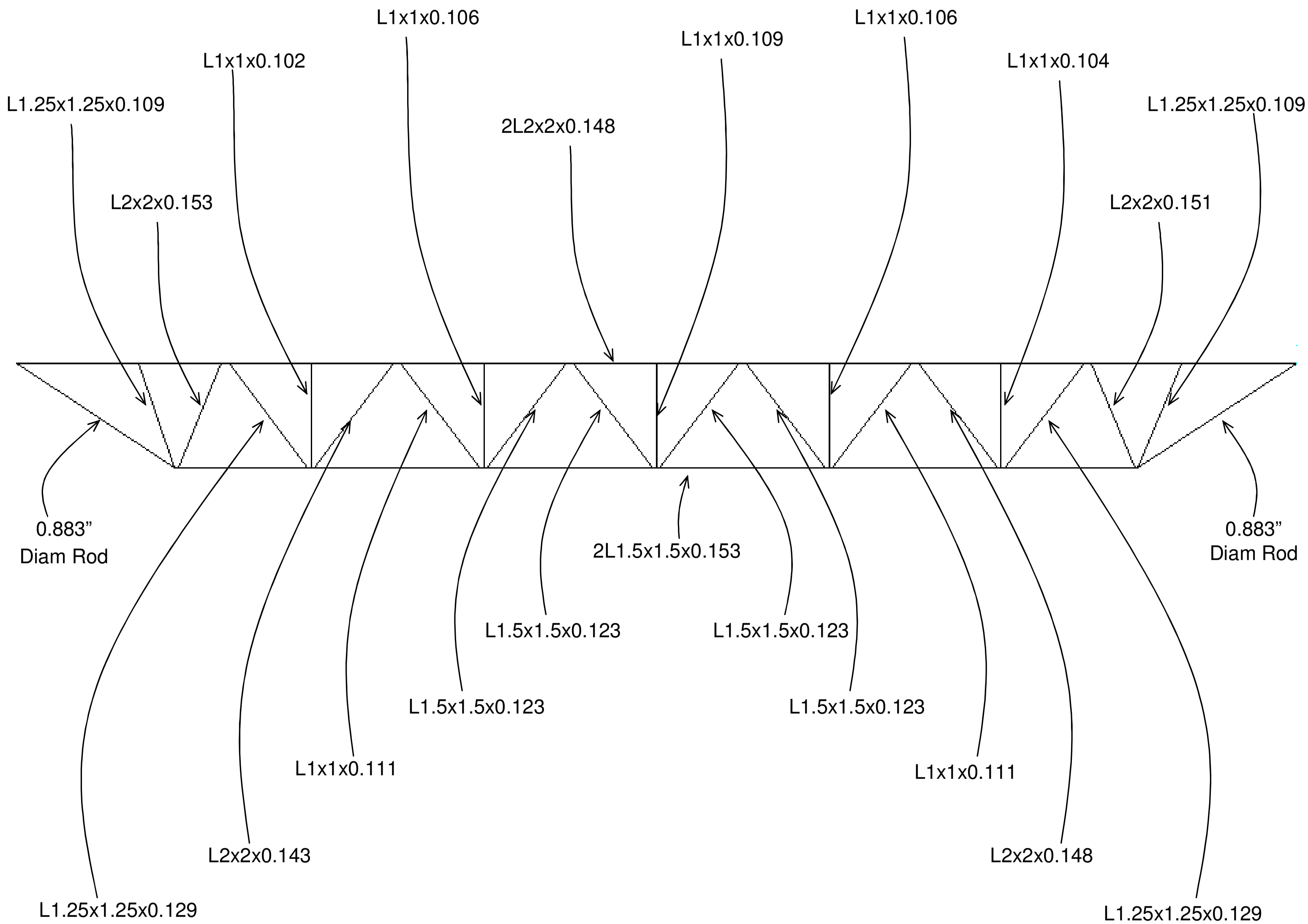


Figure A.5 Three Span Footbridge- Joist 3

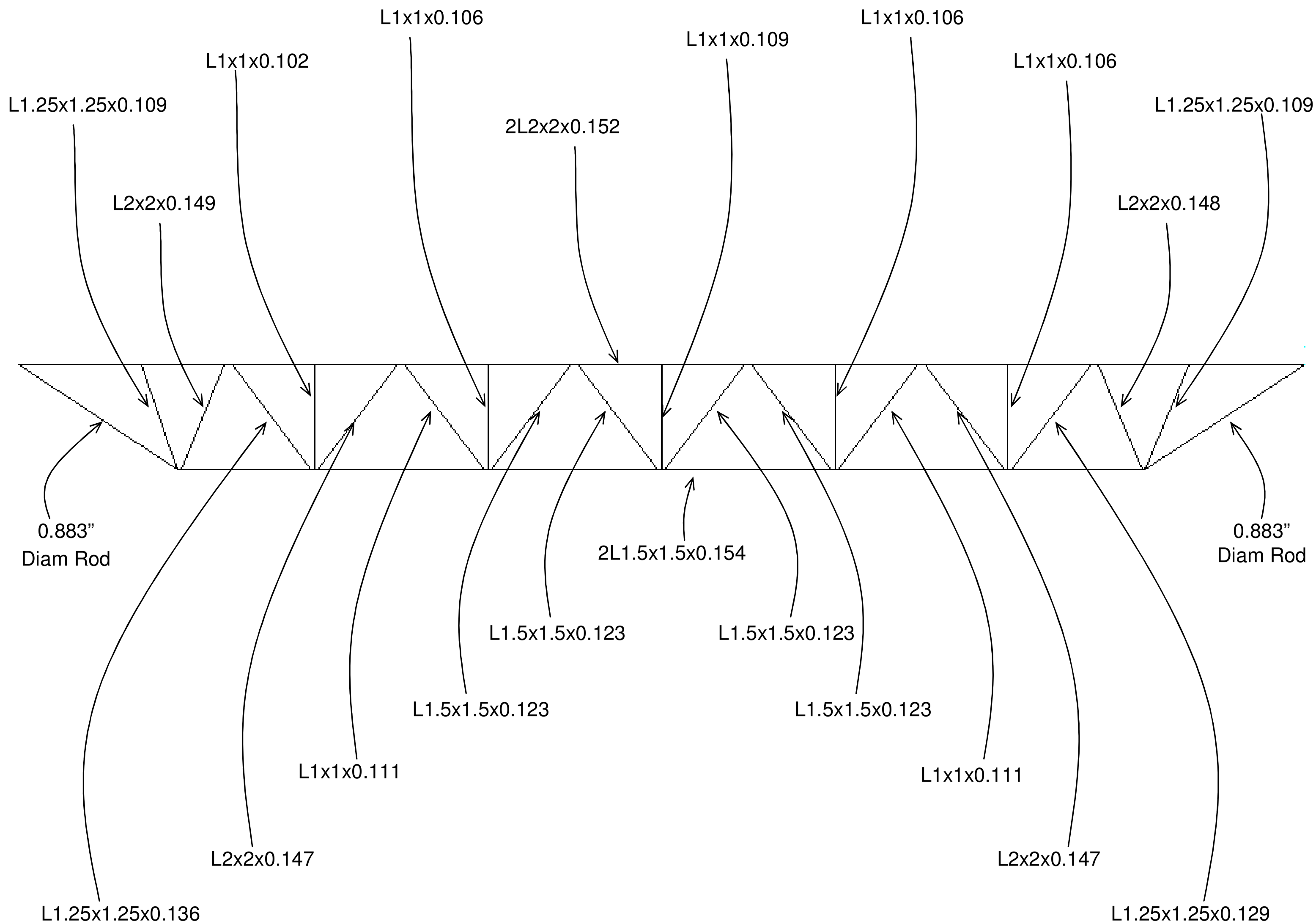


Figure A.6 Three Span Footbridge- Joist 4

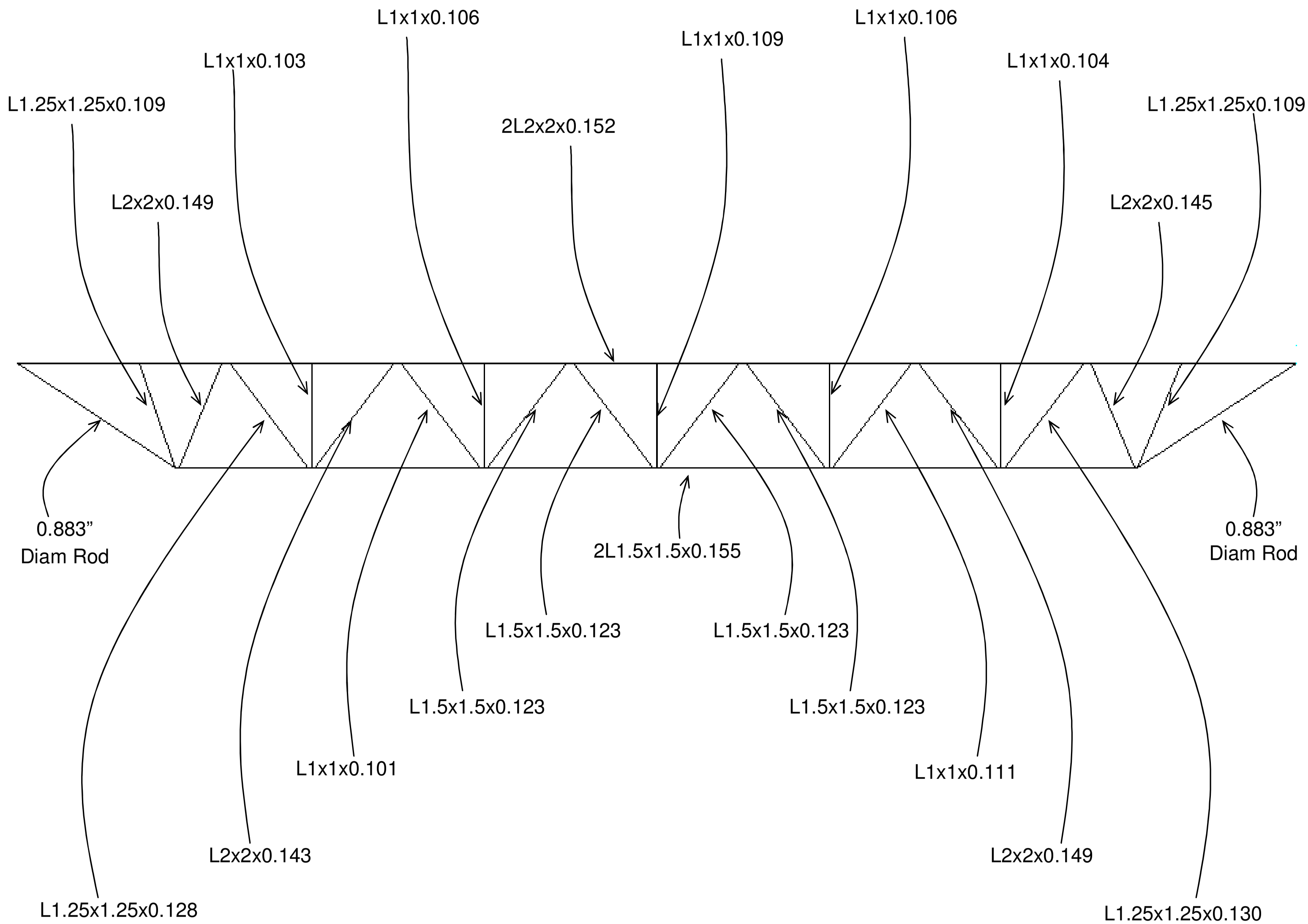


Figure A.7 Three Span Footbridge- Joist 5

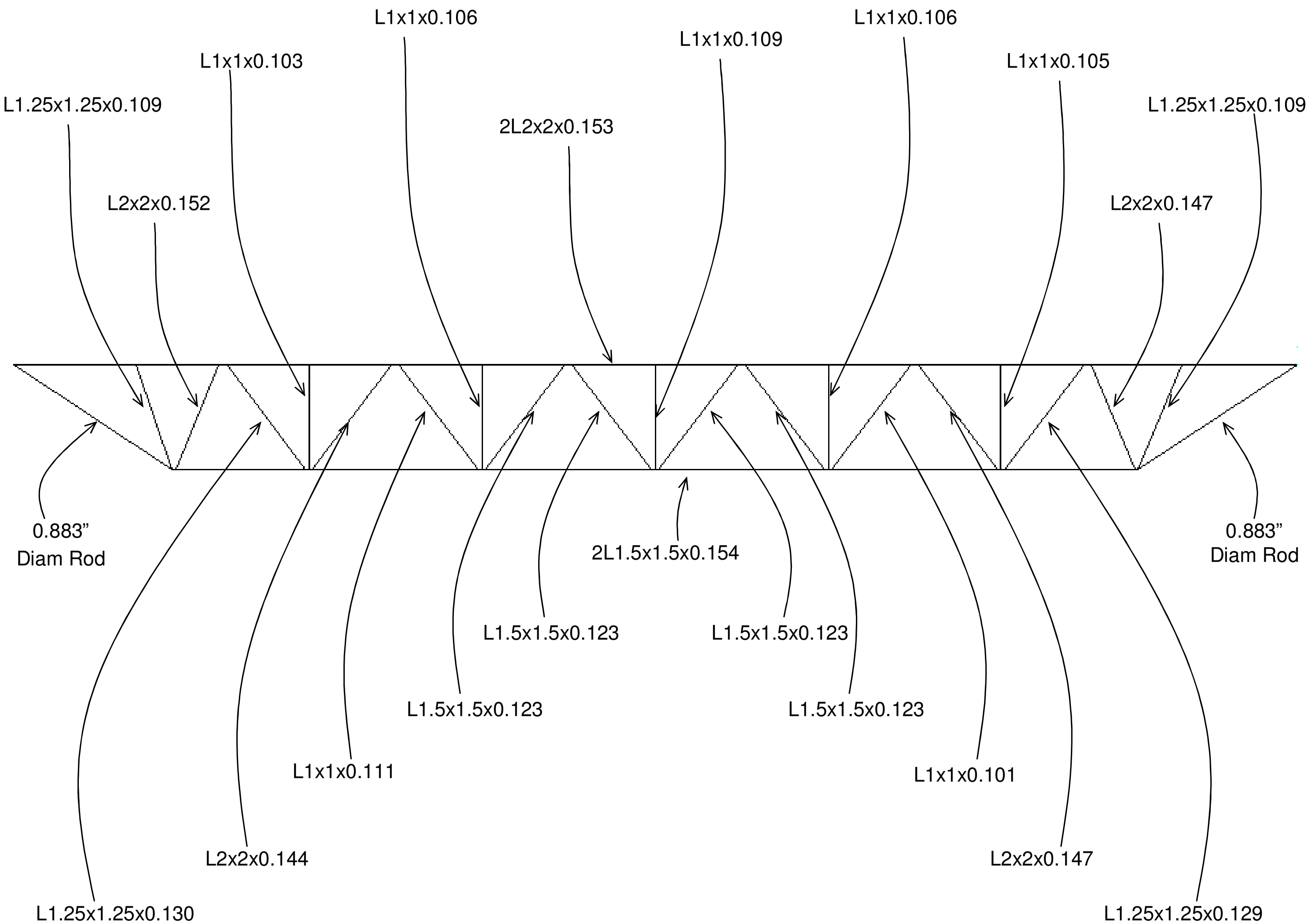


Figure A.8 Three Span Footbridge- Joist 6

APPENDIX B

DESIGN GUIDE 11 CALCULATIONS FOR SINGLE SPAN FOOTBRIDGE

APPENDIX B

DESIGN GUIDE 11 CALCULATIONS FOR SINGLE SPAN FOOTBRIDGE

Weight Calculations

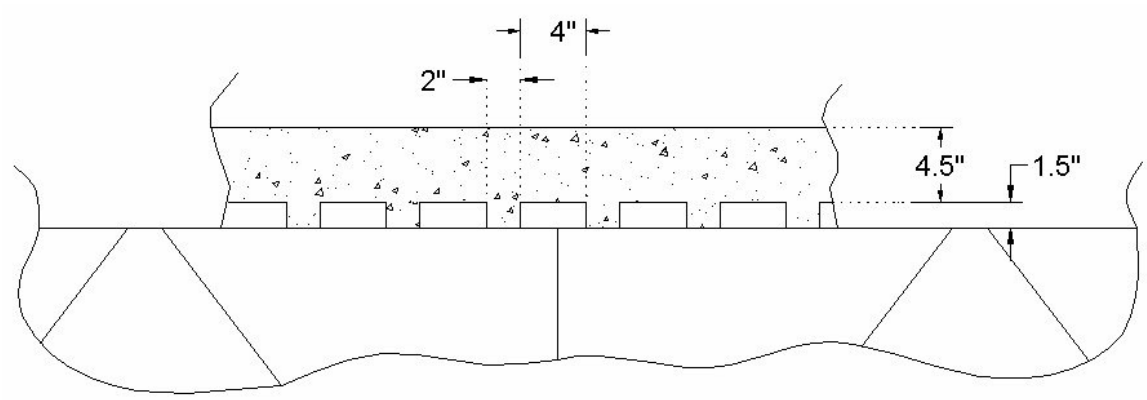


Figure B.1

Concrete slab= 4.50" + 1.50" / 3 = 5.00"

Measured concrete density = 142.32 lbs / ft^3

w_{slab} = (142.32 lbs / ft^3)x(5" / 12") = 59.30 lbs / ft^2

W_c=59.30 x 30 x 7=12543 lbs

1.5VL22 Cold-formed steel deck = 1.78 lbs / ft^2

W_d=1.78 x 30 x 7= 373.8 lbs

30K7 Open web steel joist = 12.3 lbs / ft

W_j=2 x 30 x 12.3= 738 lbs

4 reinforcement bars: 0.668 lb / ft

4 bars parallel to joists: 4 lines of 30 ft = 120 ft 120 x 0.668=80.16 lbs

4 bars perpendicular to joists: 18 lines of 6 ft = 108 ft 108 x 0.668=72.144 lbs

W_r= (120 x 0.668) + (108 x 0.668) = 152.304 lbs

6" deep pour stops = 1.949 lbs / ft

W_p=2 x (30+7) x 1.949 = 144.226 lbs

Welded Wire Fabric: 6x6xW4xW4= 58 lbs / 100 ft^2

W_w=4 x 30 x 0.58 =69.6 lbs

Reinforcement bar chairs: 0.212 lb / ft

Chairs parallel to joists: 4 lines of 30 ft = 120 ft 120 x 0.212=25.44 lbs

Chairs perpendicular to joists: 18 lines of 5 ft = 90 ft 90 x 0.212=19.08 lbs

W_{ch}= (120 x 0.212) + (90 x 0.212) =44.52 lbs

Stand-off shear screws= 0.12 lbs

W_s= (64) x (0.12) =7.68 lbs

Self-drilling screws: 3 lbs (estimated)

W_{ss}=3 lbs

W_{total}= W_c+ W_d+ W_j+ W_r+ W_p+ W_w+ W_{ch}+ W_s+ W_{ss}= 13986.1 lbs

$$\frac{W_{total}}{2} = 6993.1 \text{ lbs per joist}$$

(W_{total}) / 2 =6993.1 lbs per joist

$$w = \left(\frac{W_{total}}{2}\right)\left(\frac{1}{30}\right)\left(\frac{1}{1000}\right) = 0.2331 \text{ kips / ft per joist}$$

$$= 0.0194 \text{ kips / in per joist}$$

For the shell elements in the SAP2000 model, Sladki (1999) demonstrated that the unit weight per unit volume, W_{SHELL}, and mass per unit volume M_{SHELL}, of the shell material is given by:

$$W_{SHELL} = \left[\left(\frac{d + d_r/2}{12}\right)w_c + w_d + w_{deck} + w_l + w_{coll}\right]\left(\frac{12}{d}\right)\left(\frac{1}{1{,}728{,}000}\right)$$

$$M_{SHELL} = \frac{W_{SHELL}}{386.1}$$

In these formulae, W_{SHELL} is the unit weight of the material (kips/in^3), d is the depth of concrete above the metal deck (in.), d_r is the height of the metal deck (in.), w_c is the unit weight of concrete (pcf), w_d is the actual superimposed dead load (psf), w_{deck} is the weight of the deck (psf), w_l is the actual live load (psf), and w_{coll} is the collateral loading (psf). Collateral loading is any load that is an addition to typical dead and live loads. The units for the unit mass used in SAP2000 are kip-s^2/in^4. The modulus of elasticity of shell material was set to the dynamic modulus of elasticity of the concrete as defined in the Design Guide, e.g. 1.35 times the static modulus of elasticity of the concrete. Also, the Poisson's ratio for the material, ν, was set as 0.2.

According to Figure B.1 and above calculations, for the single span footbridge:

$$W_{SHELL} = \left[\left(\frac{d + d_r/3}{12}\right)w_c + w_d + w_{deck} + w_l + w_{coll}\right]\left(\frac{12}{d}\right)\left(\frac{1}{1{,}728{,}000}\right)$$

$$W_{SHELL} = \left[\left(\frac{4.5 + 1.5/3}{12}\right)142.32 + 1.78 + \left(\frac{152.3 + 144.2 + 69.6 + 44.5 + 7.7 + 3}{30.7}\right)\right]\left(\frac{12}{4.5}\right)\left(\frac{1}{1{,}728{,}000}\right)$$

W_{SHELL}= 9.736.10^{-5} kip/in^3

M_{SHELL}= W_{SHELL}/ 386.1= 2.522.10^{-7} kip-s^2/in^4

M_{SHELL} and W_{SHELL} are used in the FE model as Slab material (shell element) properties.

Then, for the three span footbridge:

W_{total}= W_c+ W_d+ W_j+ W_r+ W_p+ W_w+ W_{ch}+ W_s+ W_{ss}= 40824.4 lbs

And,

$$W_{SHELL} = \left[\left(\frac{d + d_r/3}{12}\right)w_c + w_d + w_{deck} + w_l + w_{coll}\right]\left(\frac{12}{d}\right)\left(\frac{1}{1{,}728{,}000}\right)$$

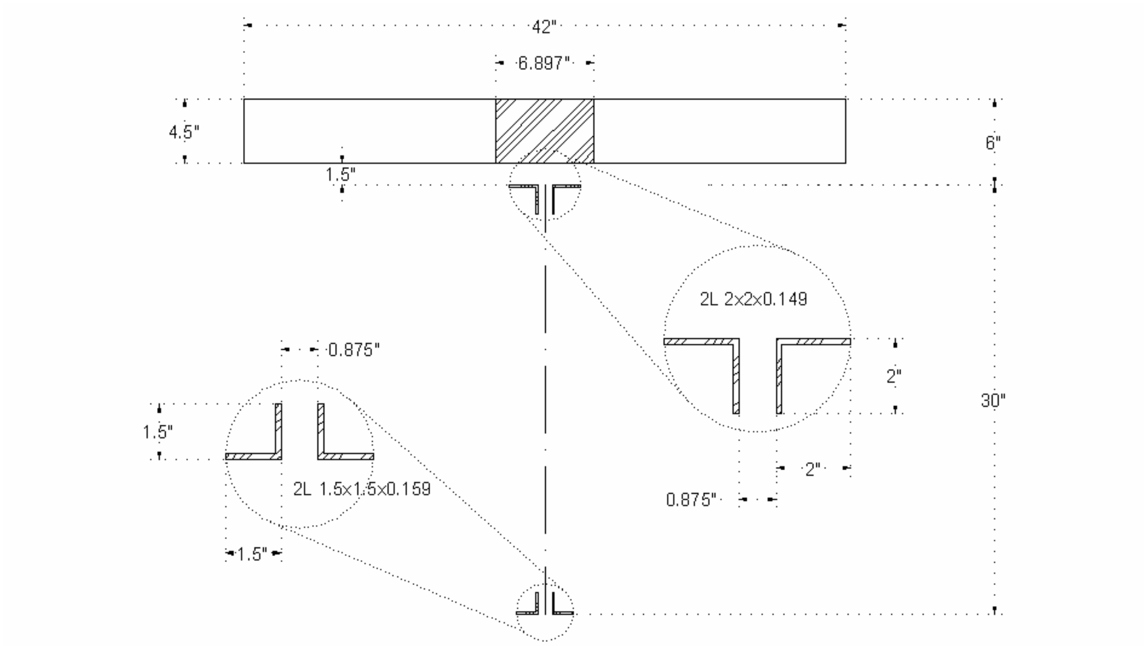
$$W_{SHELL} = \left[\left(\frac{4.5 + 1.5/3}{12}\right)138 + 1.78 + \left(\frac{(152.3 + 144.2 + 69.6 + 44.5 + 7.7 + 3)(3)}{90.7}\right)\right]\left(\frac{12}{4.5}\right)\left(\frac{1}{1{,}728{,}000}\right)$$

W_{SHELL}= 9.458.10^{-5} kip/in^3

M_{SHELL}= W_{SHELL}/ 386.1= 2.45.10^{-7} kip-s^2/in^4

M_{SHELL} and W_{SHELL} are used in the FE model as Slab material (shell element) properties.

Cross Sectional Properties:

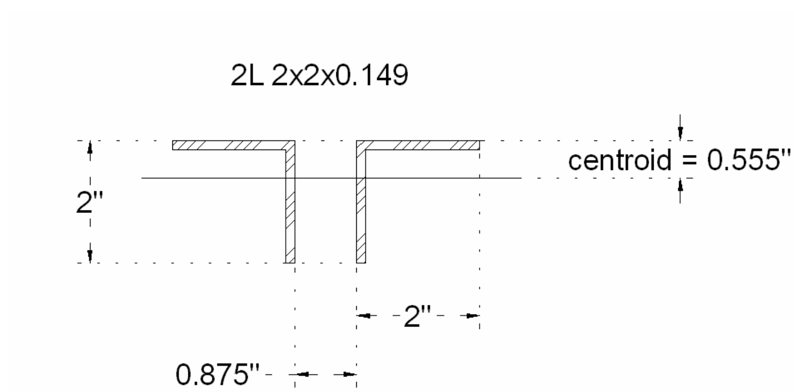


Joist top chord: 2L 2x2x0.149

A_{tc}= 2(2 x 0.149 x 2 – 0.149 x 0.149) = 1.148 in^2

Centroid of top chord, y_{tc}:

$$y_{tc} = \frac{\Sigma A_i y_i}{\Sigma A_i} = \frac{2[(2)(0.149)(1) + (2-0.149)(0.149)(0.149/2)]}{2[(2)(0.149) + (2-0.149)(0.149)]} = 0.555''$$



Moment of inertia of top chord, I_{tc}:

$$I_{tc} = 2\left[\frac{1}{12}(0.149)(2)^3 + (2)(0.149)(1-0.555)^2\right] + 2\left[\frac{1}{12}(2-0.149)(0.149)^3 + (2-0.149)(0.149)(0.555-0.149/2)^2\right]$$

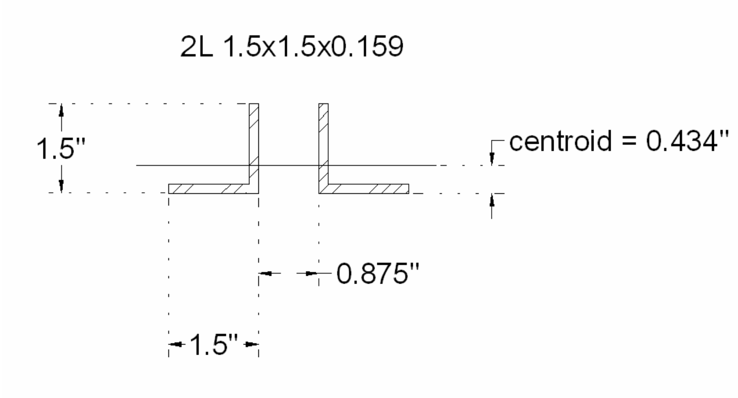
$$= 2[0.15834 + 0.06419] = 0.445 in^4$$

Joist bottom chord: 2L 1.5x1.5x0.159

A_{bc}= 2(1.5 x 0.159 x 2 – 0.159 x 0.159) = 0.903 in^2

Centroid of bottom chord, y_{bc}:

$$y_{bc} = \frac{\Sigma A_i y_i}{\Sigma A_i} = \frac{2[(1.5)(0.159)(0.75) + (1.5 - 0.159)(0.159)(0.159/2)]}{2[(1.5)(0.159) + (1.5 - 0.159)(0.159)]} = 0.434"$$



Moment of inertia of bottom chord, I_{bc}:

$$I_{bc} = 2\left[\frac{1}{12}(0.159)(1.5)^3 + (1.5)(0.159)(0.75 - 0.434)^2\right]$$
$$+ 2\left[\frac{1}{12}(1.5 - 0.159)(0.159)^3 + (1.5 - 0.159)(0.159)(0.434 - 0.159/2)^2\right]$$
$$= 2[0.06853 + 0.02724] = 0.192 in^4$$

Joist Overall:

A_j= 1.148 + 0.903 = 2.051 in^2

Centroid of joist, y_j:

$$y_j = \frac{\Sigma A_i y_i}{\Sigma A_i} = \frac{(1.148)(30 - 0.555) + (0.903)(0.434)}{1.148 + 0.903} = 16.672"$$

= 16.672” from bottom

= (30”-16.672”) = 13.328” from top

Moment of inertia of joist, $I_j = I_{chords}$

$$I_j = \left[0.445 + (1.148)(13.328 - 0.555)^2\right] + \left[0.192 + (0.903)(16.672 - 0.434)^2\right]$$

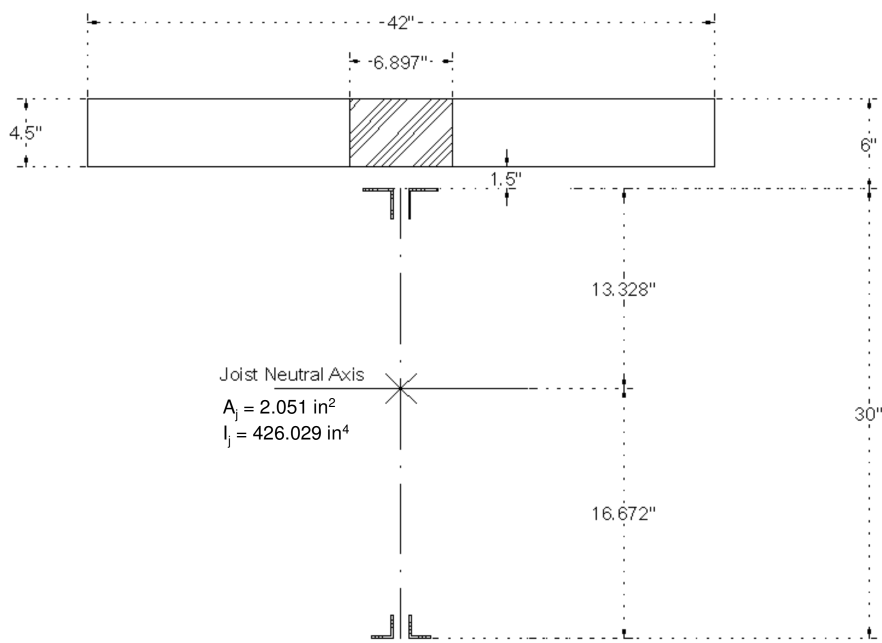
$$= 187.741 + 238.288 = 426.029 in^4$$

$w_{concrete}$= 142.32 lb/ ft^3

f_c' = 4317 psi = 4.317 ksi

$$Dynamic E_c = 1.35 w^{1.5} \sqrt{f'_c} = (1.35)(142.32)^{1.5} \sqrt{4.317} = 4762.4 ksi$$

$$b_{tr} = \frac{s}{(E_s/E_c)} = \frac{42''}{(29000/4762.4)} = 6.897''$$



Next, calculate composite section centroid:

Assume there is no tension in concrete.

$$y_{composite} = \frac{\Sigma A_i y_i}{\Sigma A_i} = \frac{(6.897)(4.5)(33.75) + (2.051)(16.672)}{(6.897)(4.5) + 2.051} = 32.691''$$

= 32.691” from bottom

= (36”-32.691”) = 3.309” from top-- Concrete in Tension- Acceptable for floor vibration purposes.

Moment of inertia of composite cross section, $I_{composite}$:

$$I_{composite} = \left[426.029 + (2.051)(32.691 - 16.672)^2\right]$$

$$+\left[\frac{1}{12}(6.897)(4.5)^3 + (6.897)(4.5)(3.309 - 4.5/2)^2\right]$$

$$= \left[952.333 + 87.181\right] = 1039.514 in^4$$

In Design Guide 11, C_r is the modification factor that accounts for the reduction in the moment of inertia due to shear deformations and joint eccentricity in the web members of joists and joist girders:

$$C_r = 0.8455\left(1 - e^{-0.28(L/D)}\right)^{2.8} \quad \text{for angle web joists } (6 \le L/D \le 24)$$

$$\frac{L}{D} = \frac{356}{30} = 6 < 11.867 < 24$$

$$C_r = 0.8455\left(1 - e^{-0.28(356/30)}\right)^{2.8} = 0.76288$$

For bare Joists:

$$I_{\text{mod}} = C_r I_{chords} = (0.76288)(426.029) = 325.009 in^4$$

The effective composite moment of inertia for joist supported tee-beams is going to be less than the fully composite moment of inertia of the entire cross section due to shear deformations and joint eccentricity (Band and Murray 1996). Effective composite moment of inertia of joist supported tee-beams is given as:

$$I_{eff} = \frac{1}{\dfrac{\gamma}{I_{chords}} + \dfrac{1}{I_{comp}}}$$

where

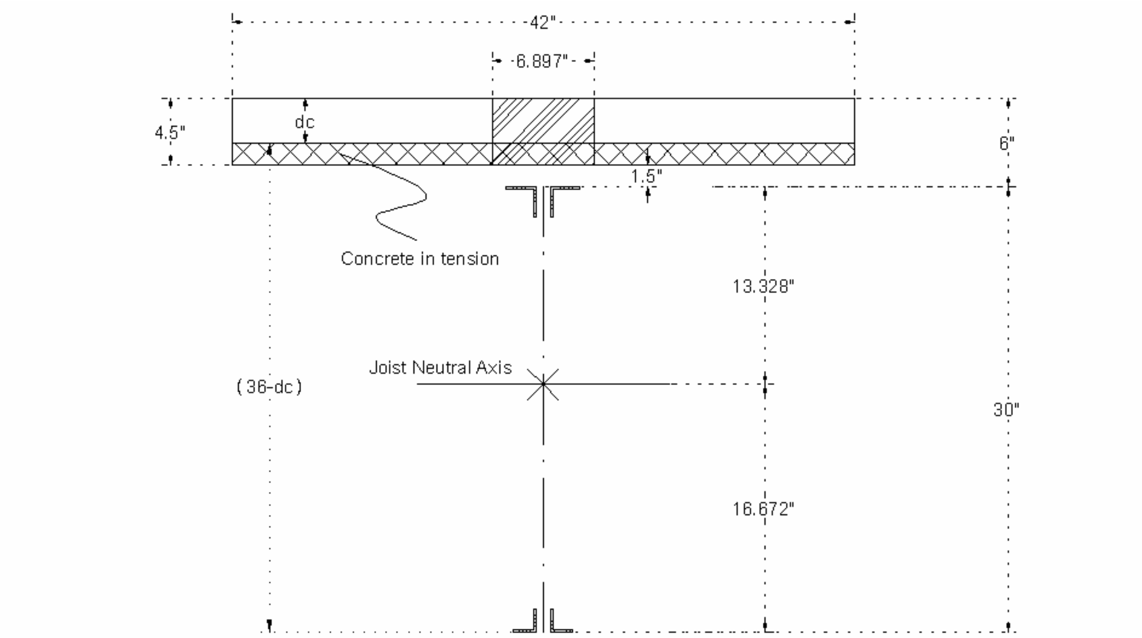
$$\gamma = \frac{1}{\mathrm{C_r}} - 1 = \frac{1}{0.76288} - 1 = 0.31082$$

$$I_{eff} = \frac{1}{\dfrac{0.31082}{426.029} + \dfrac{1}{1039.514}} = 591.172 in^4$$

then,

$$f_n = \frac{\pi}{2}\sqrt{\frac{gE_sI_{eff}}{wL^4}} = \frac{\pi}{2}\sqrt{\frac{(386.1)(29000)(591.172)}{(0.2331/12)(356)^4}} = 7.235Hz$$

For comparison purposes, let's look at the case where there is tension in the concrete:



$$y_{composite} = (36 - d_c) = \frac{(6.897)(d_c)(36 - d_c/2) + (2.051)(16.672)}{(6.897)(d_c) + 2.051}$$

Solving for d_c:

$d_c = 3.106"$

$y_{composite} = (36 - d_c) = (36 - 3.106) = 32.894"$

Moment of inertia of composite cross section, $I_{composite}$:

$$I_{composite} = \left[426.029 + (2.051)(32.894 - 16.672)^2\right]$$
$$+ \left[\frac{1}{12}(6.897)(3.106)^3 + (6.897)(3.106)(3.106/2)^2\right]$$
$$= \left[965.756 + 68.888\right] = 1034.644 in^4$$

$C_r = 0.8455\left(1 - e^{-0.28(L/D)}\right)^{2.8}$ for angle web joists ($6 \le L/D \le 24$)

$$\frac{L}{D} = \frac{356}{30} = 6 < 11.867 < 24$$

$$C_r = 0.8455\left(1 - e^{-0.28(356/30)}\right)^{2.8} = 0.76288$$

$$I_{eff} = \frac{1}{\dfrac{\gamma}{I_{chords}} + \dfrac{1}{I_{comp}}}$$

where

$$\gamma = \frac{1}{\mathrm{C_r}} - 1 = \frac{1}{0.76288} - 1 = 0.31082$$

$$I_{eff} = \frac{1}{\dfrac{0.31082}{426.029} + \dfrac{1}{1034.644}} = 589.594 in^4$$

then,

$$f_n = \frac{\pi}{2}\sqrt{\frac{gE_s I_{eff}}{wL^4}} = \frac{\pi}{2}\sqrt{\frac{(386.1)(29000)(589.594)}{(0.2331/12)(356)^4}} = 7.225 Hz \text{ (vs. 7.235 Hz)}$$

$$\frac{(7.235 - 7.225)}{7.235} 100 = 0.134\% \text{ difference}$$

APPENDIX C

STIFFNESS TEST RESULTS- THREE SPAN FOOTBRIDGE

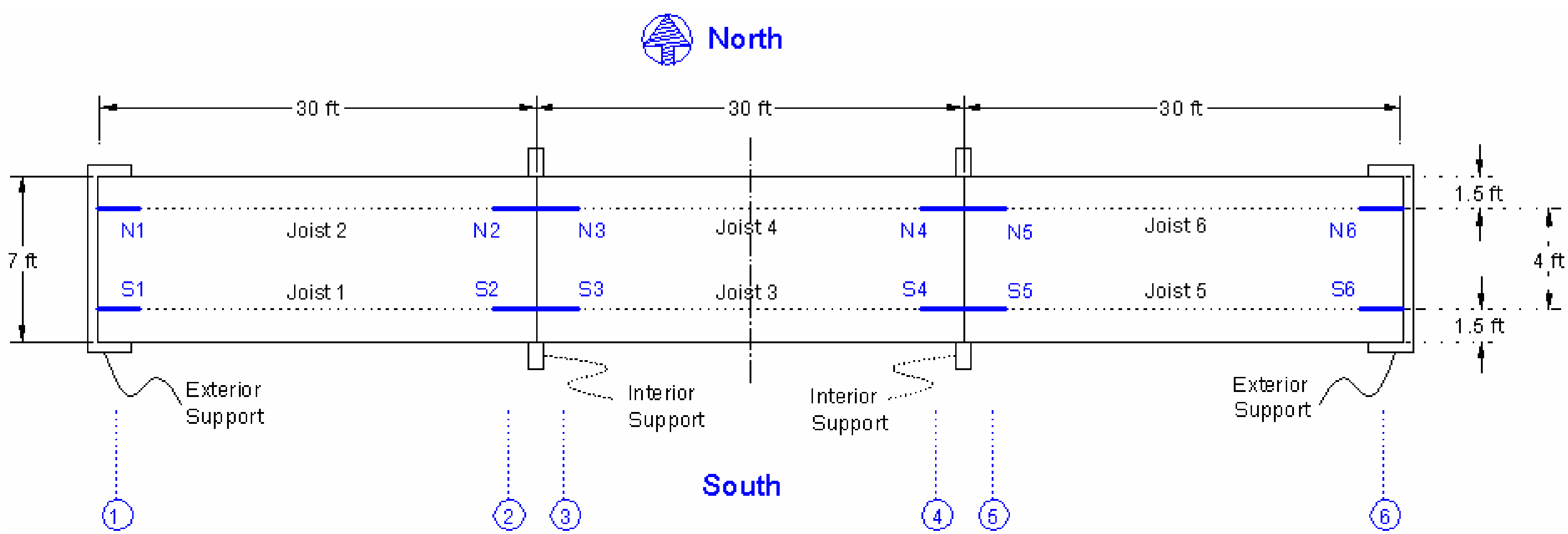


Figure C.1 Load Cell and Joist Configurations- Three Span Footbridge

APPENDIX C

STIFFNESS TEST RESULTS-- THREE SPAN FOOTBRIDGE

C.1 BARE JOIST TESTING

Bare Joists- J1 is loaded 0-600-0 lb- No Bottom Chord Extensions in Place

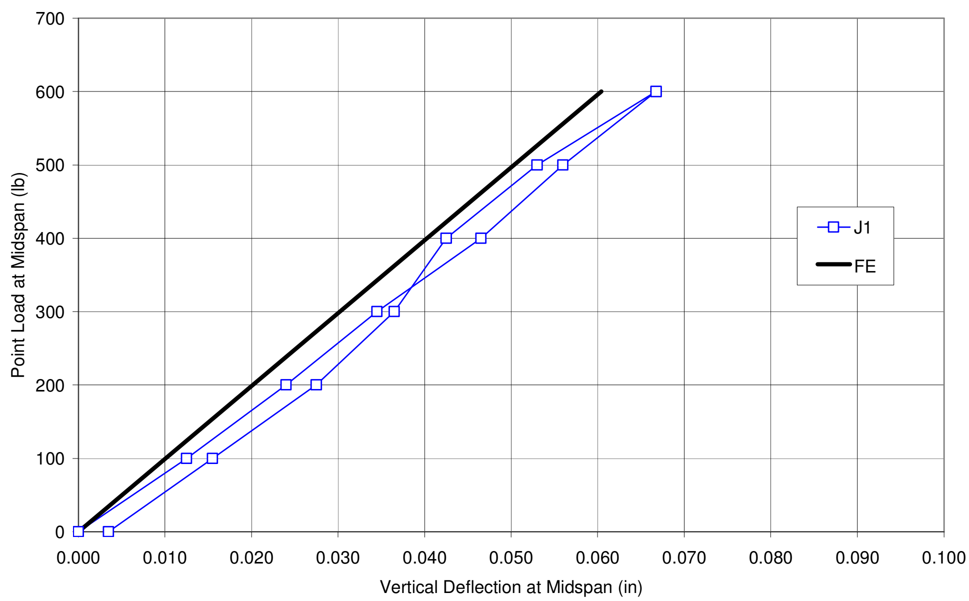


Figure C.2

Bare Joists- J2 is loaded 0-600-0 lb- No Bottom Chord Extensions in Place

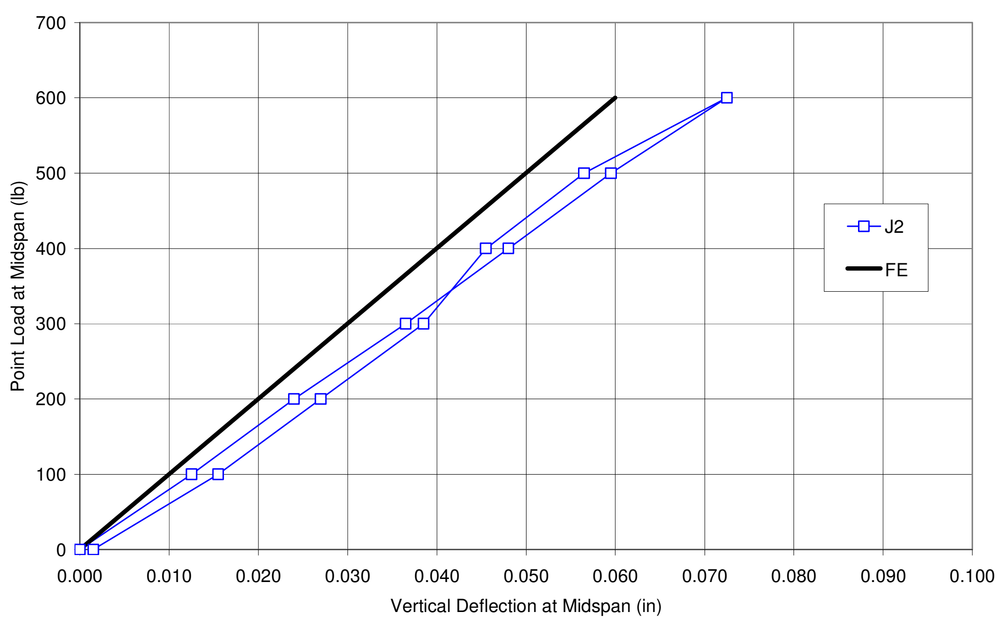


Figure C.3

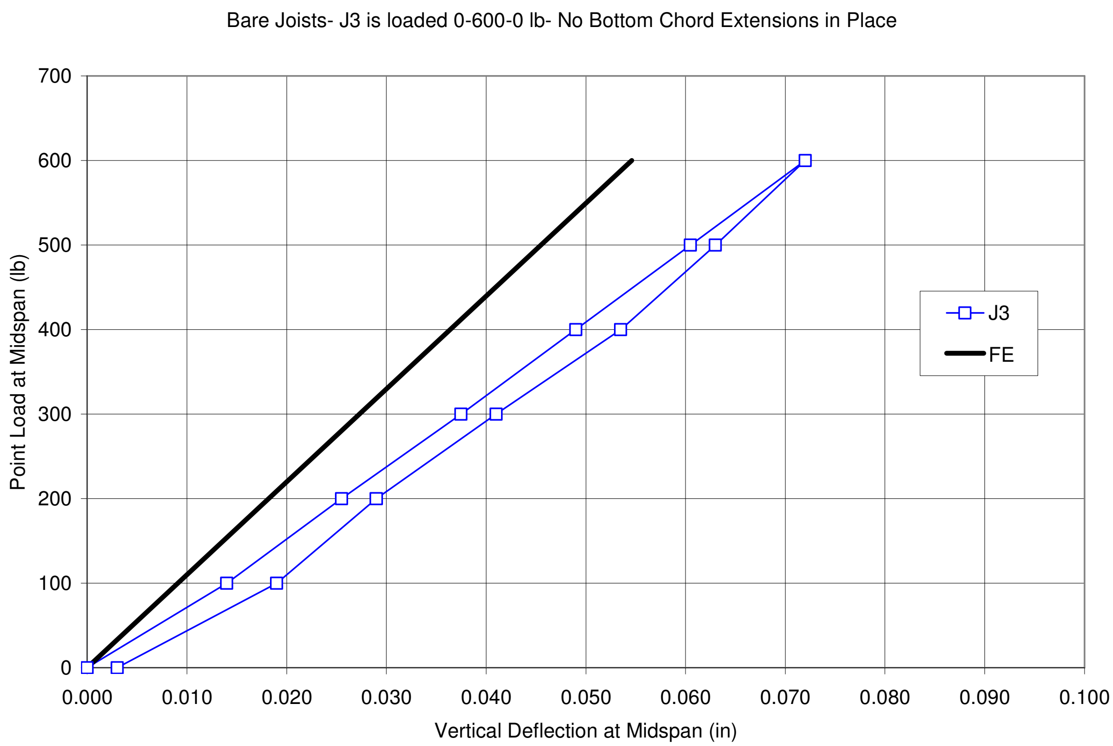


Figure C.4

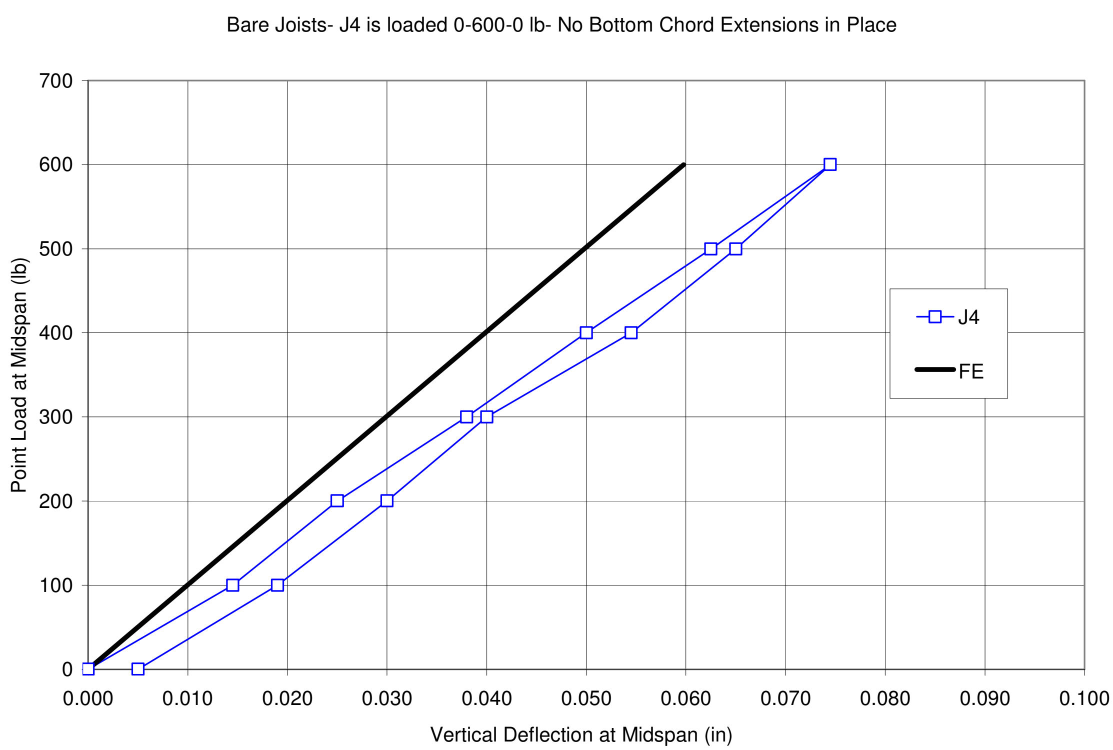


Figure C.5

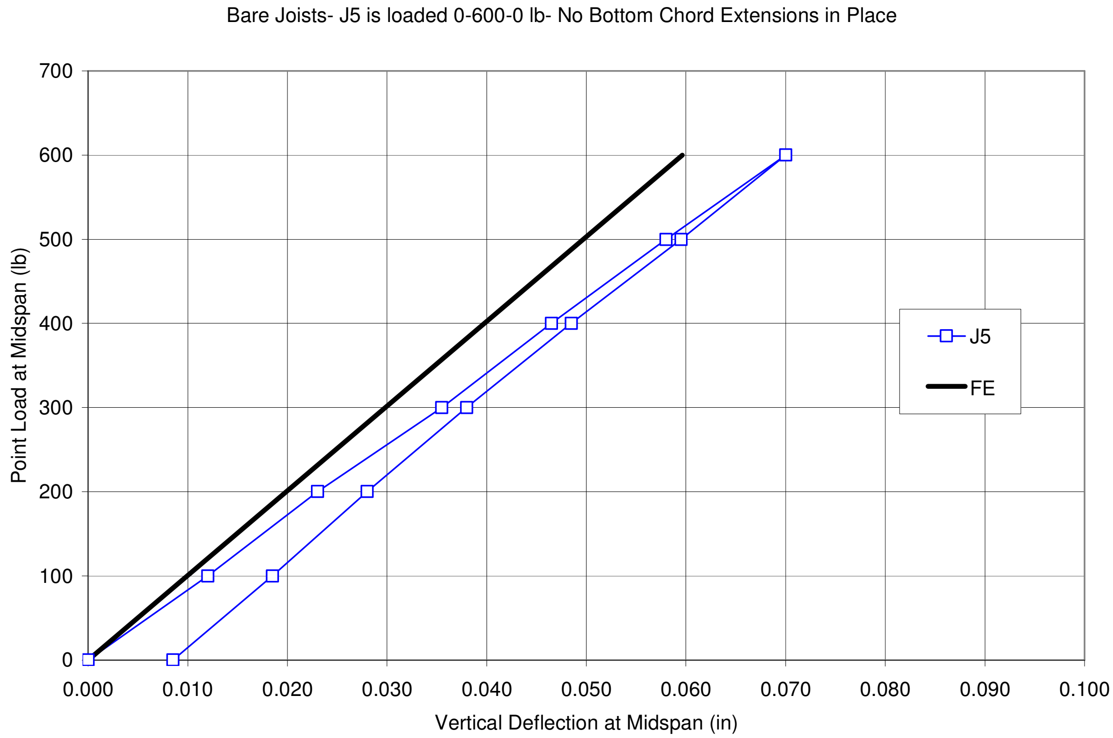


Figure C.6

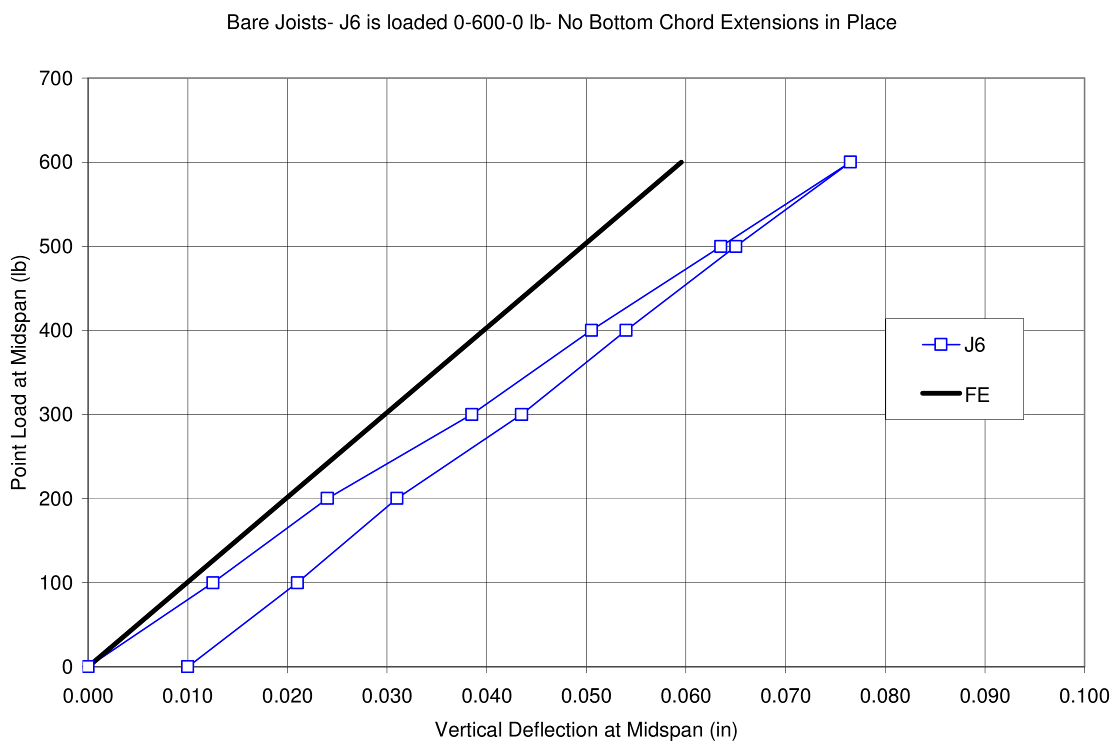


Figure C.7

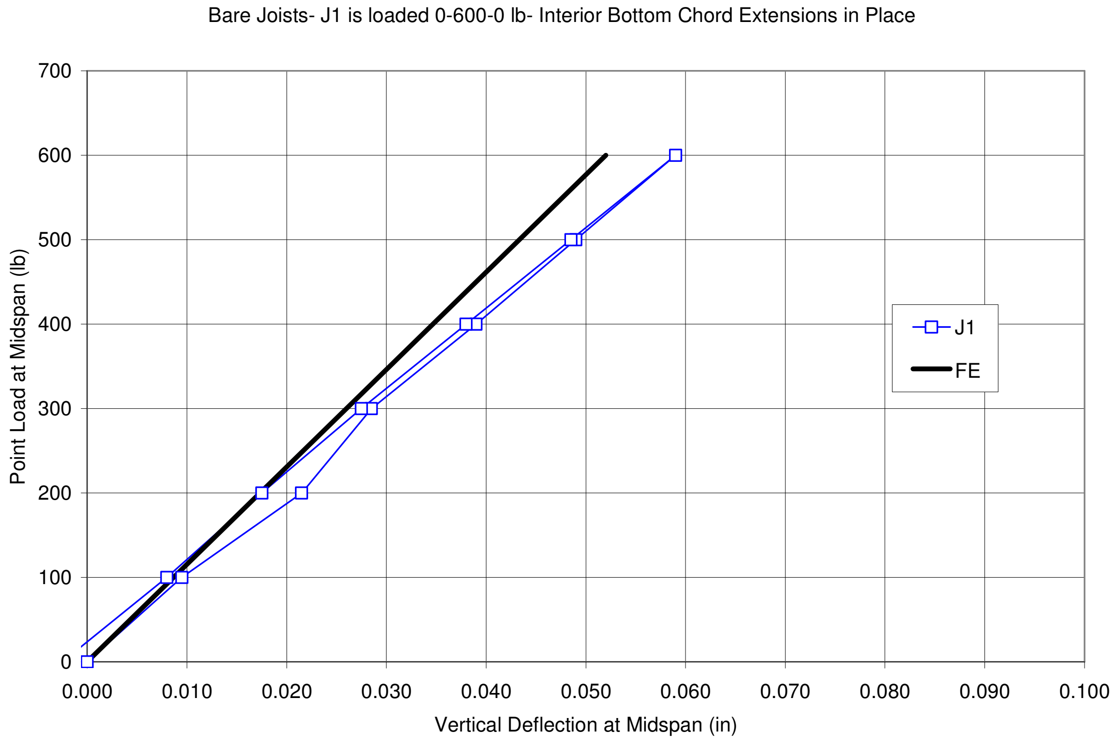


Figure C.8

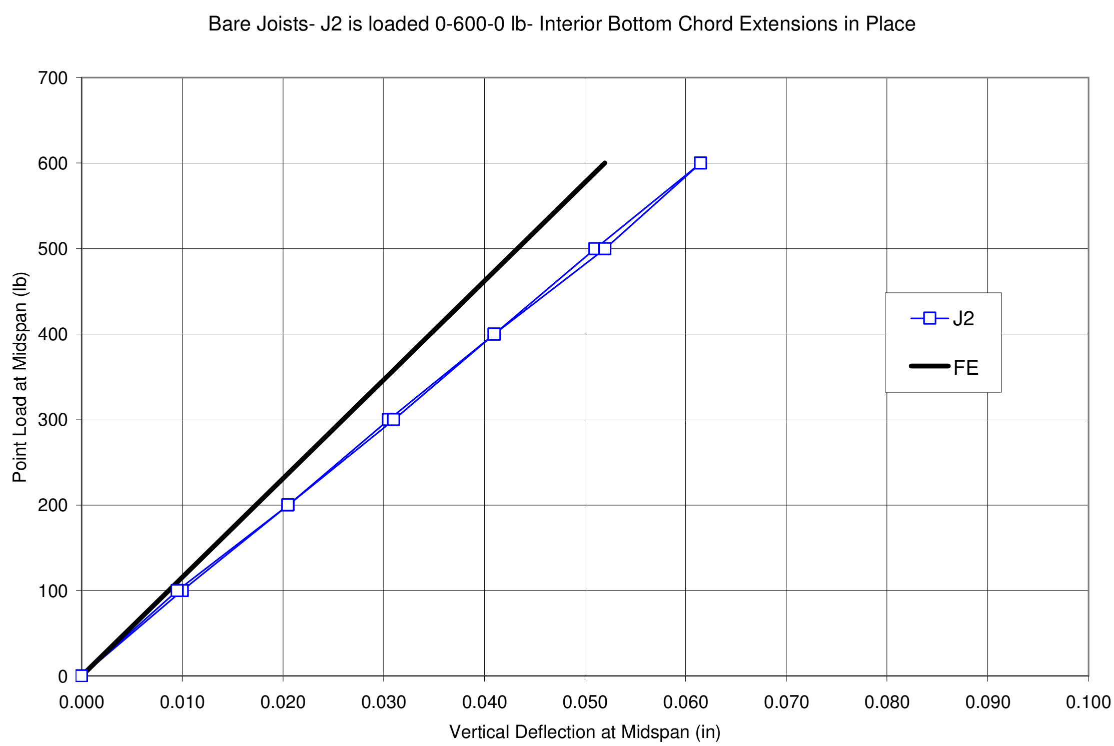


Figure C.9

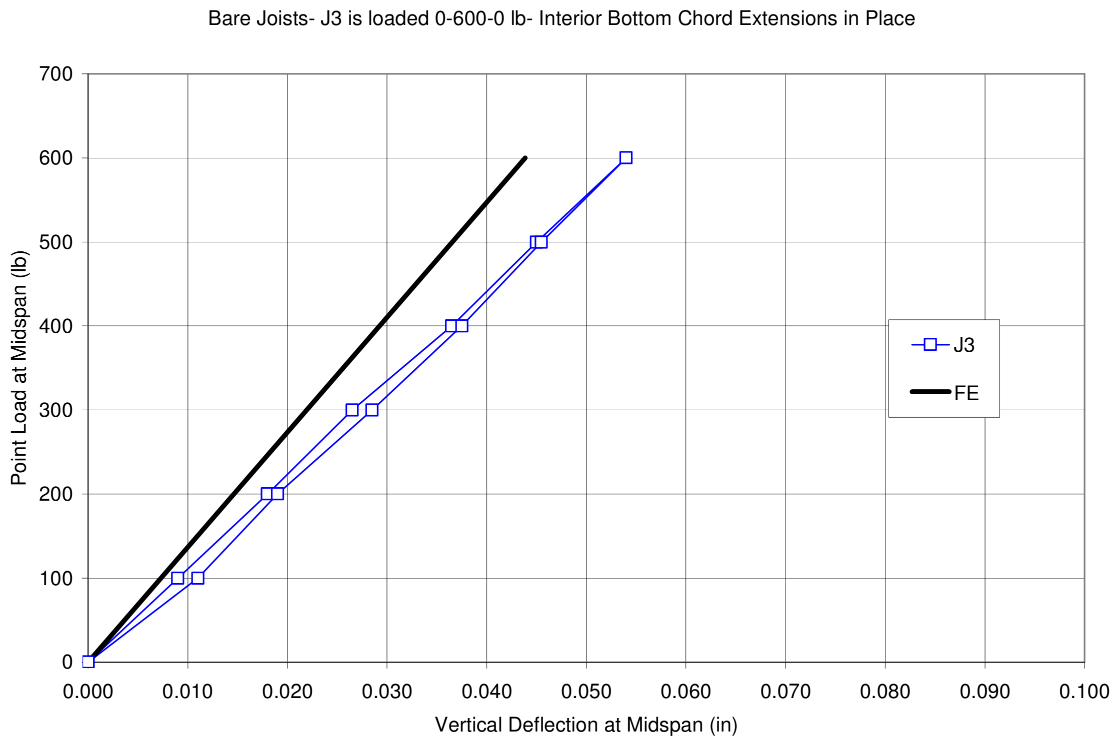


Figure C.10

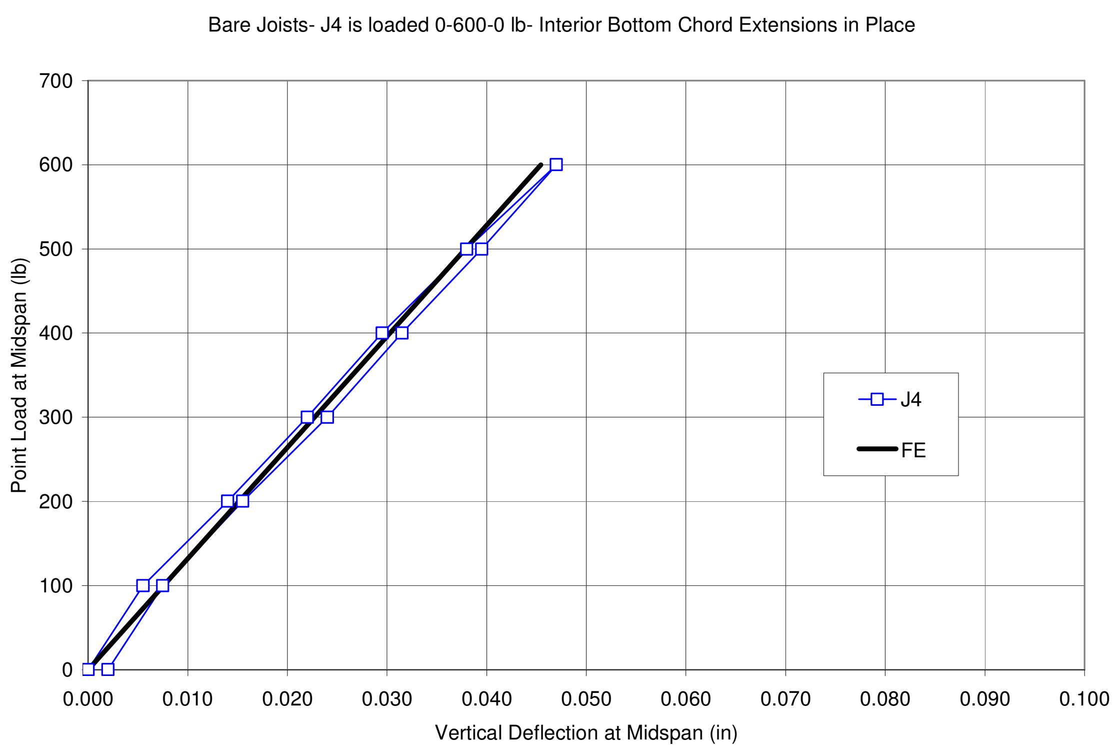


Figure C.11

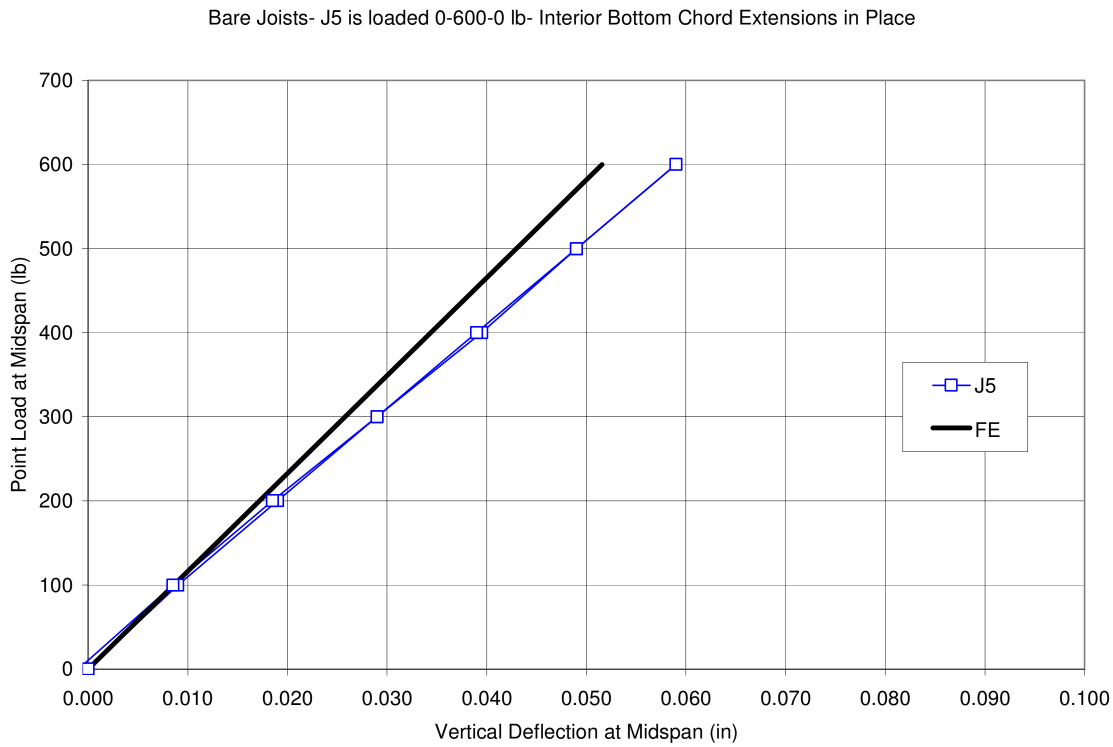


Figure C.12

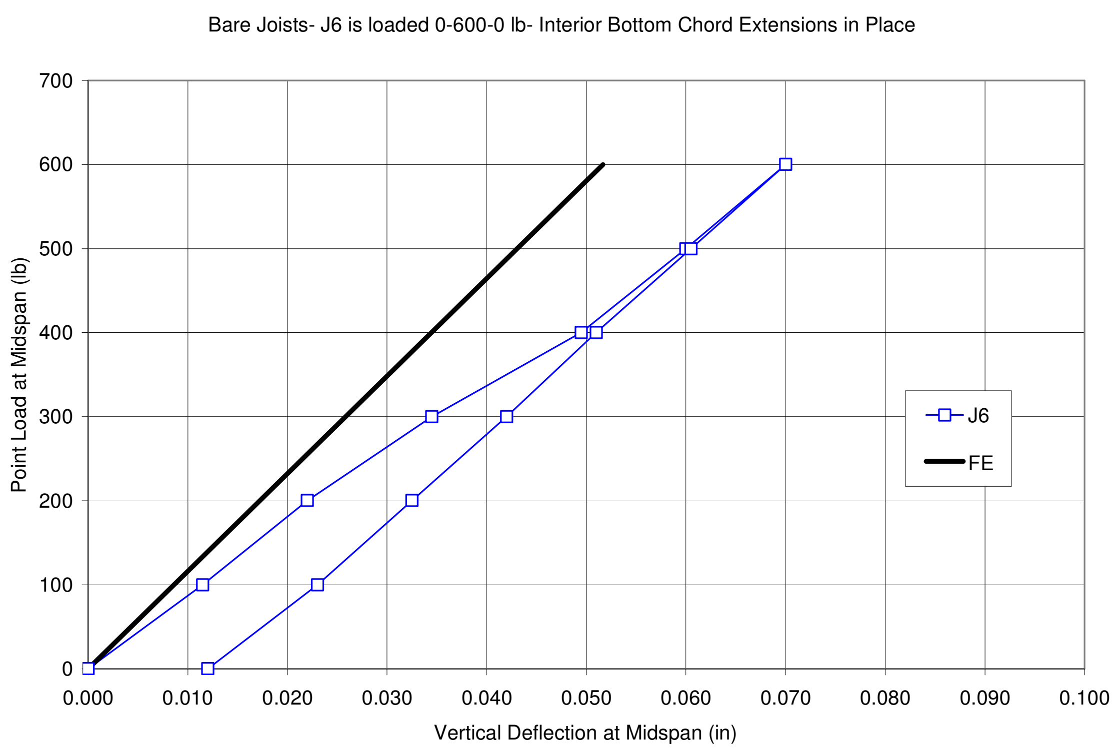


Figure C.13

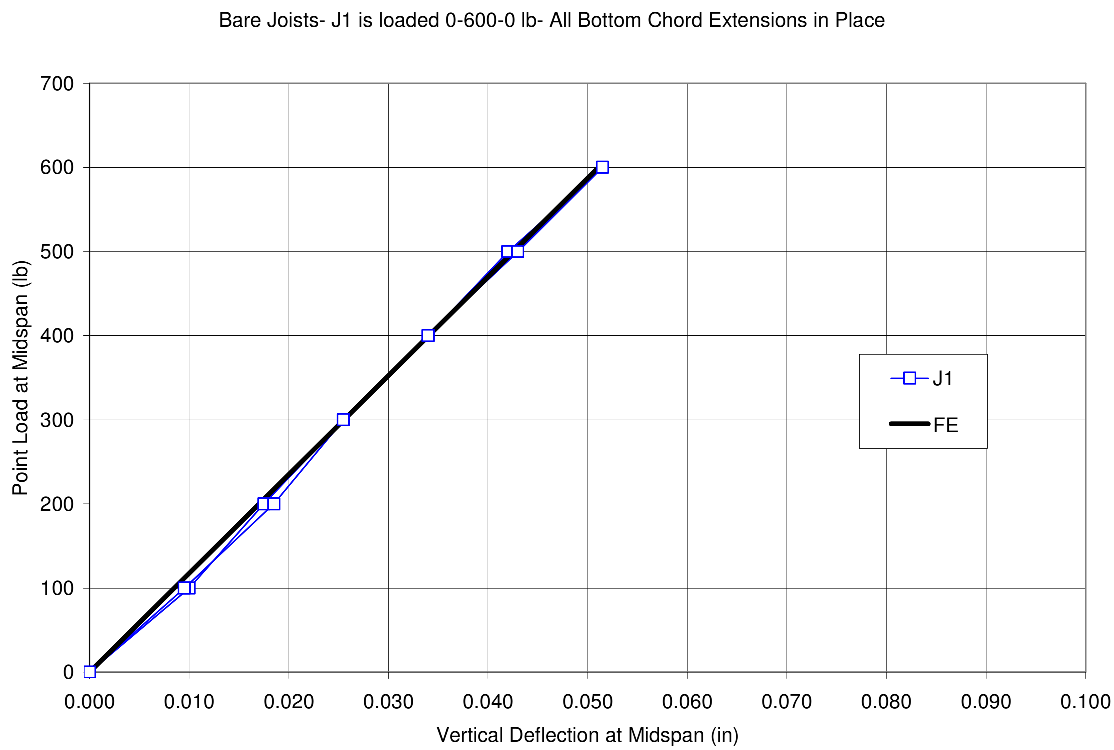


Figure C.14

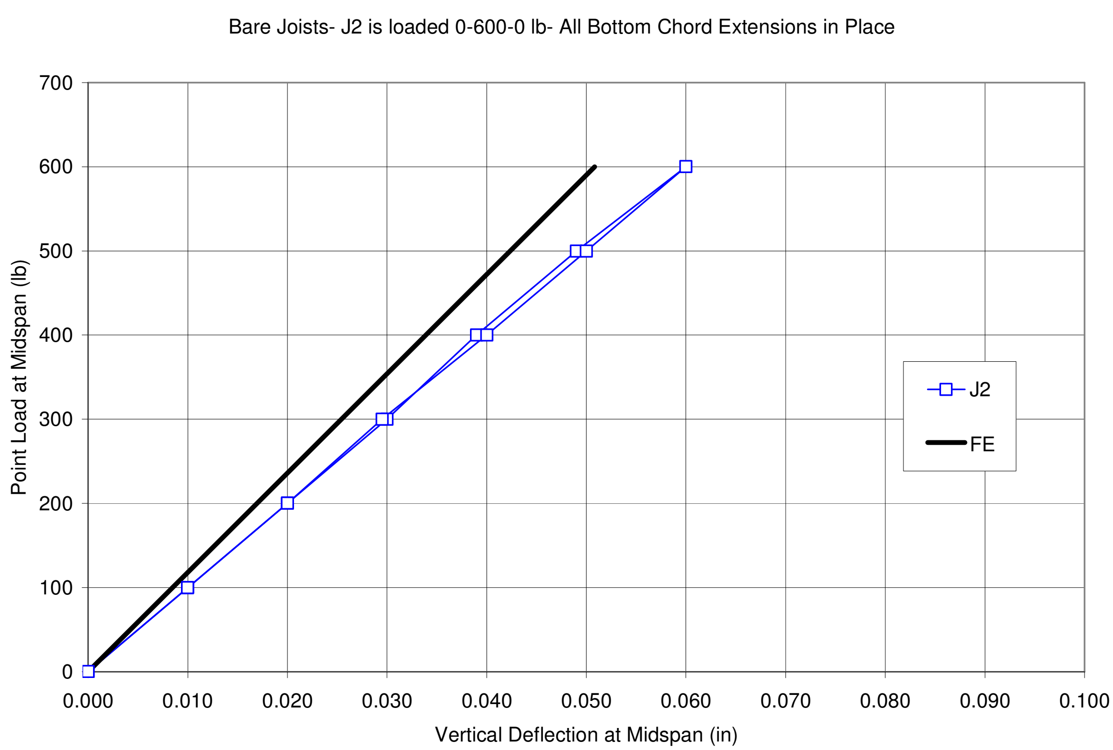


Figure C.15

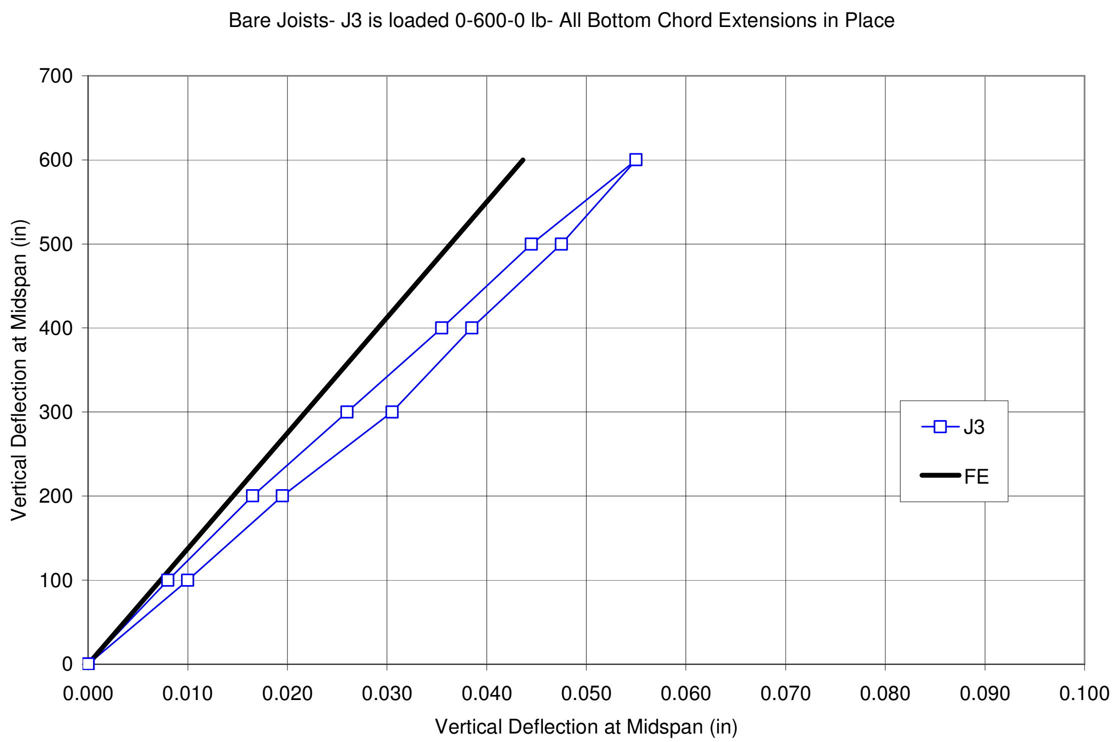


Figure C.16

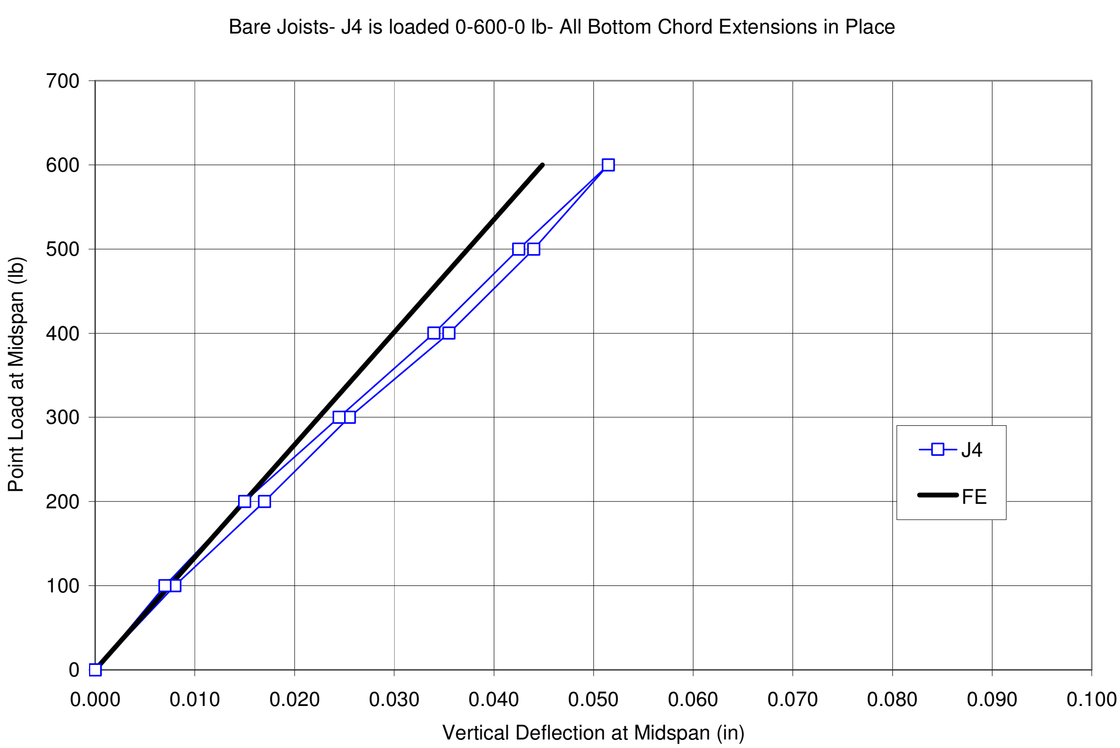


Figure C.17

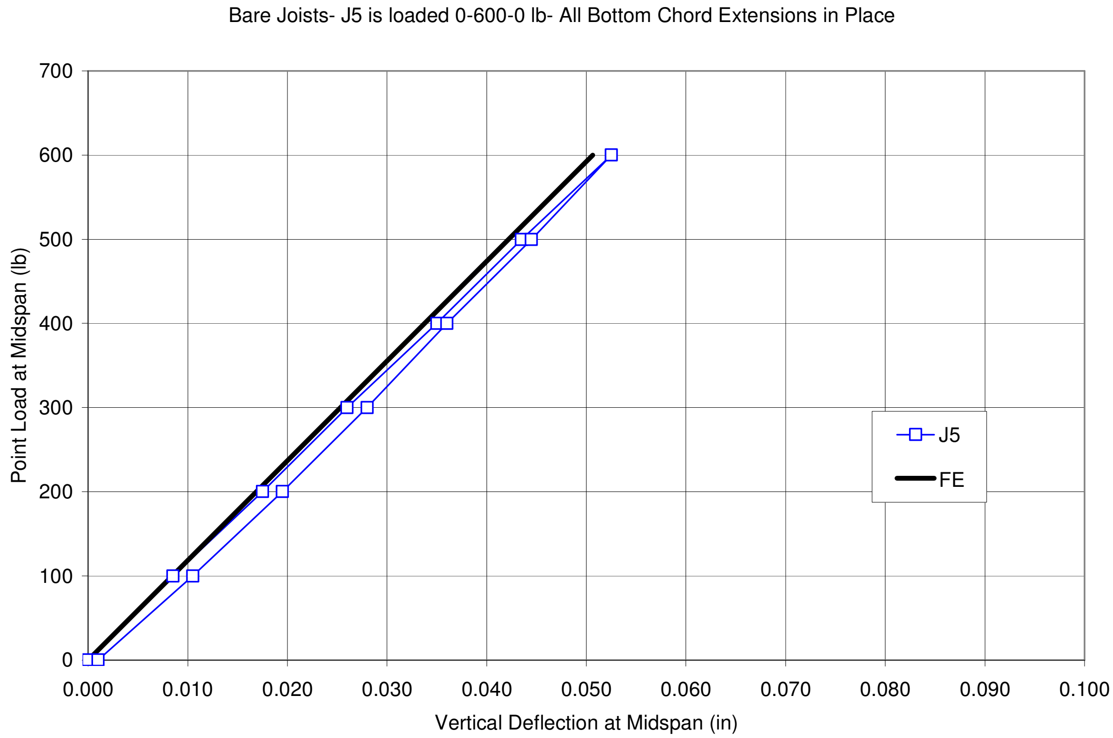


Figure C.18

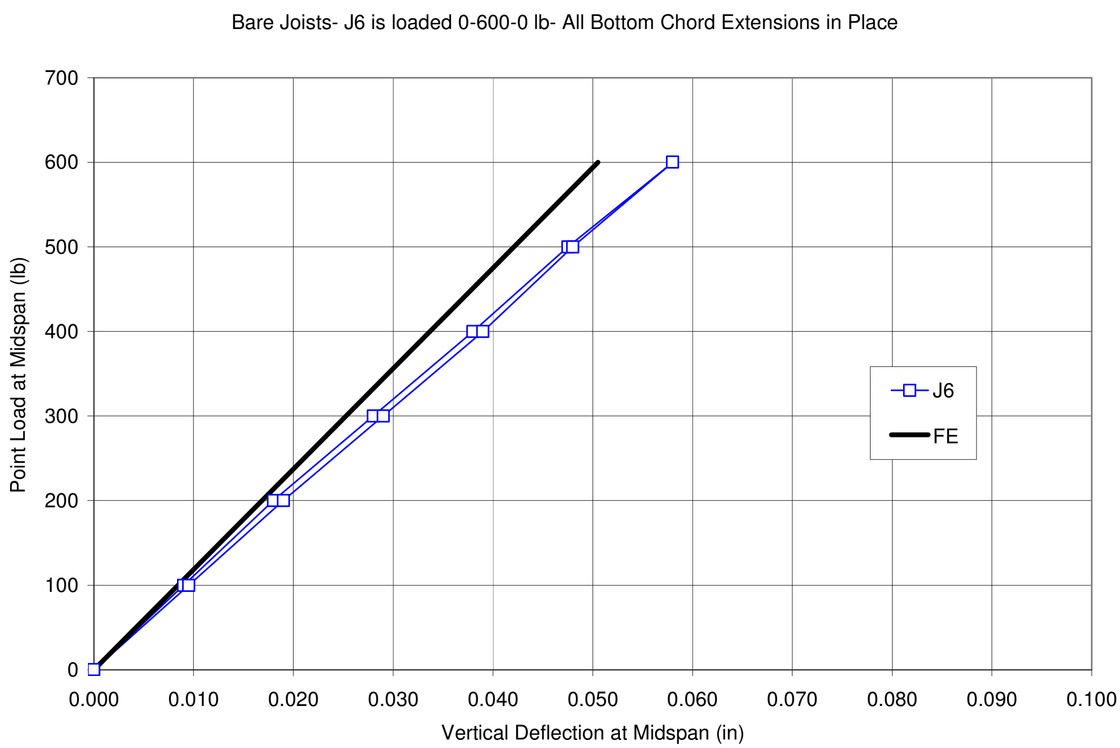


Figure C.19

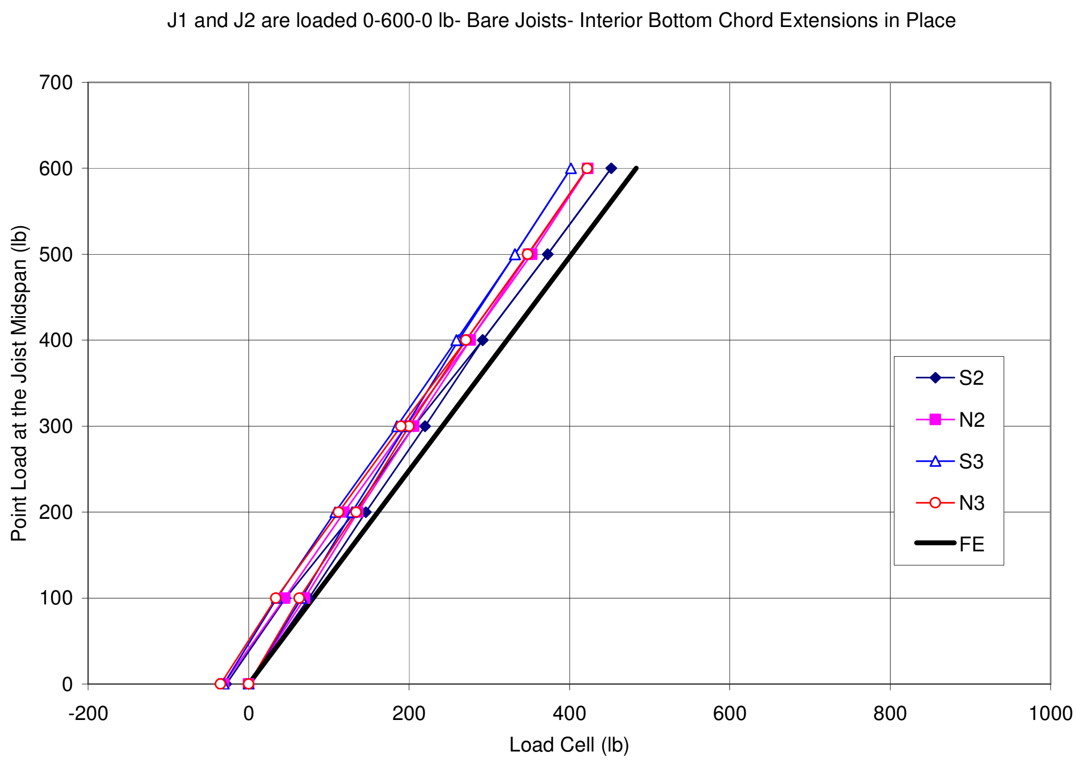


Figure C.20

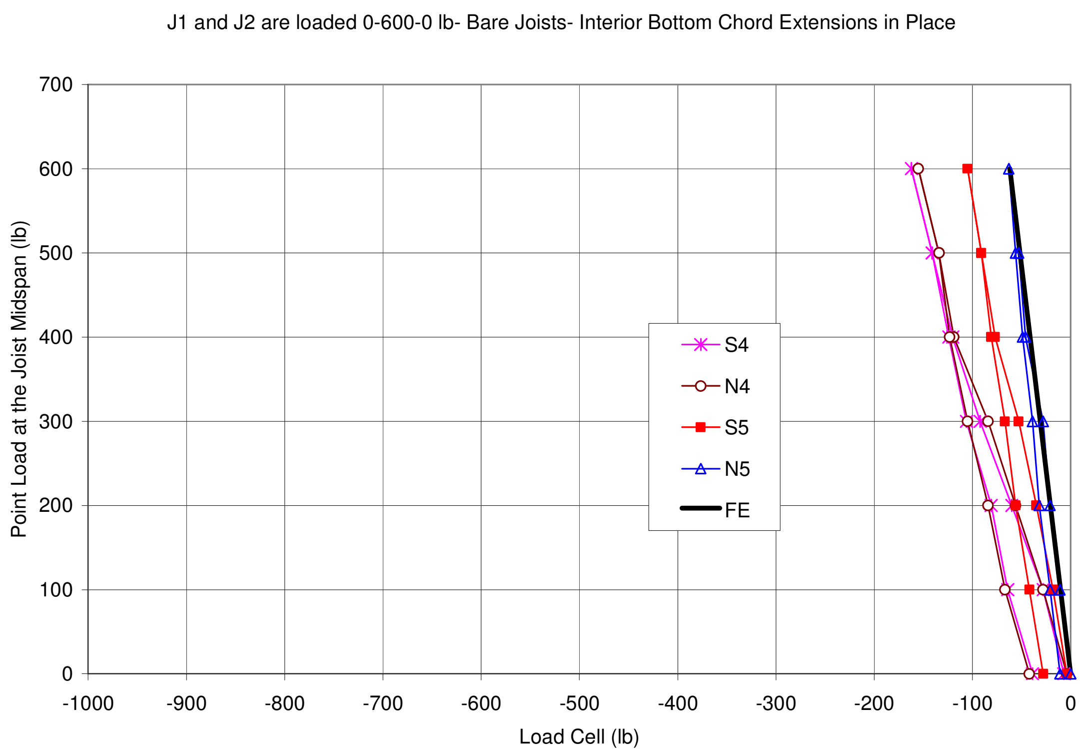


Figure C.21

J3 and J4 are loaded 0-600-0 lb- Bare Joists- Interior Bottom Chord Extensions in Place

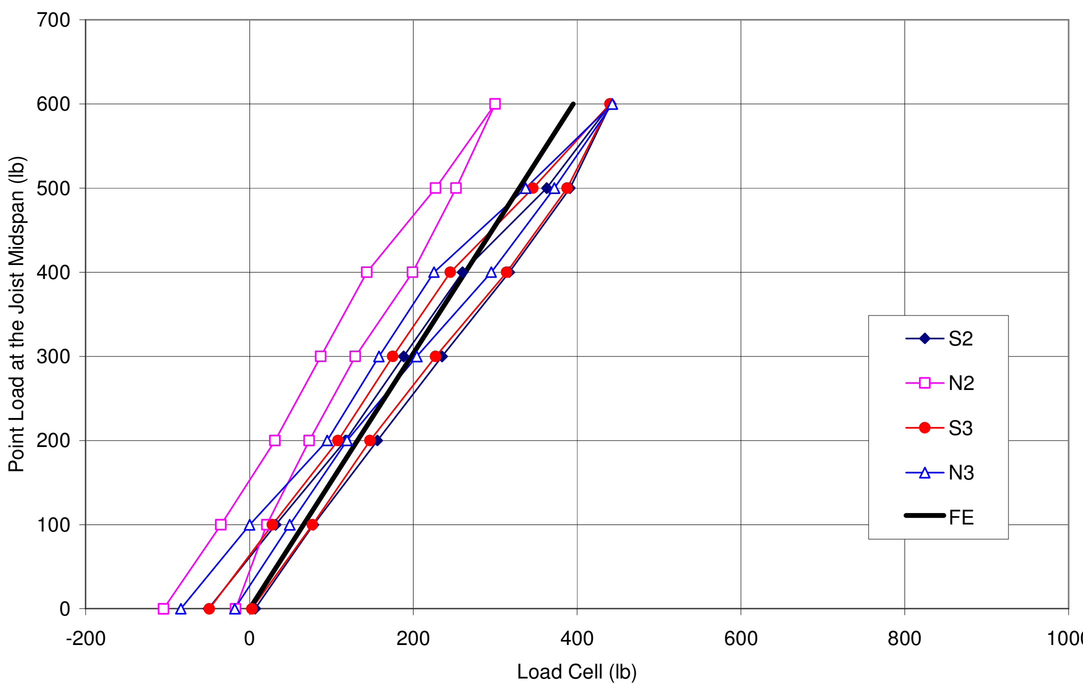


Figure C.22

J3 and J4 are loaded 0-600-0 lb- Bare Joists- Interior Bottom Chord Extensions in Place

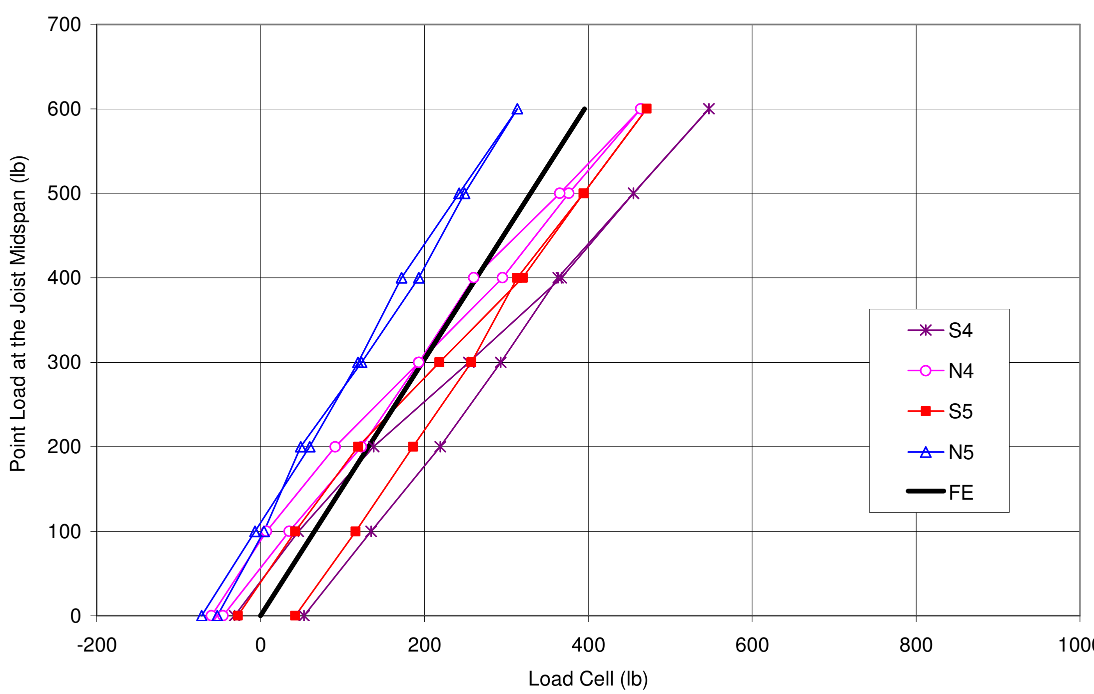


Figure C.23

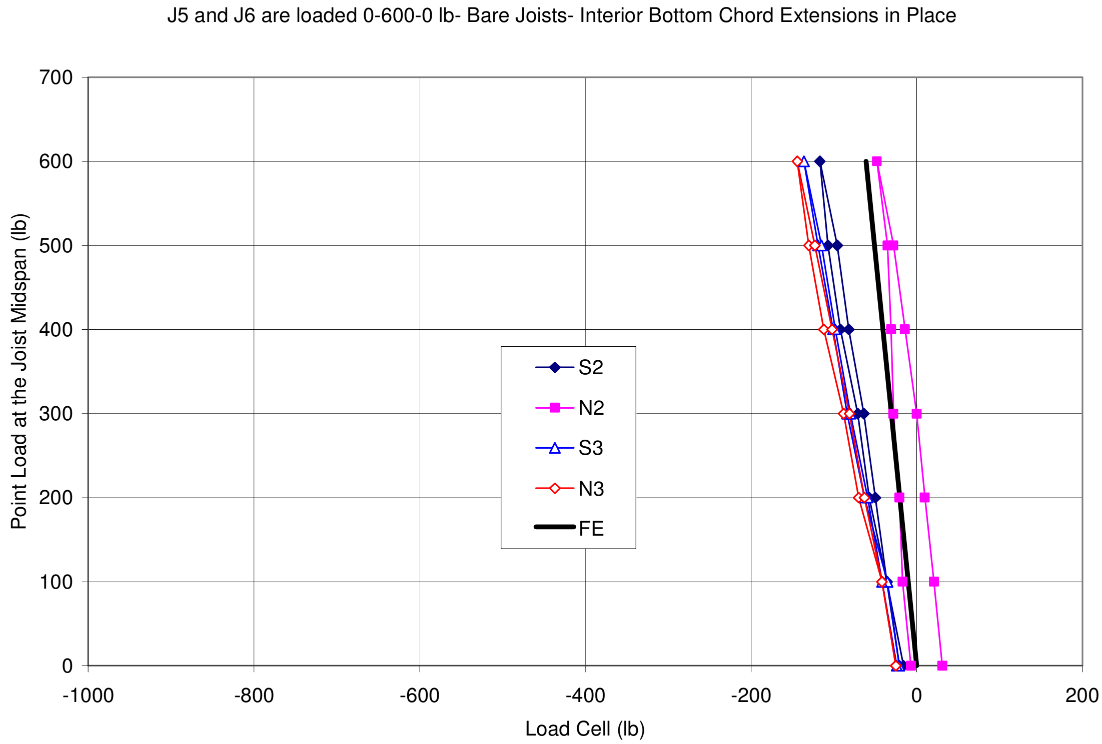


Figure C.24

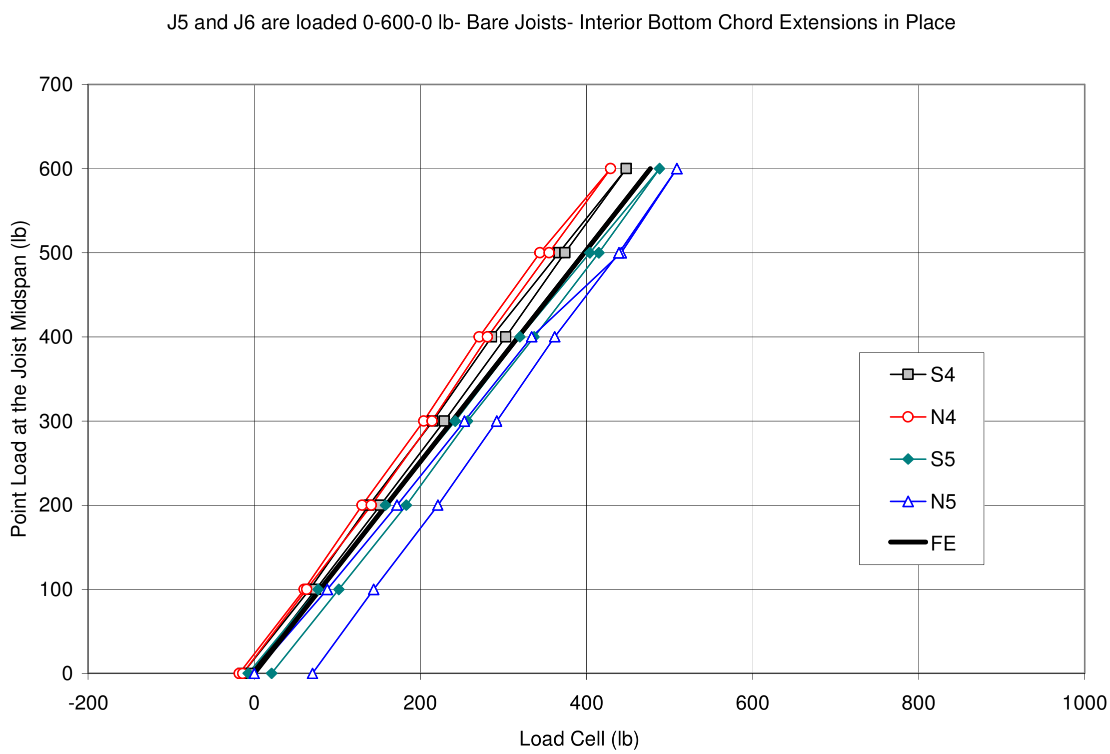


Figure C.25

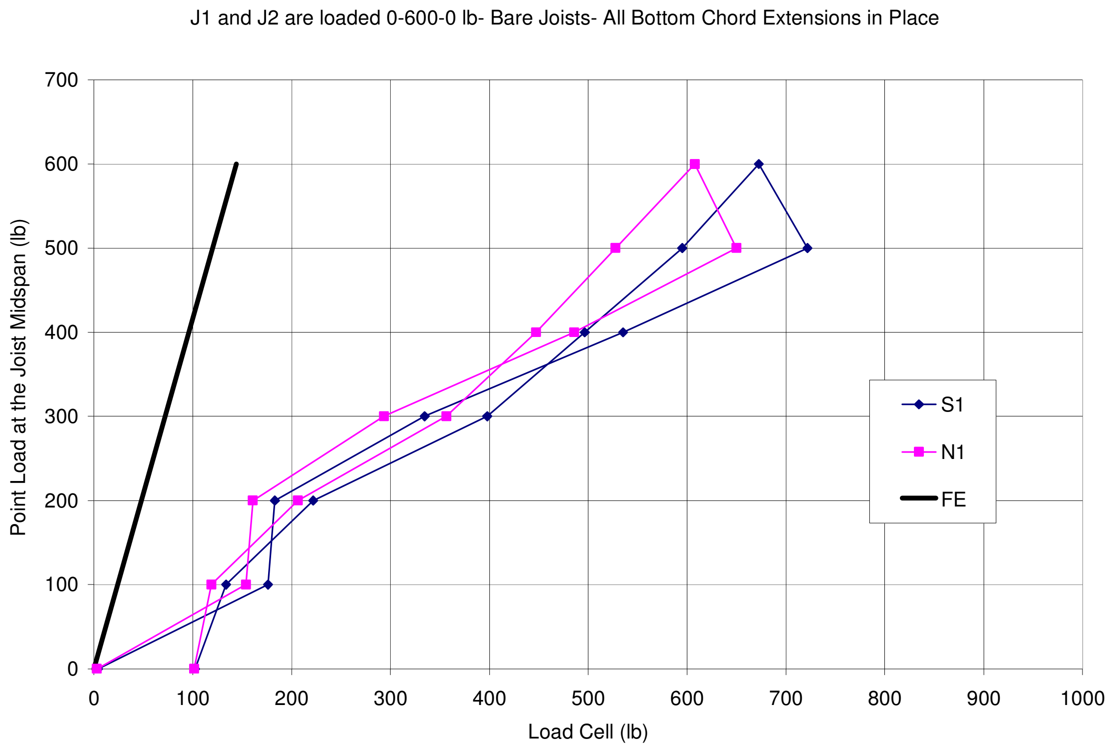


Figure C.26

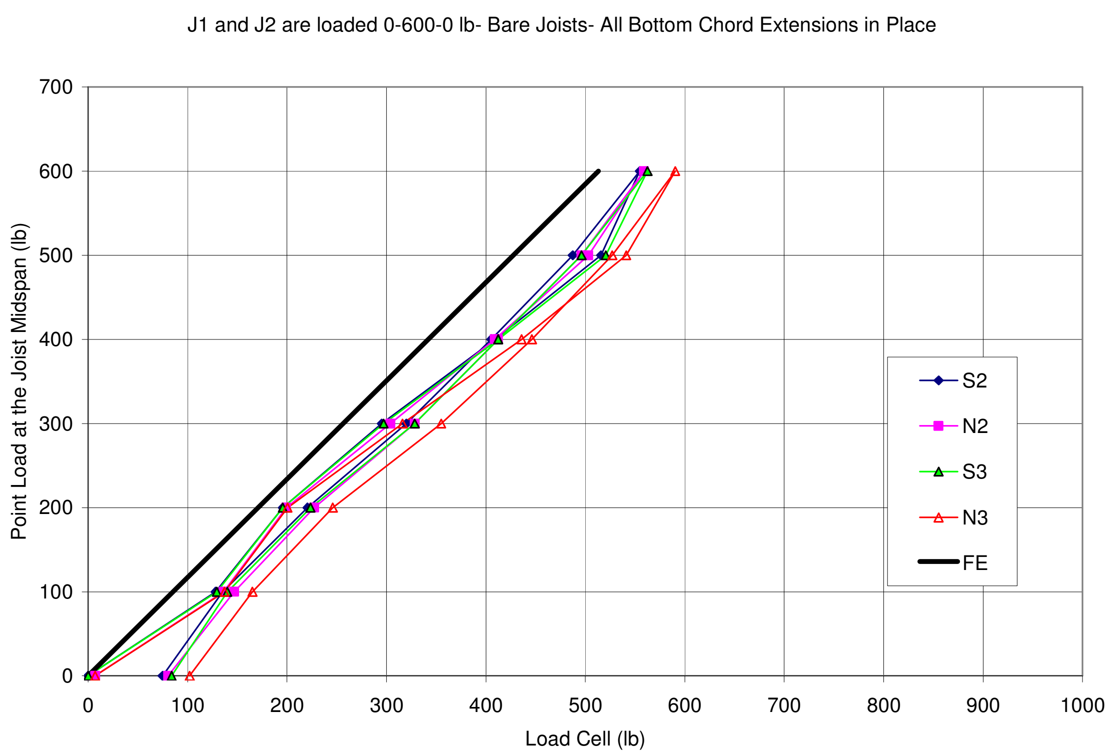


Figure C.27

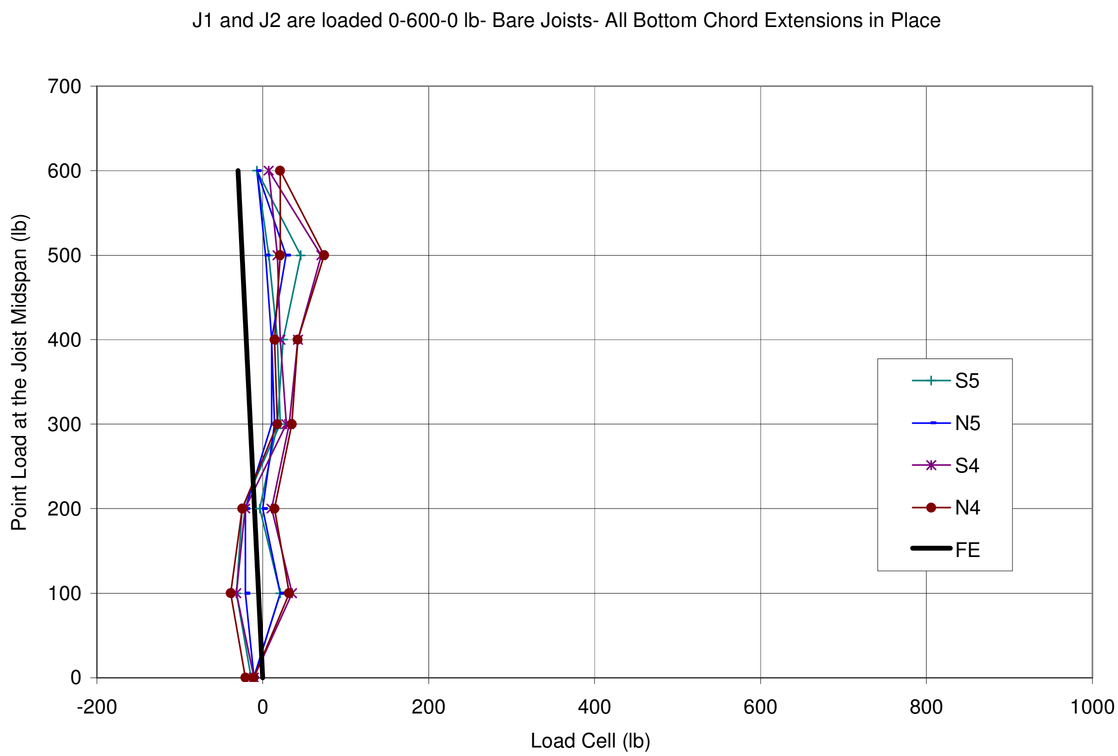


Figure C.28

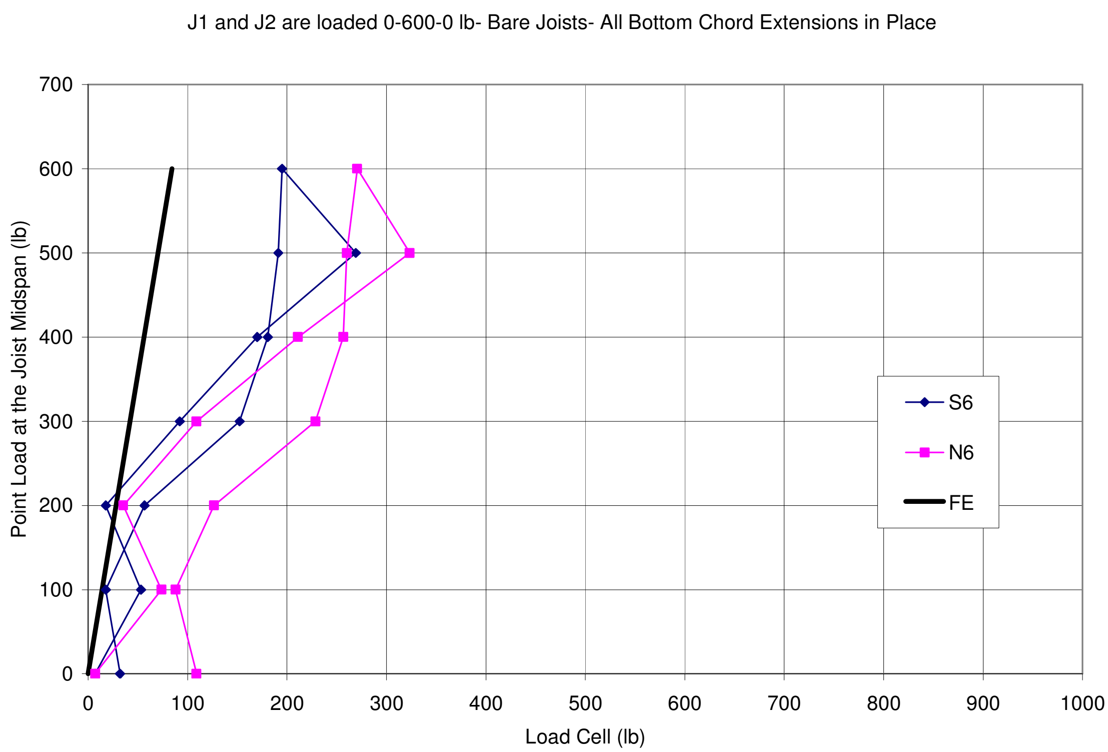


Figure C.29

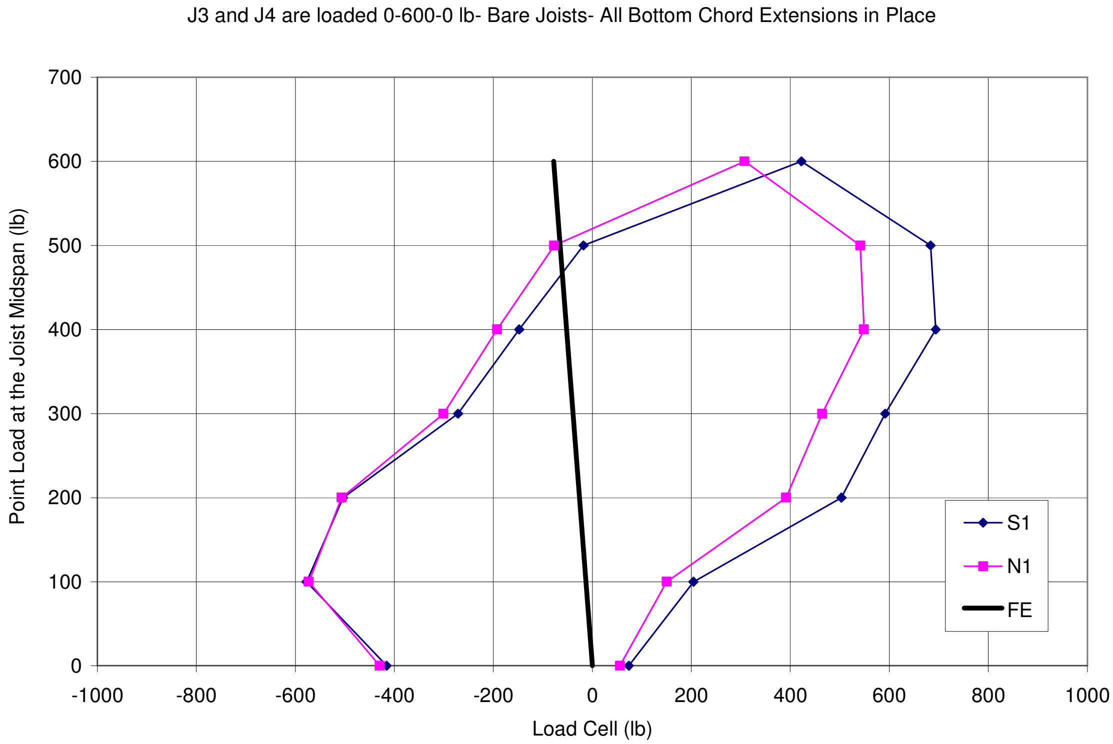


Figure C.30

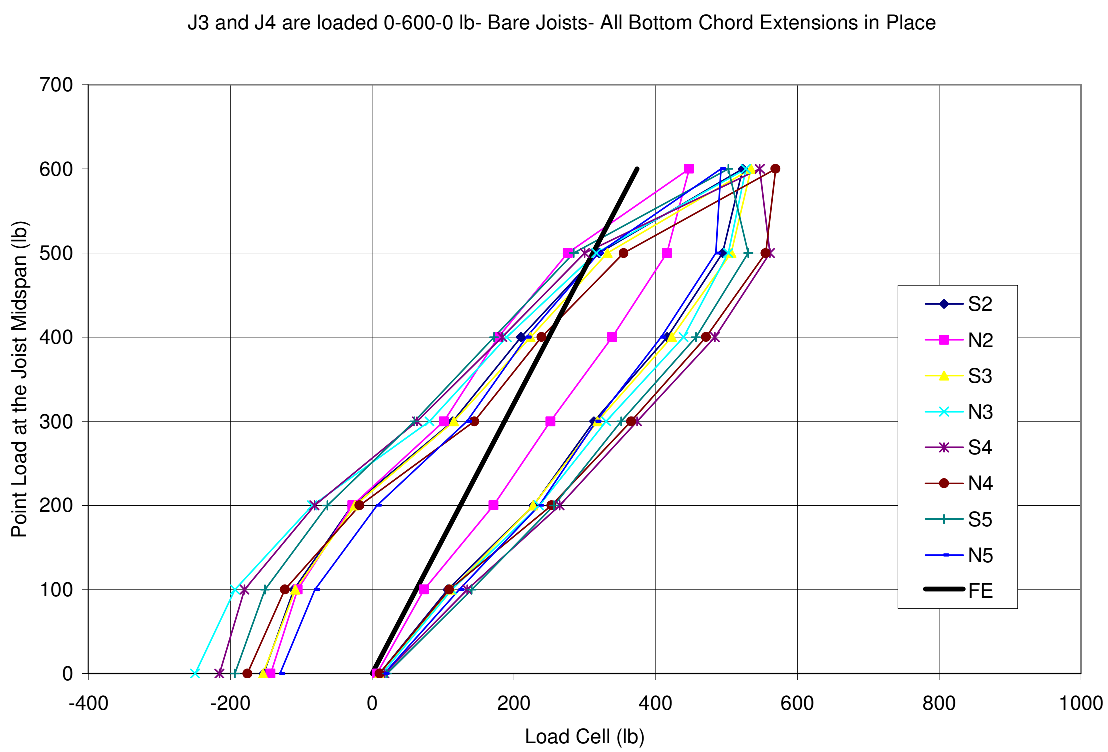


Figure C.31

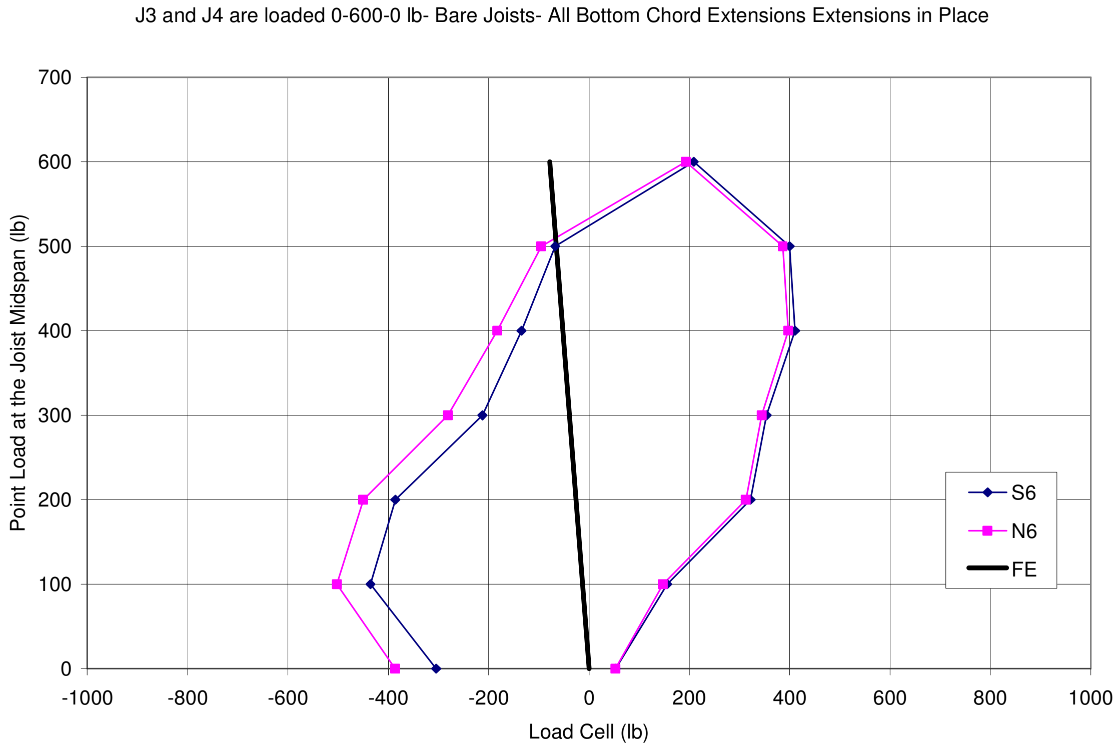


Figure C.32

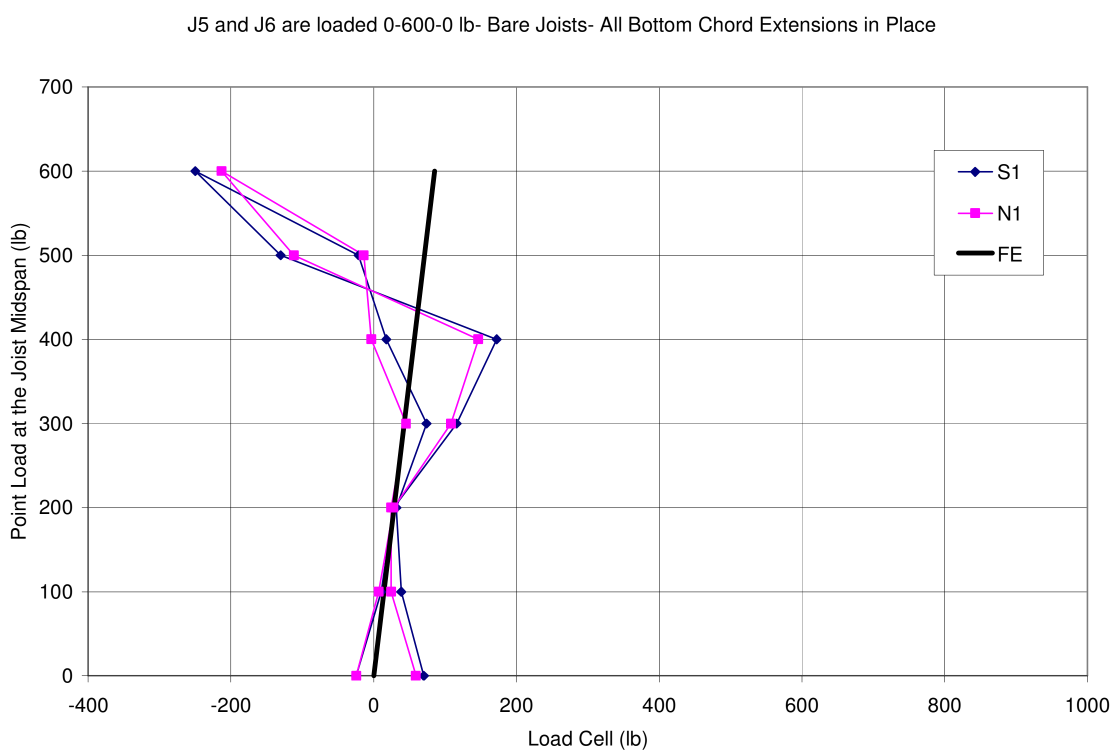


Figure C.33

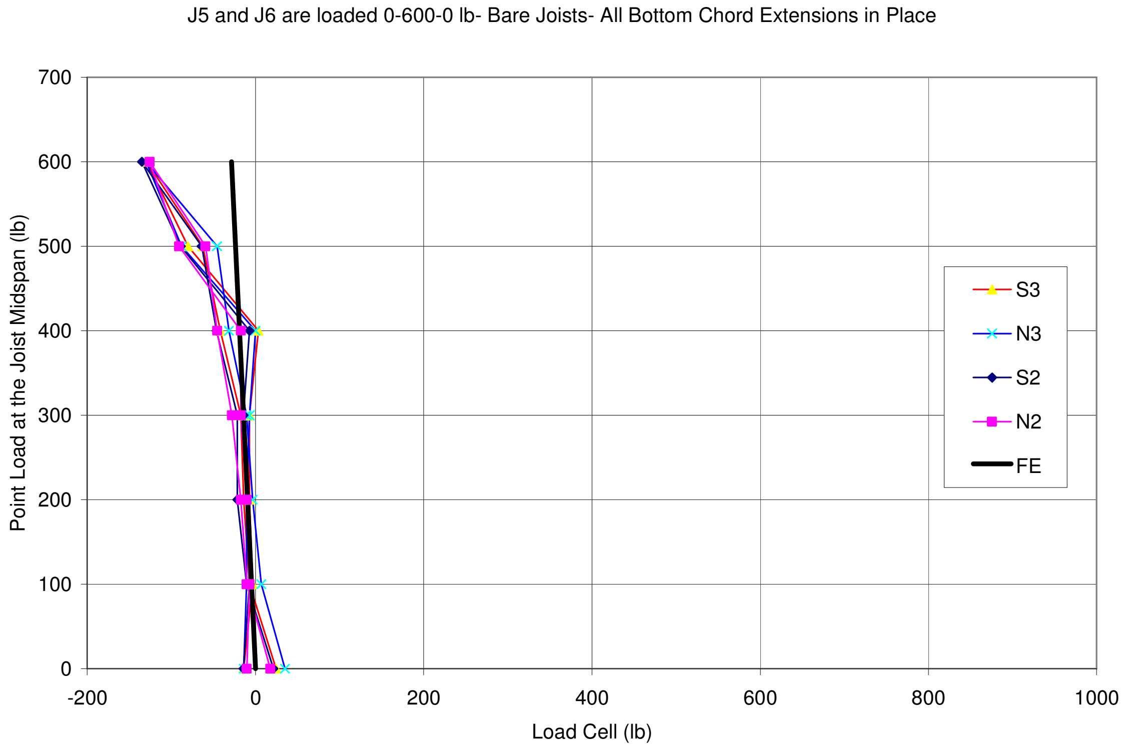


Figure C.34

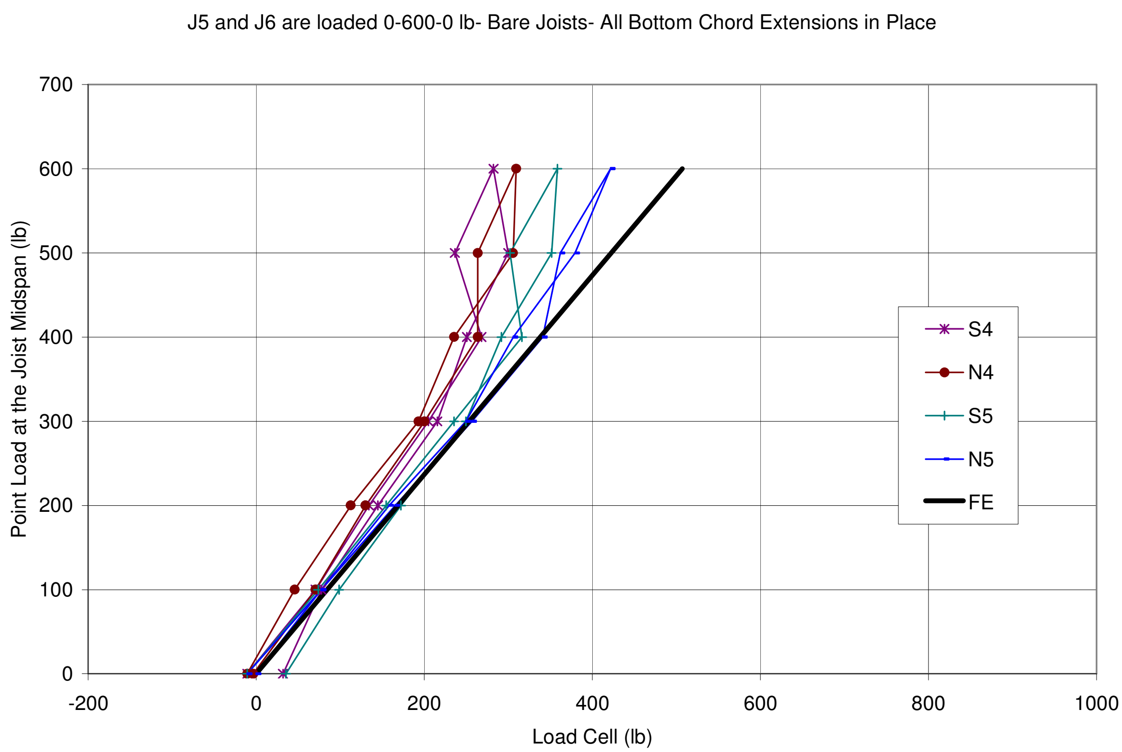


Figure C.35

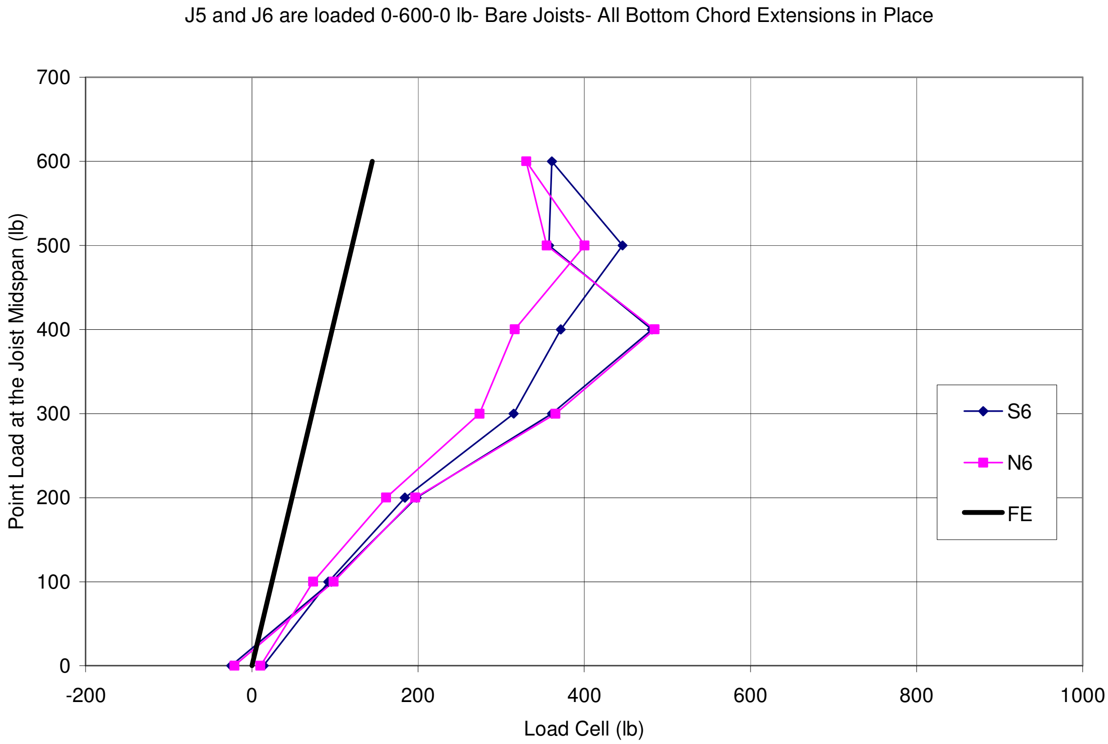

J5 and J6 are loaded 0-600-0 lb- Bare Joists- All Bottom Chord Extensions in Place
700
600
500
400
300
200
100
0
-200
0
200
400
600
800
1000
Point Load at the Joist Midspan (lb)
Load Cell (lb)
S6
N6
FE

Figure C.36

C.2 WET CONCRETE LOADING MEASUREMENTS

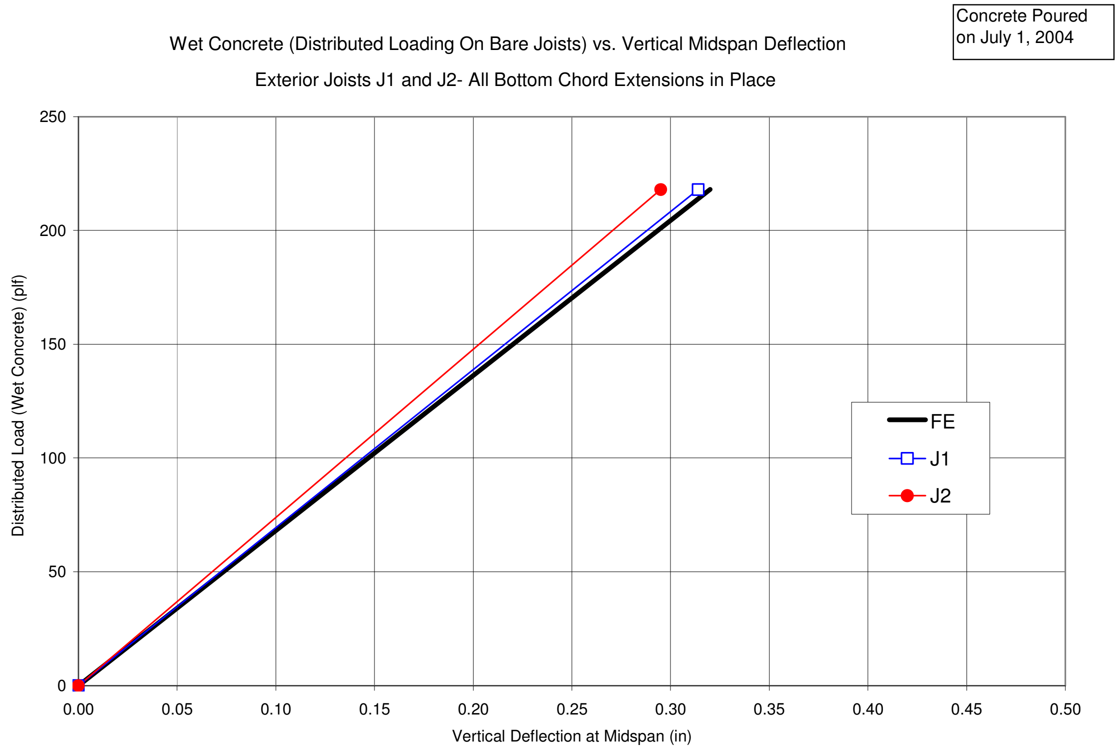


Figure C.37

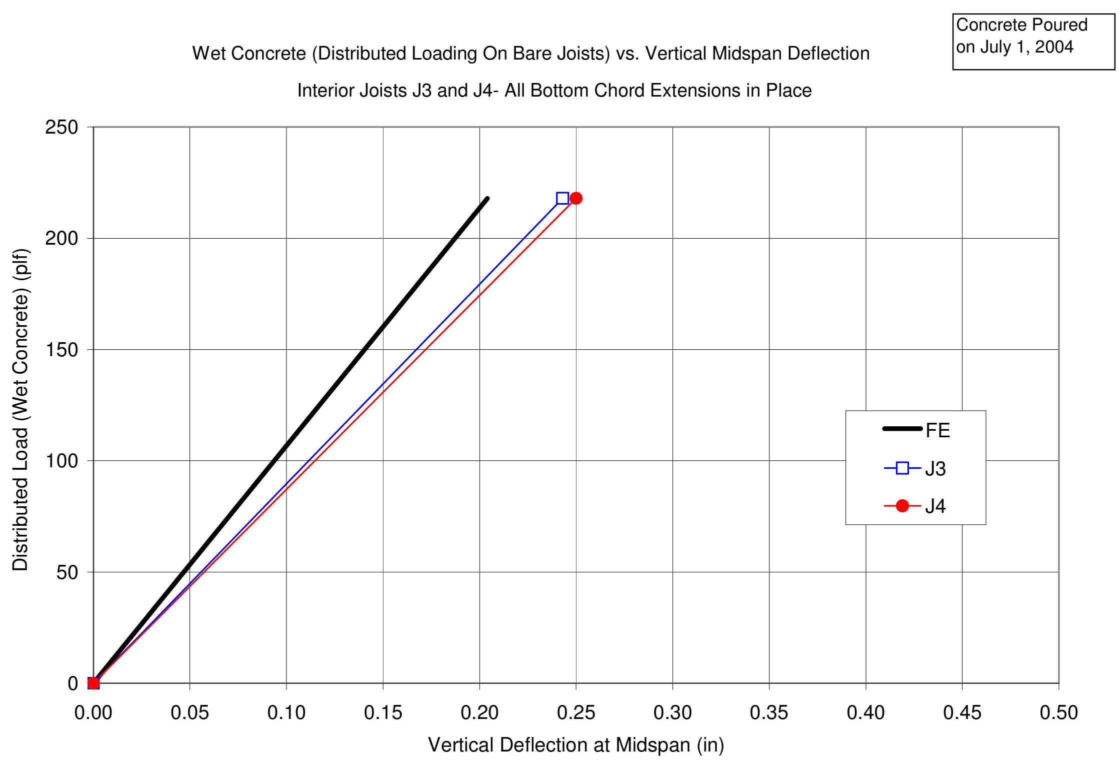


Figure C.38

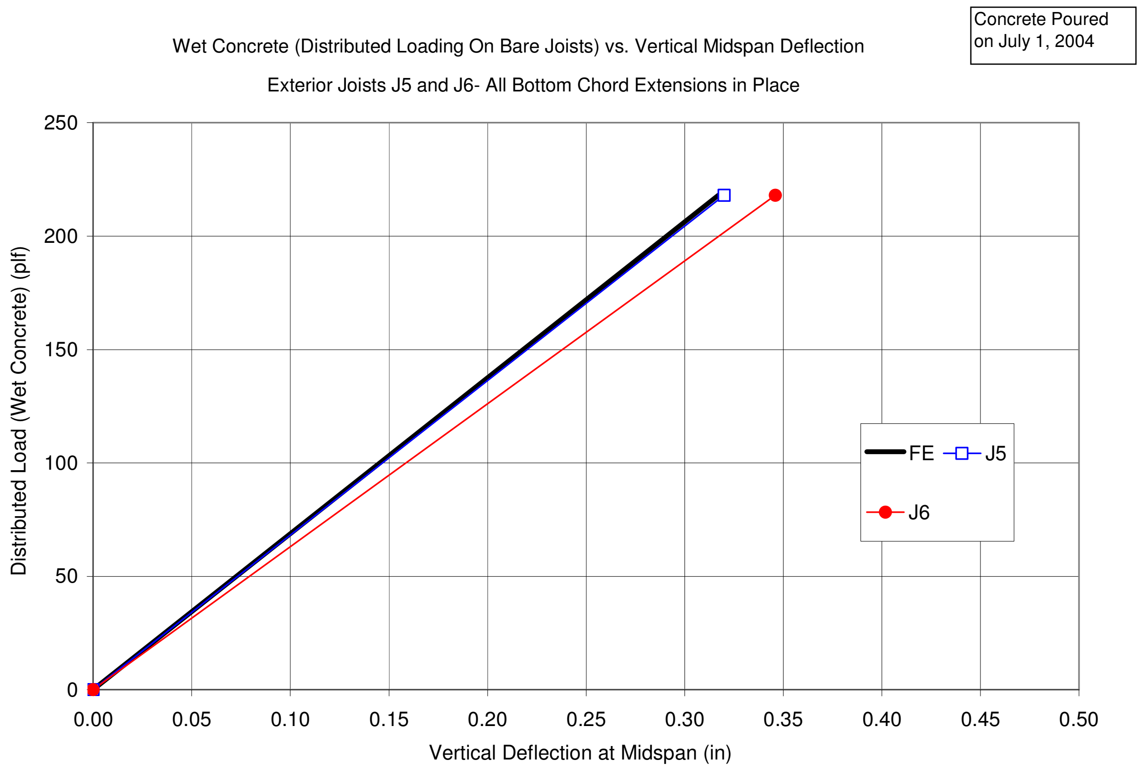


Figure C.39

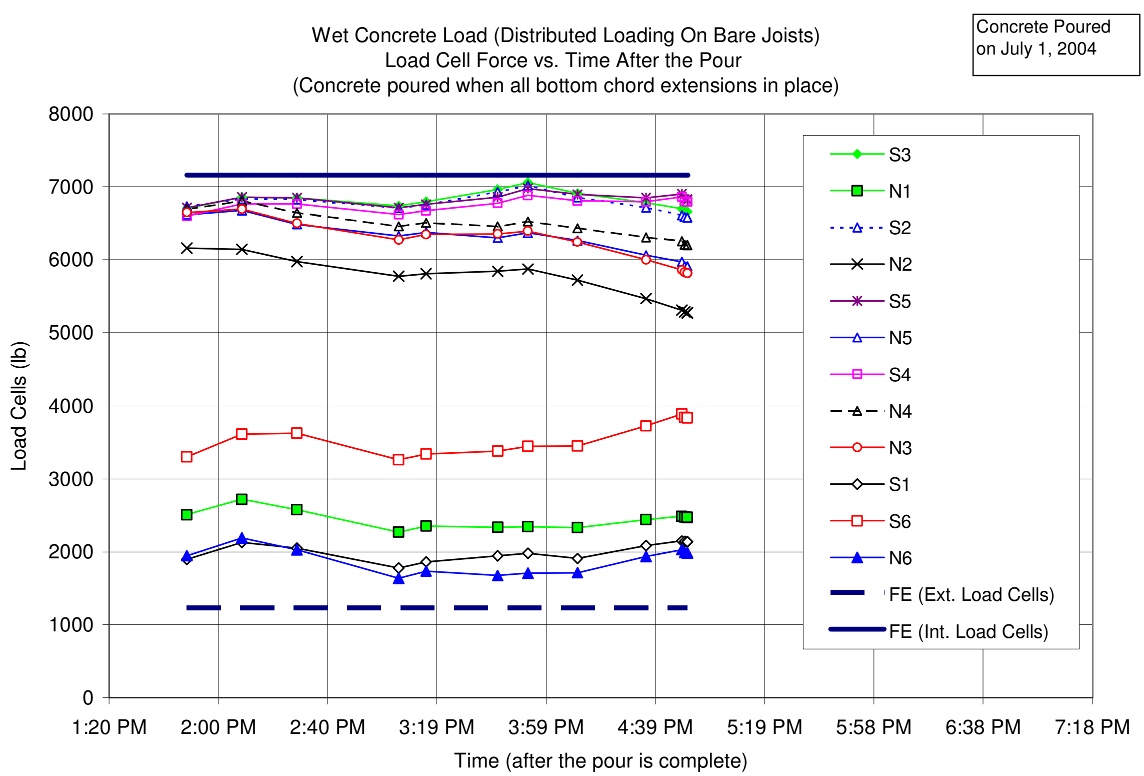


Figure C.40

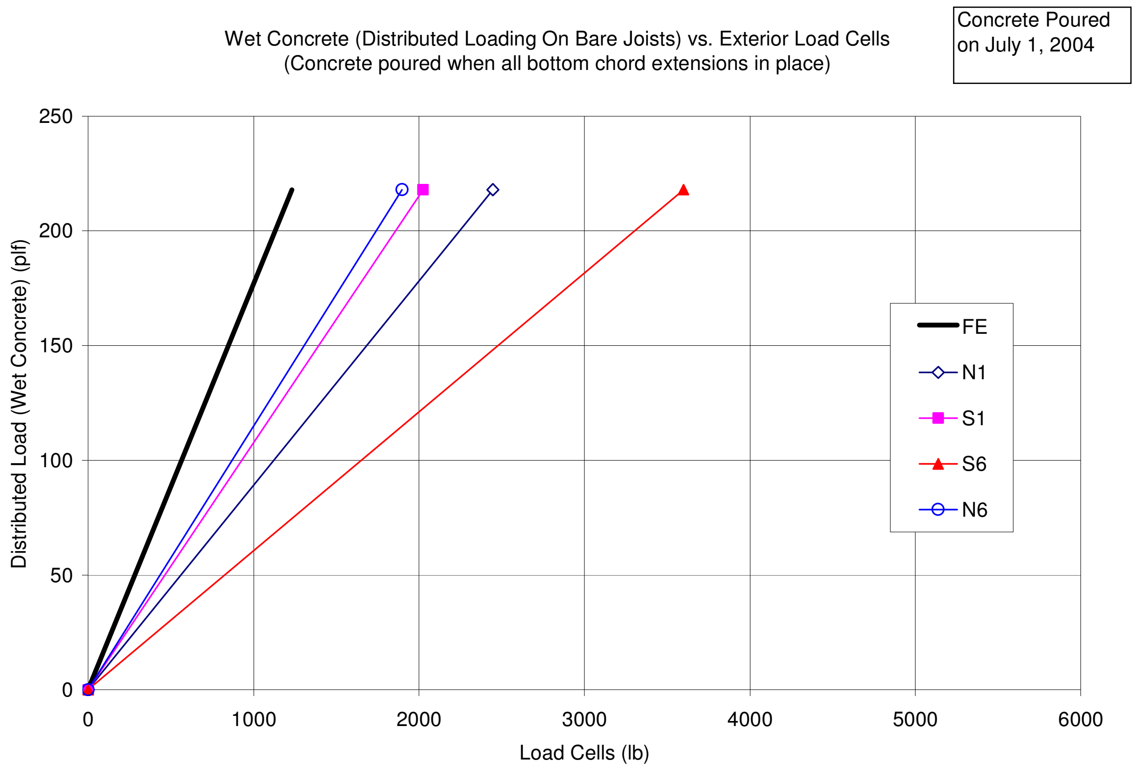


Figure C.41

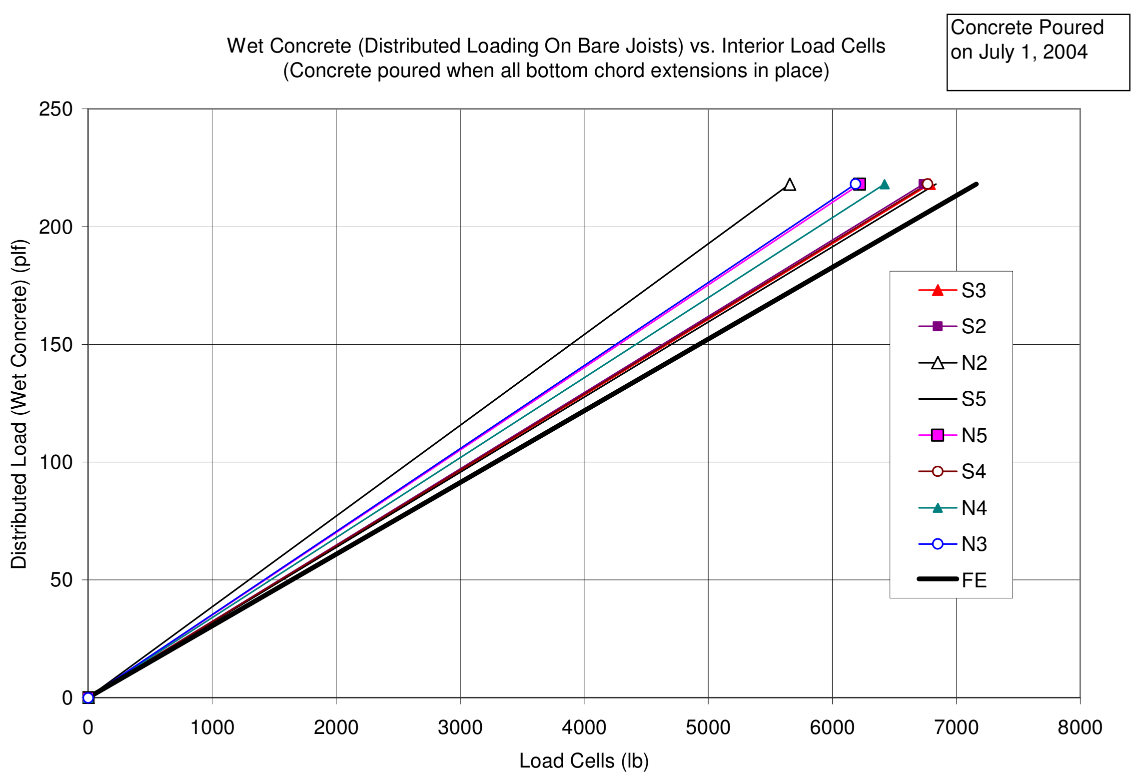


Figure C.42

C.3 CURED CONCRETE JOIST TESTING

C.3.1 ALL BOTTOM CHORD EXTENSIONS IN PLACE (STAGE 1)

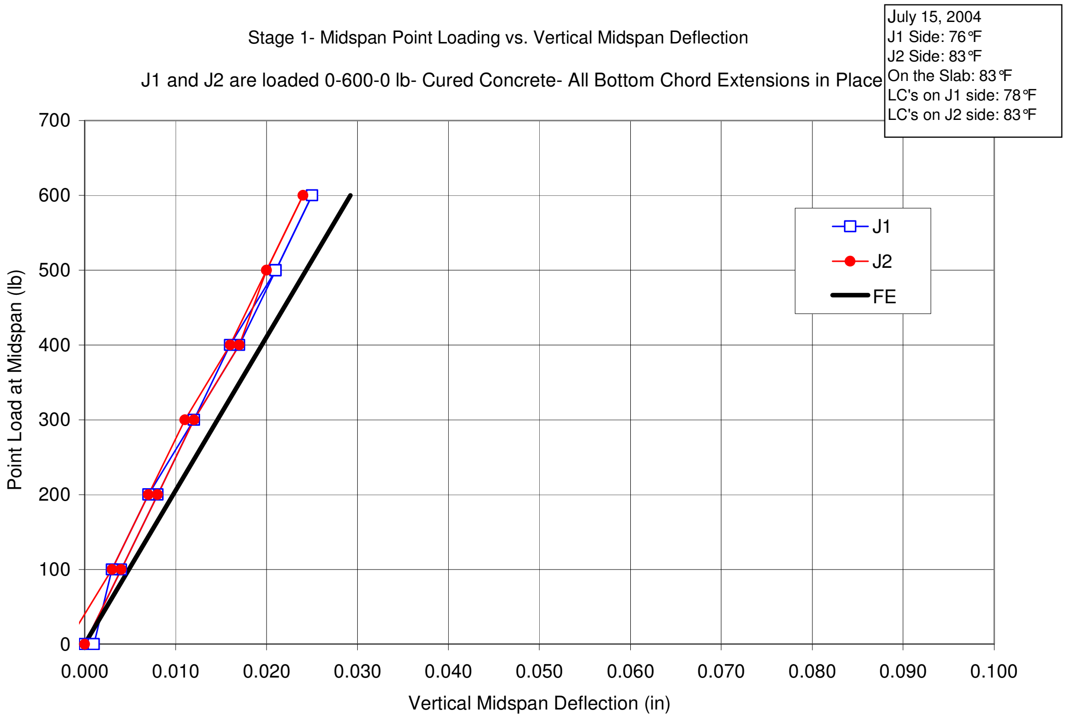


Figure C.43

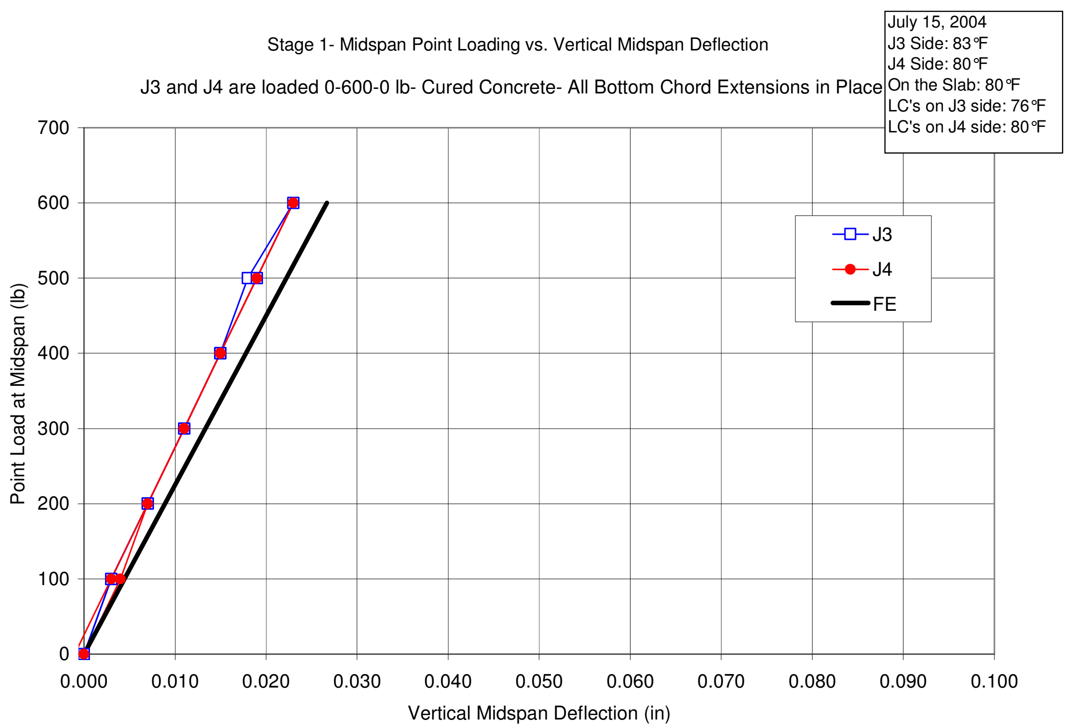


Figure C.44

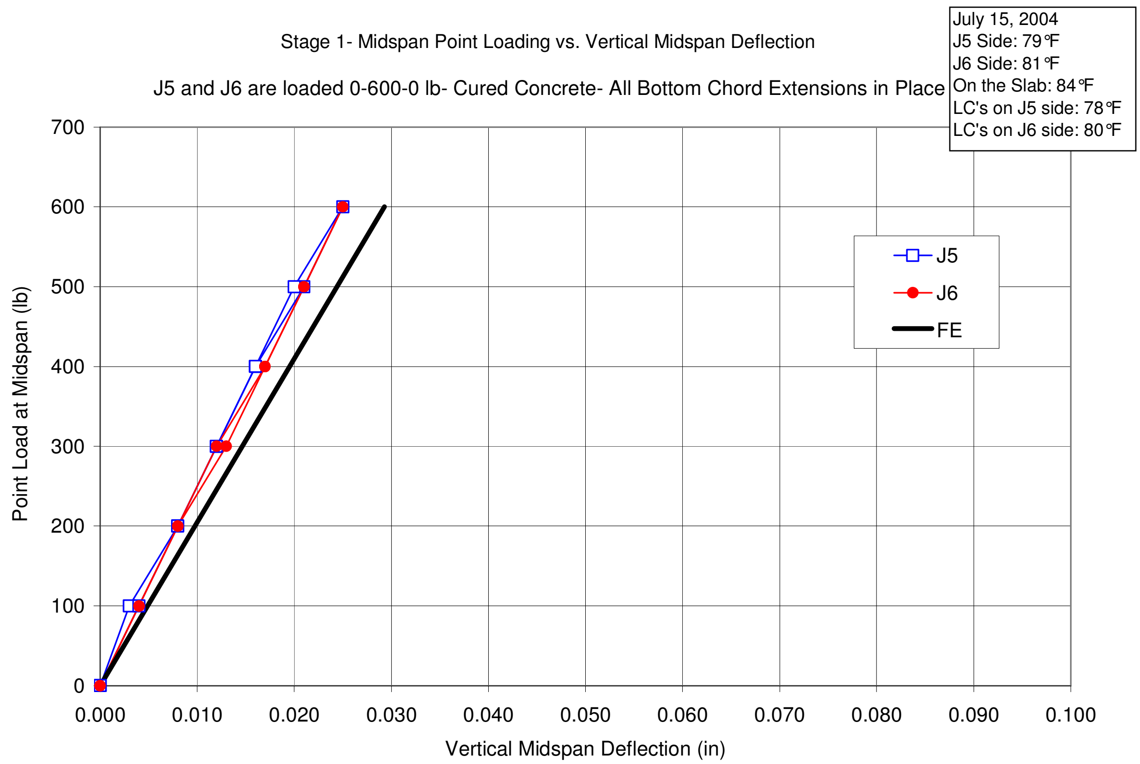


Figure C.45

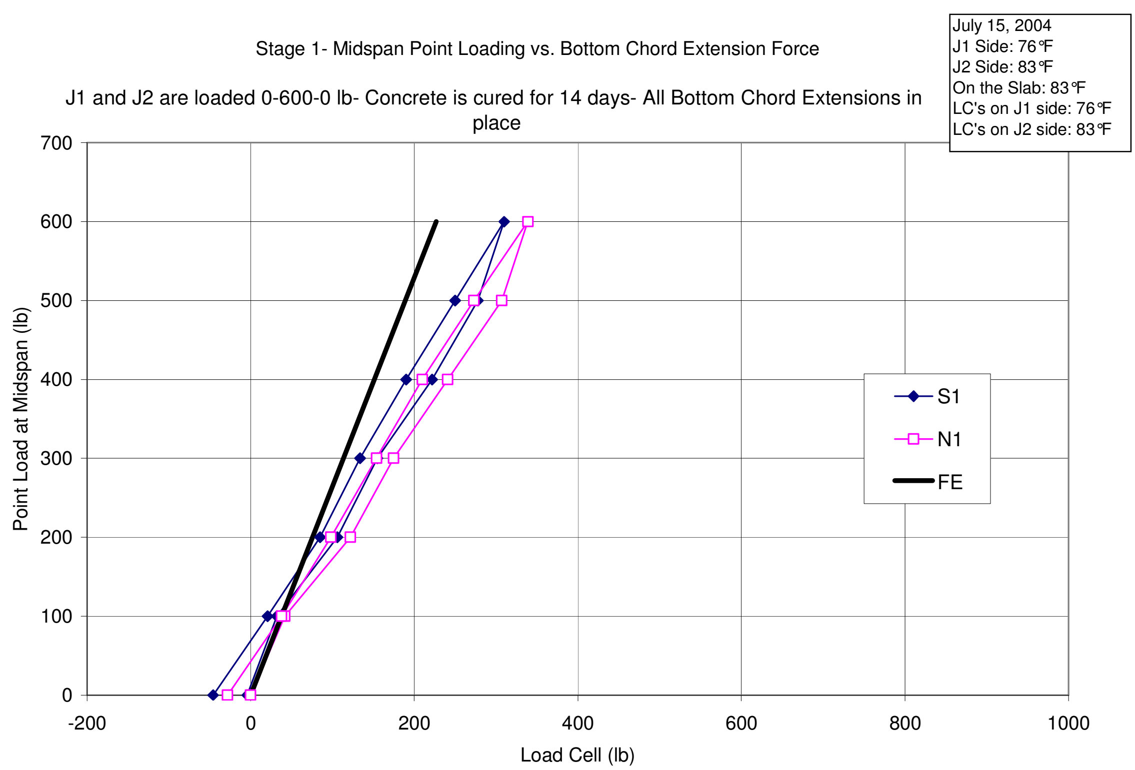


Figure C.46

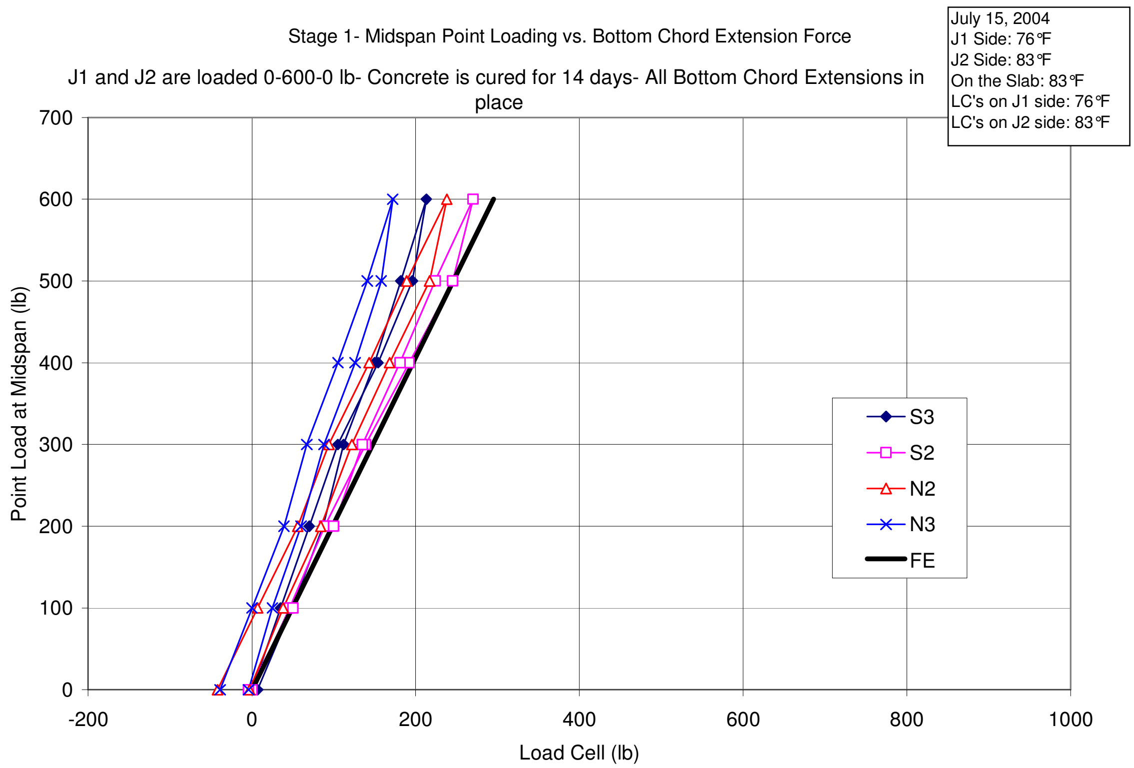


Figure C.47

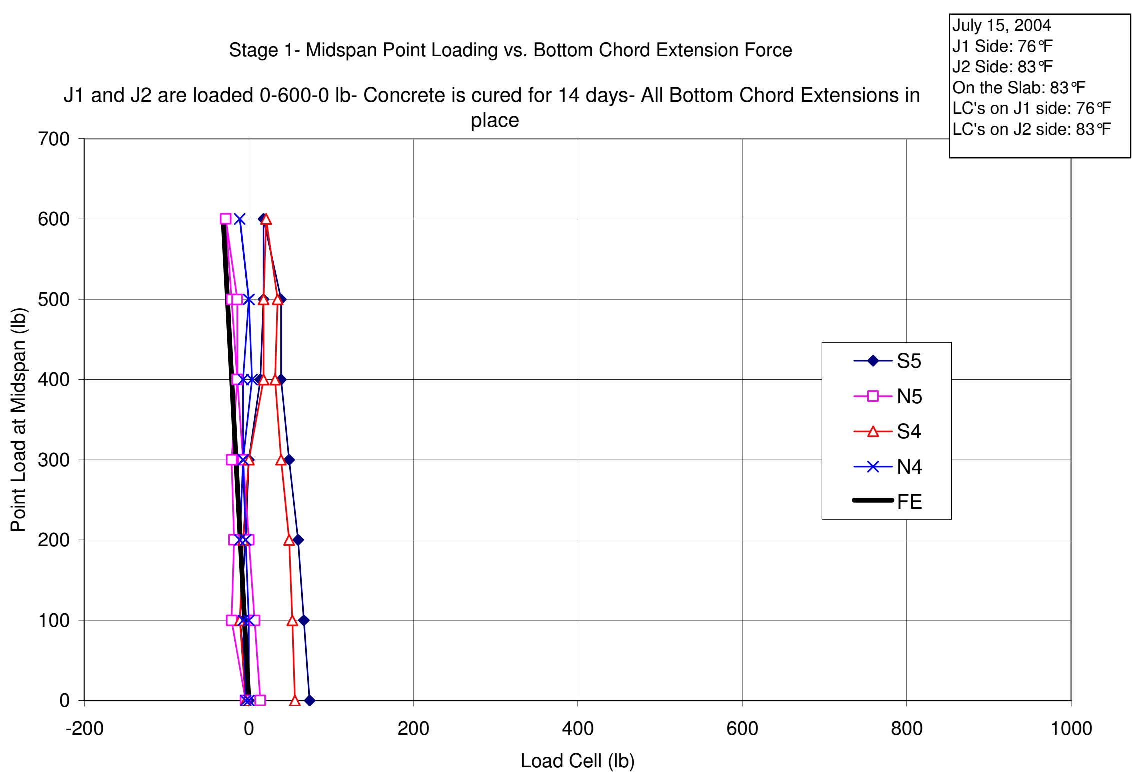


Figure C.48

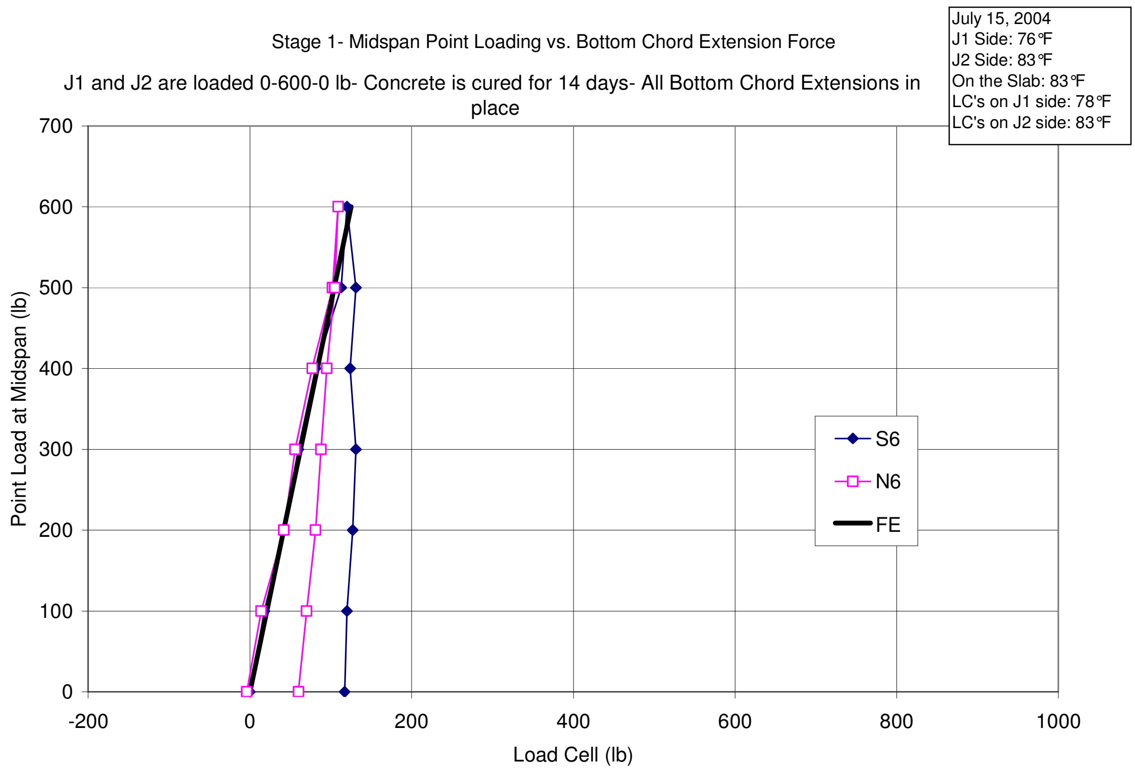


Figure C.49

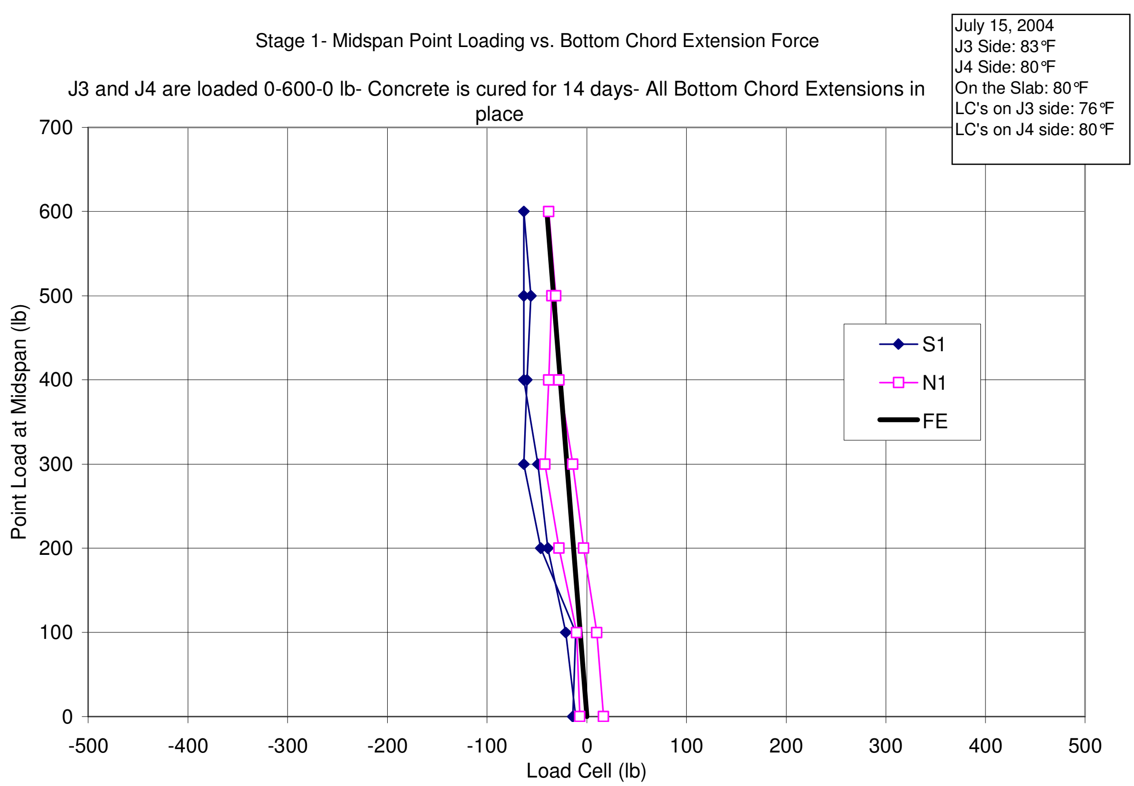


Figure C.50

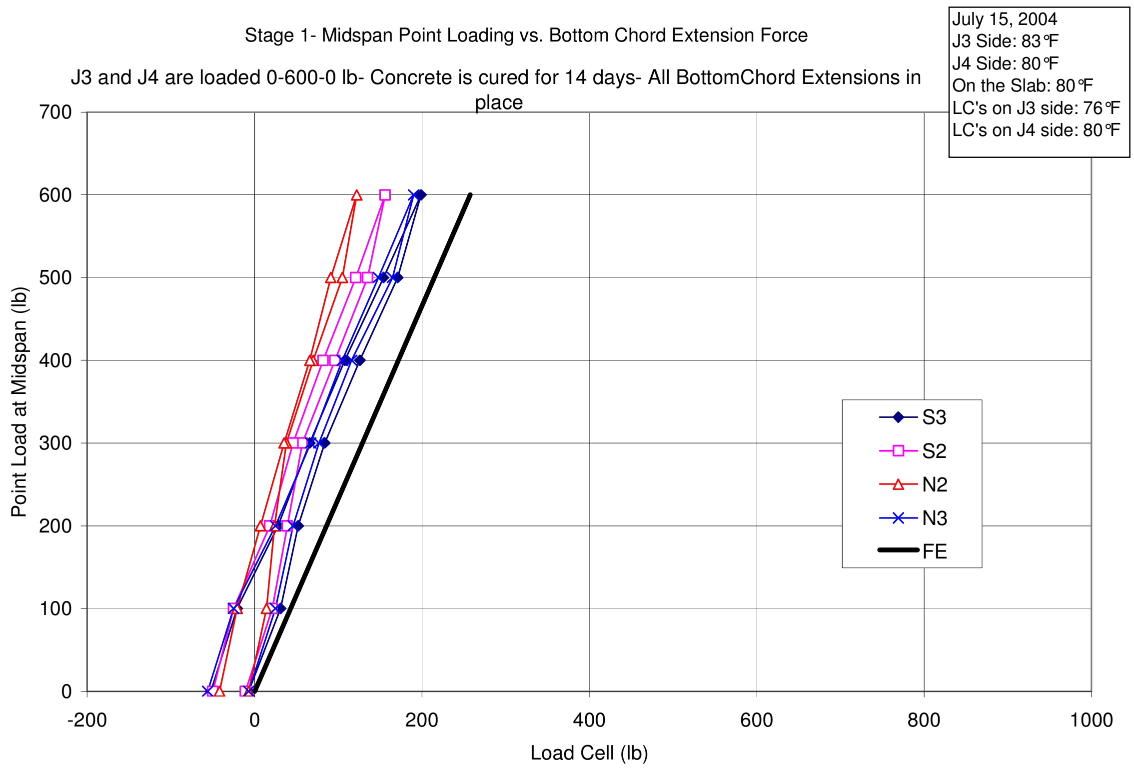


Figure C.51

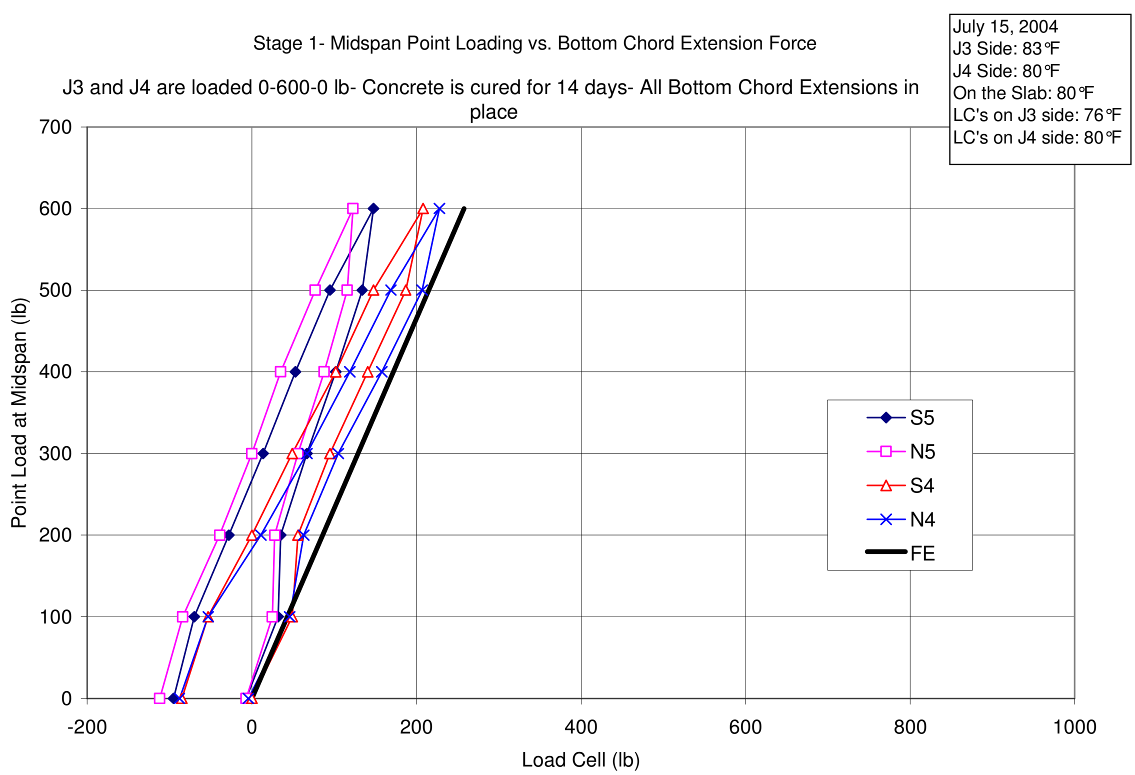


Figure C.52

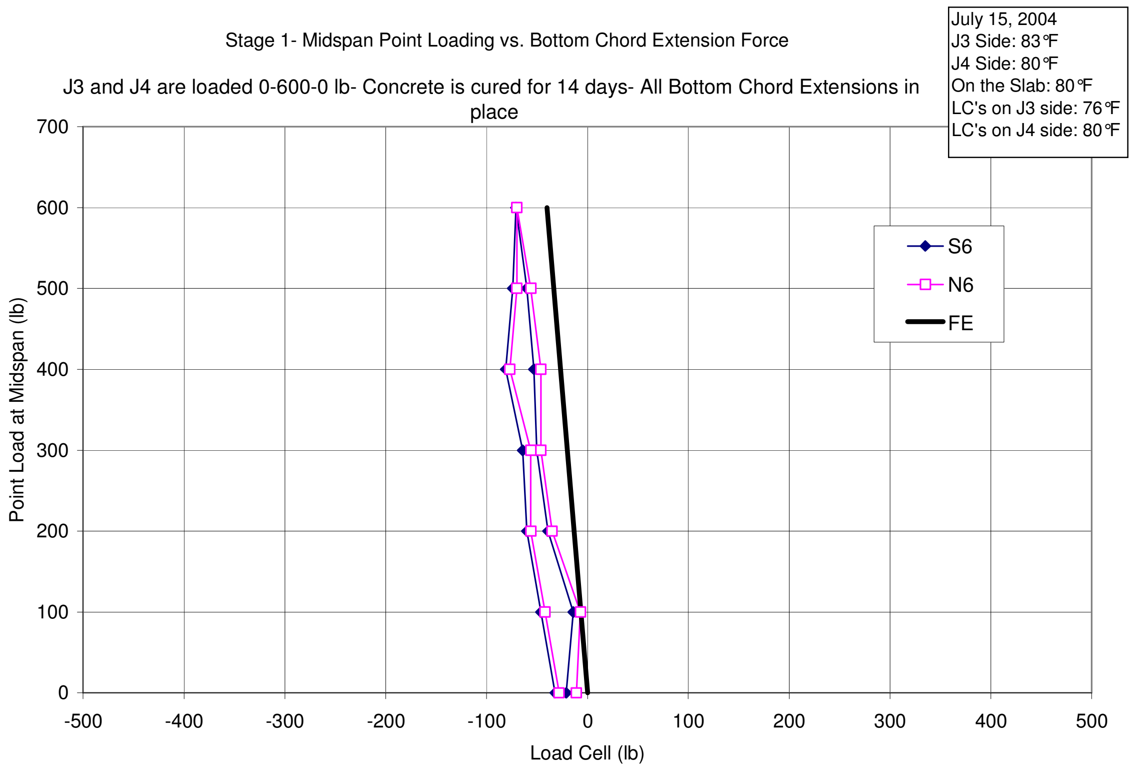


Figure C.53

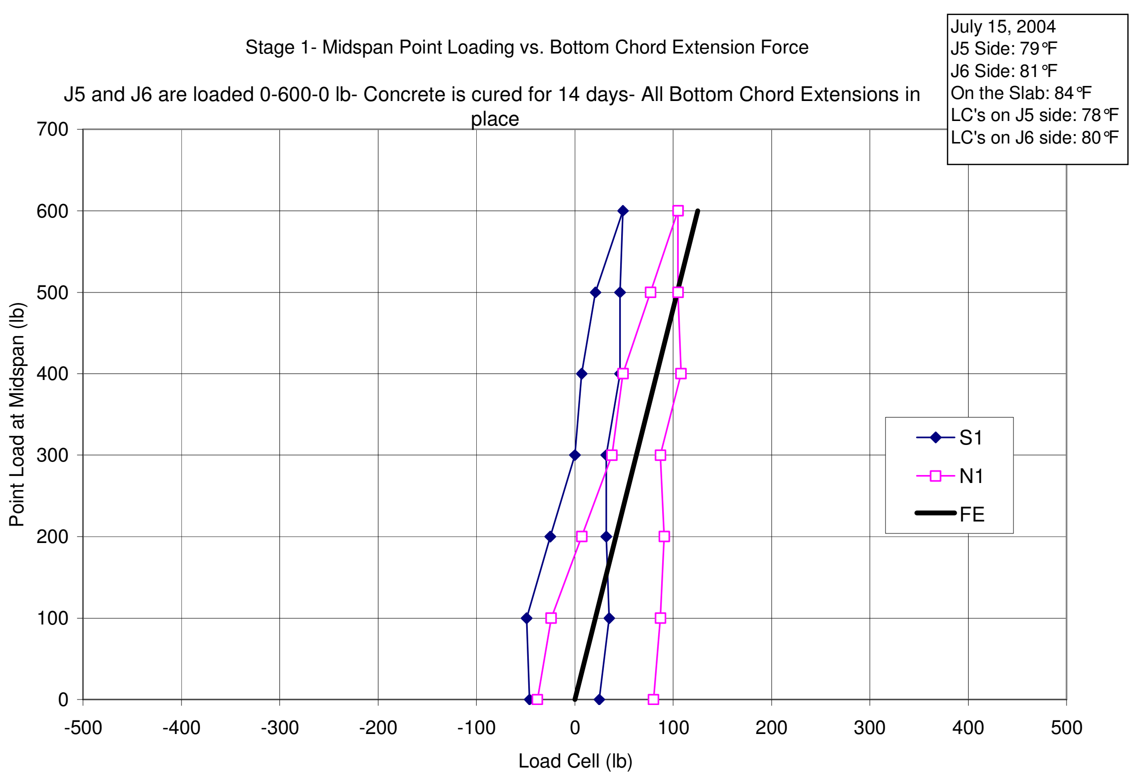


Figure C.54

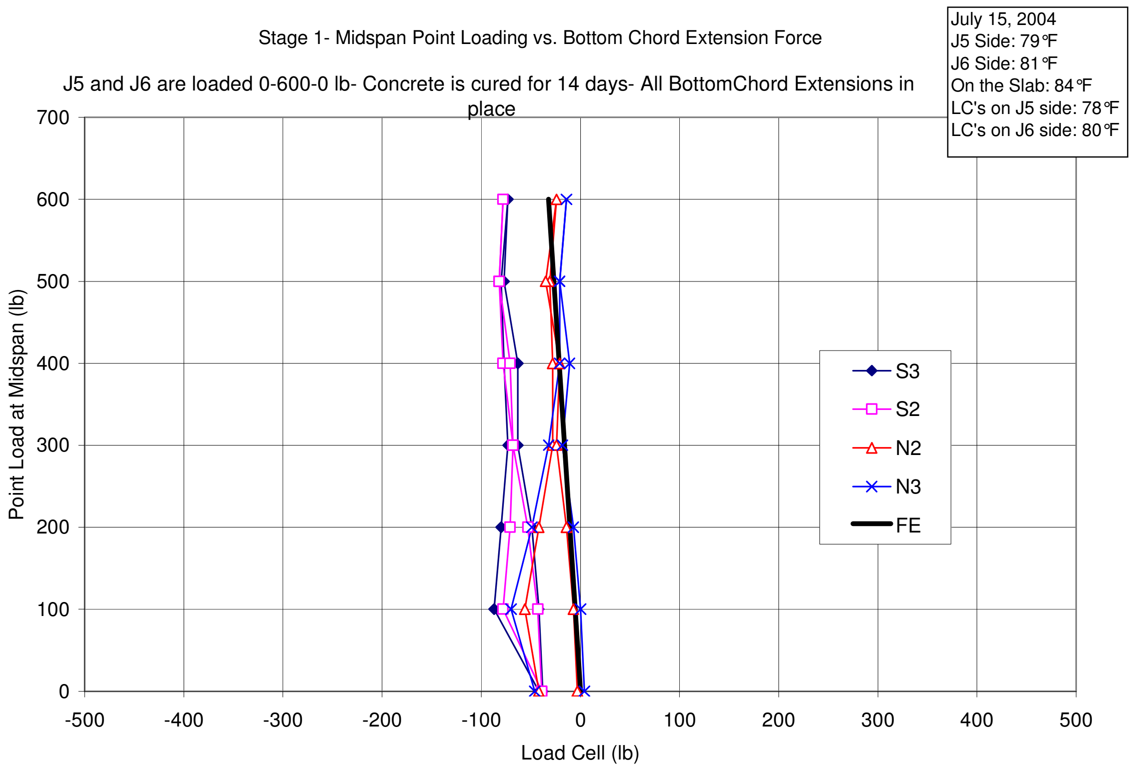


Figure C.55

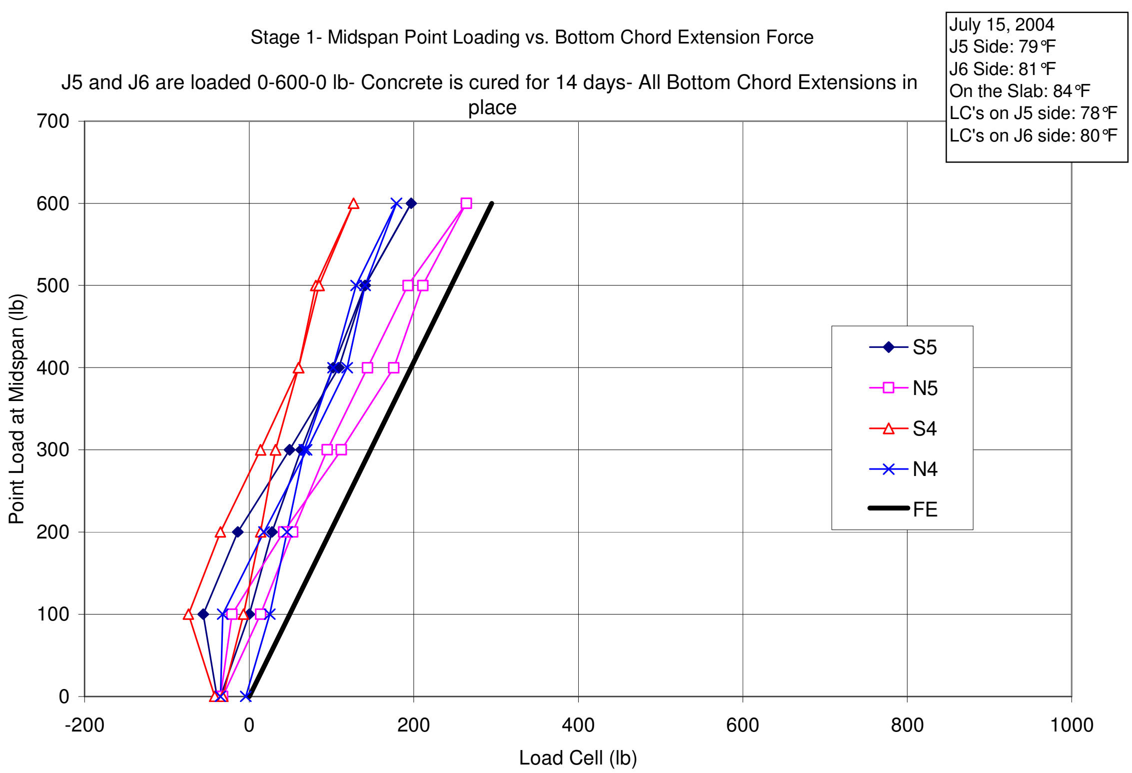


Figure C.56

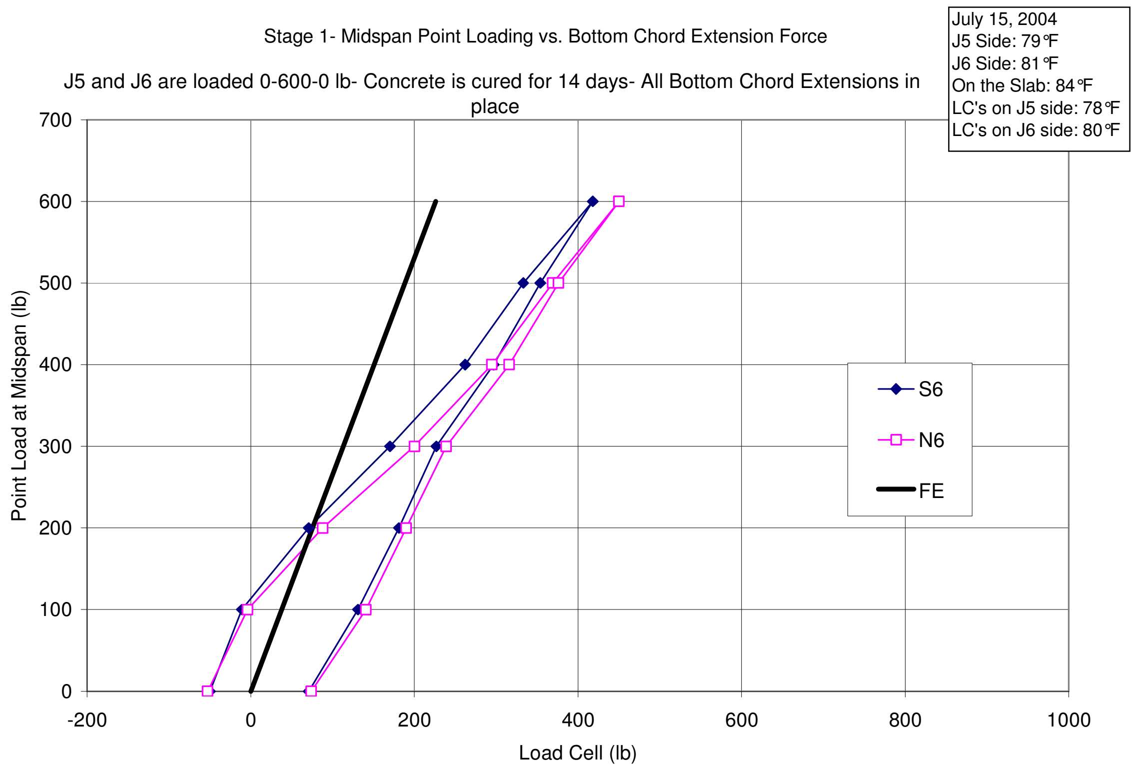


Figure C.57

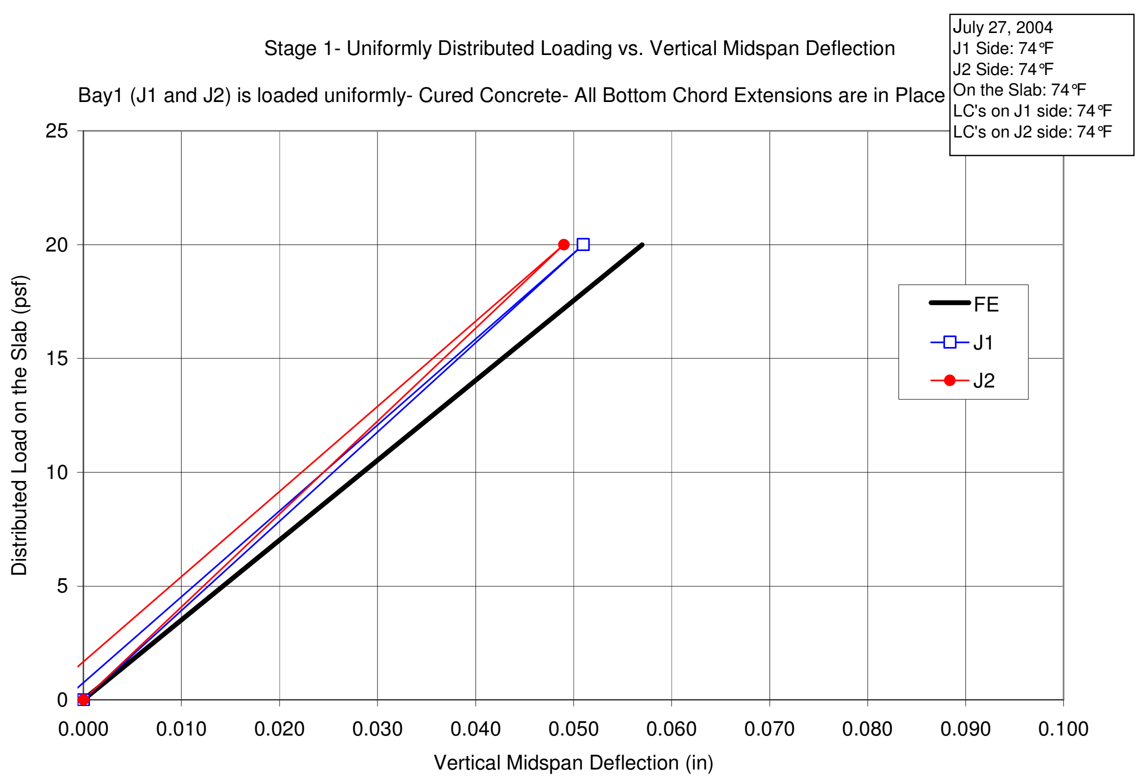


Figure C.58

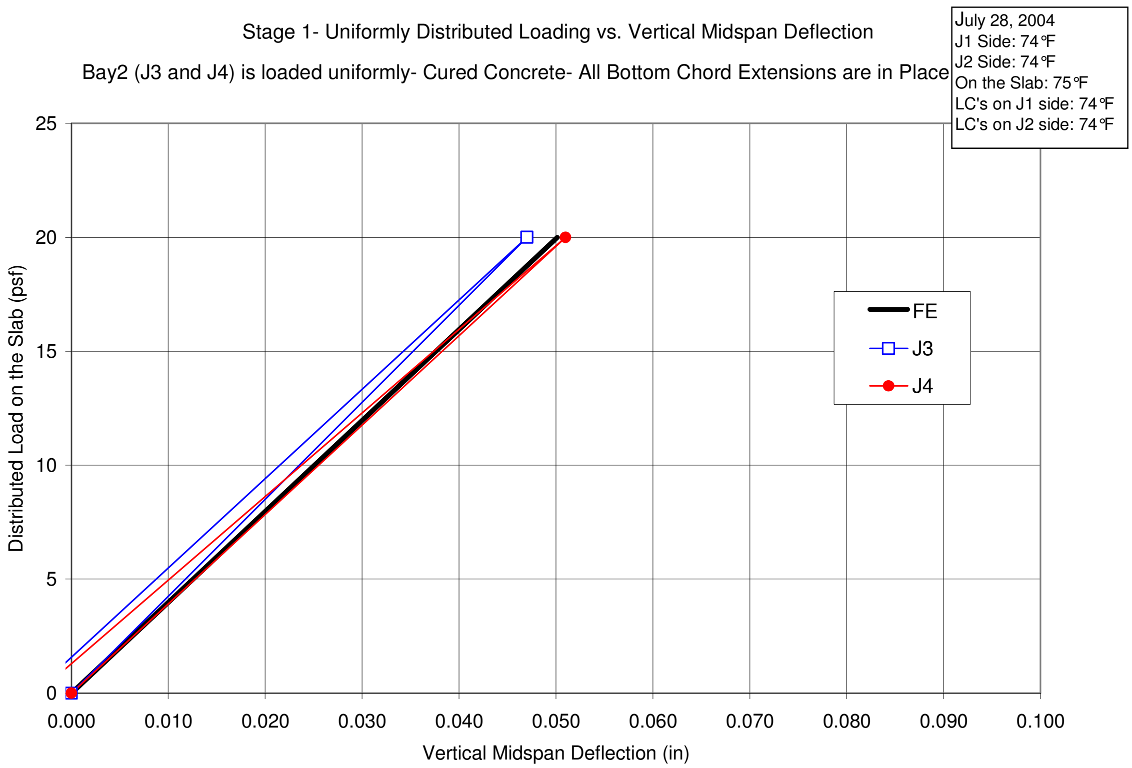


Figure C.59

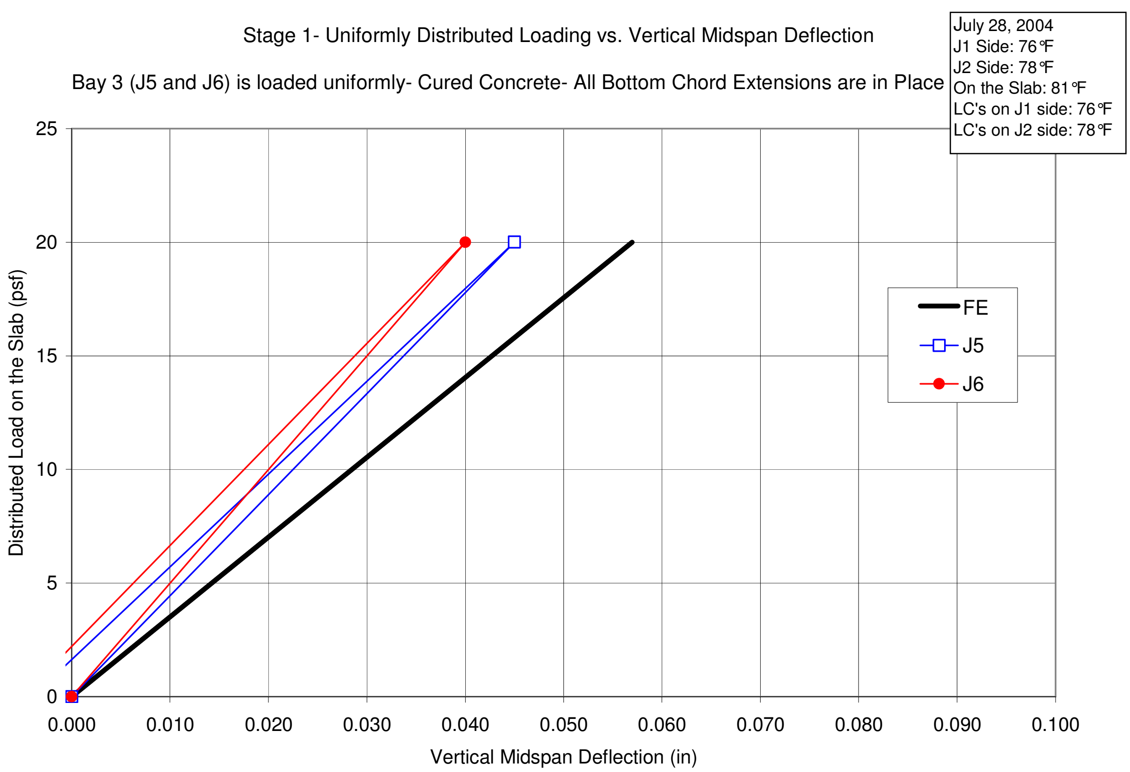


Figure C.60

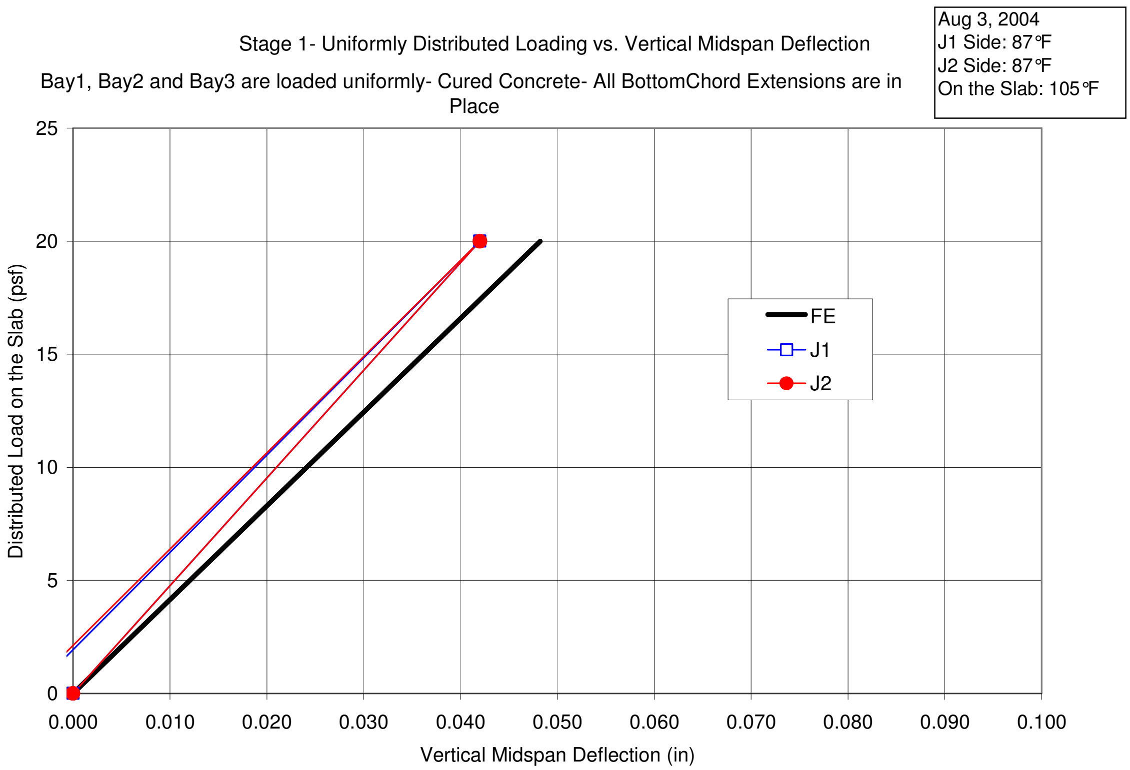


Figure C.61

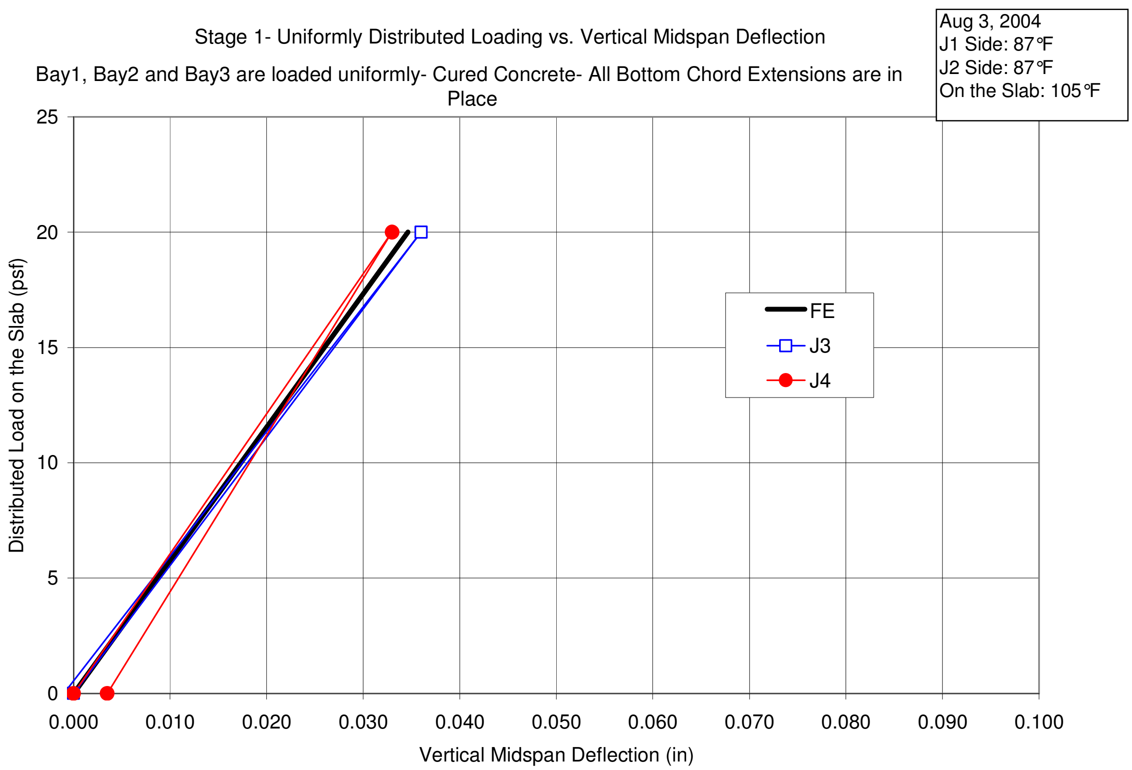


Figure C.62

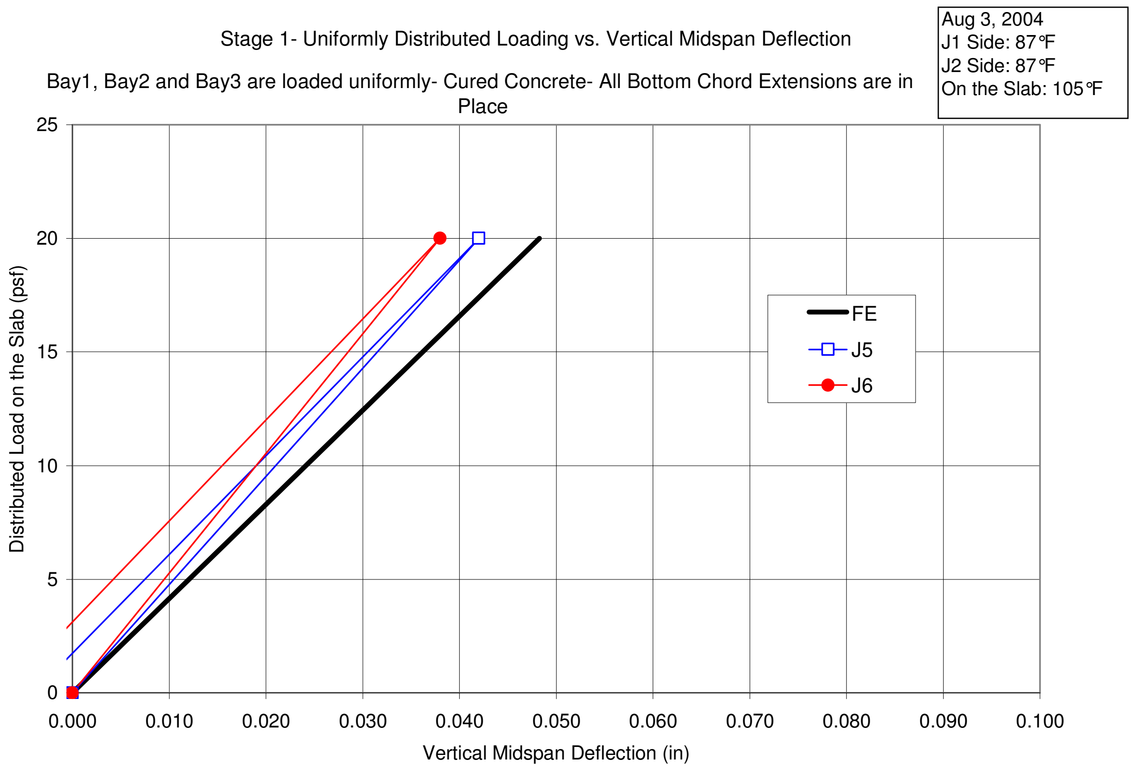


Figure C.63

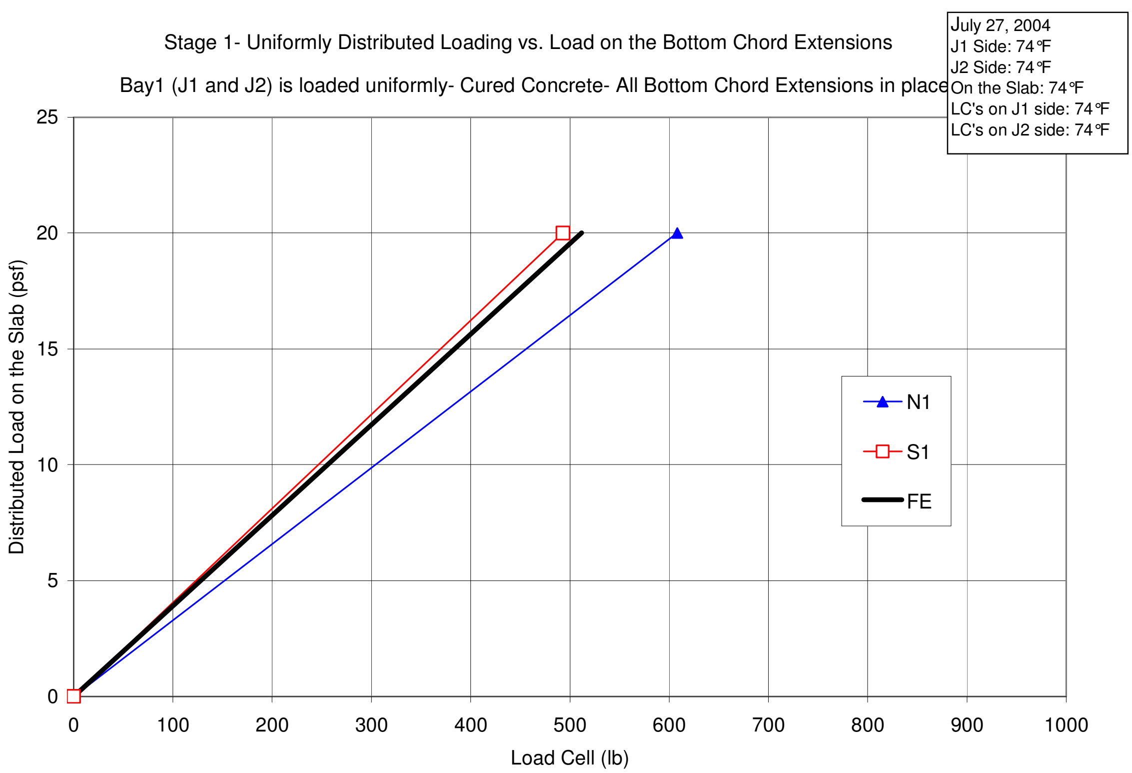


Figure C.64

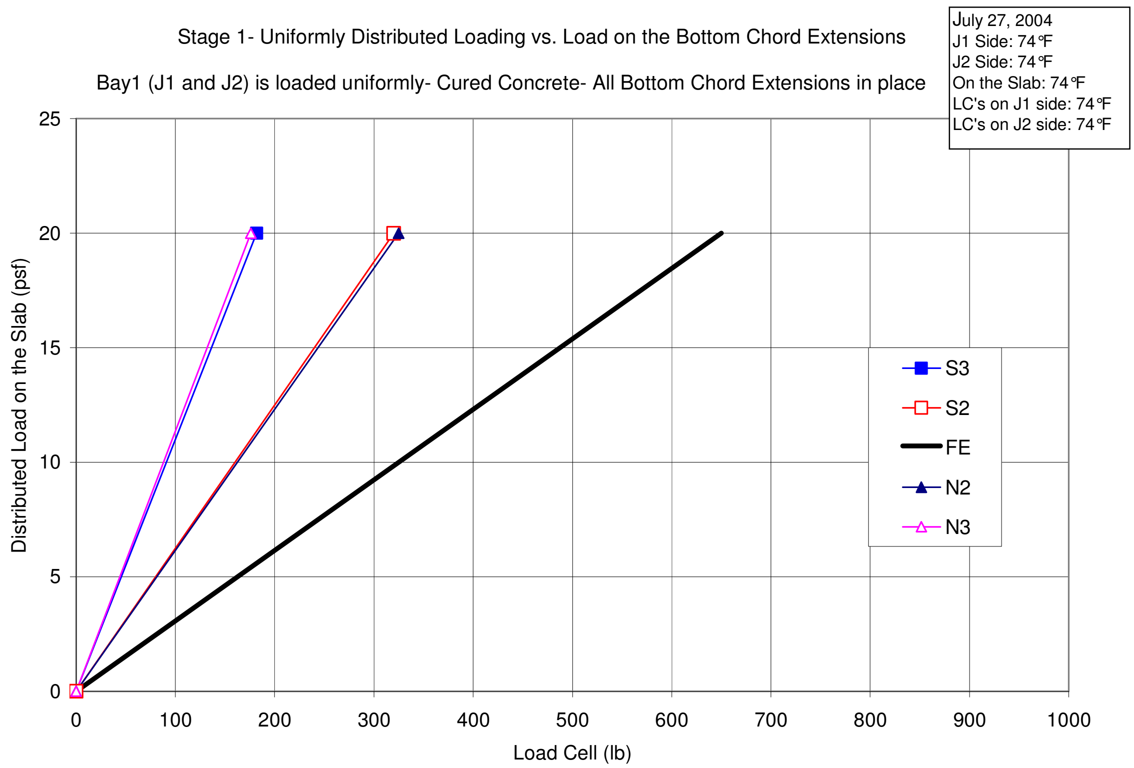


Figure C.65

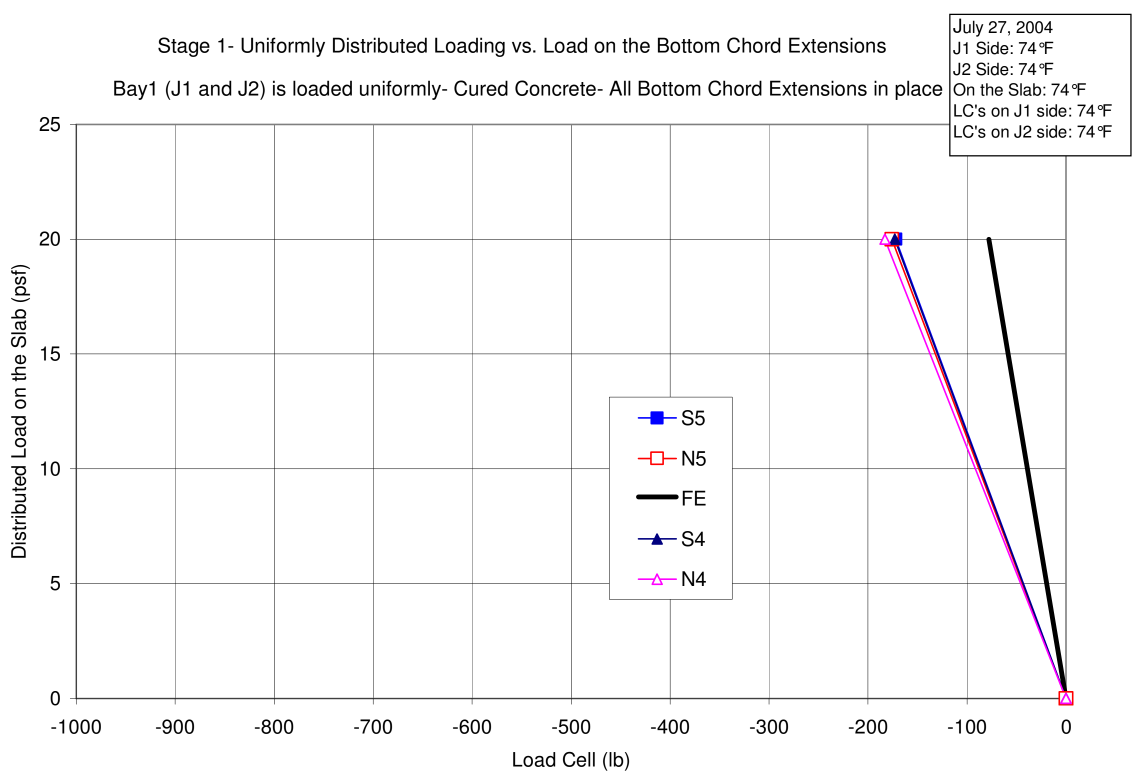


Figure C.66

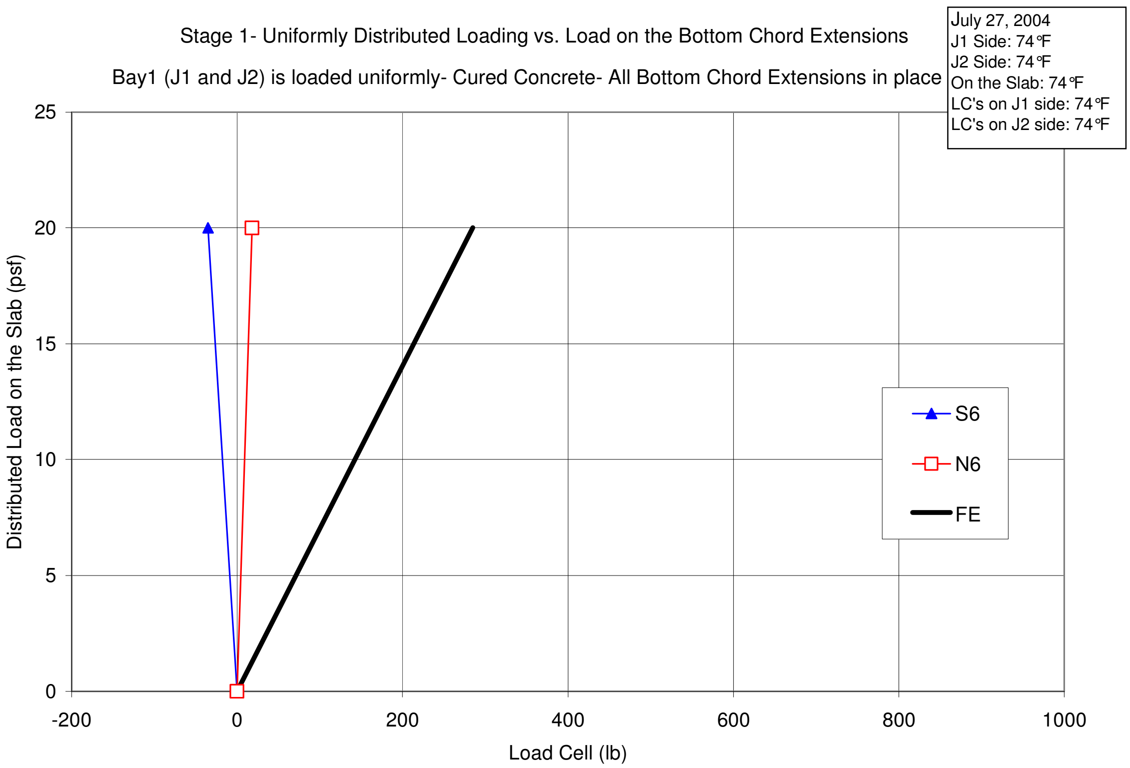


Figure C.67

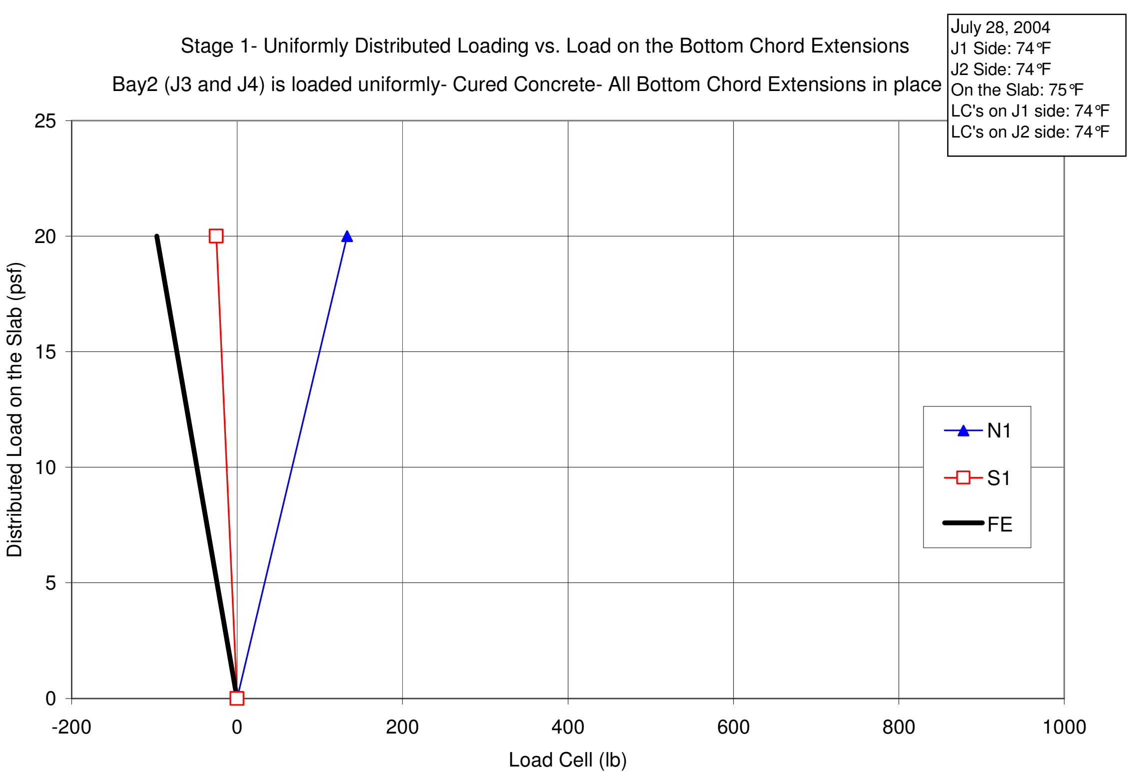


Figure C.68

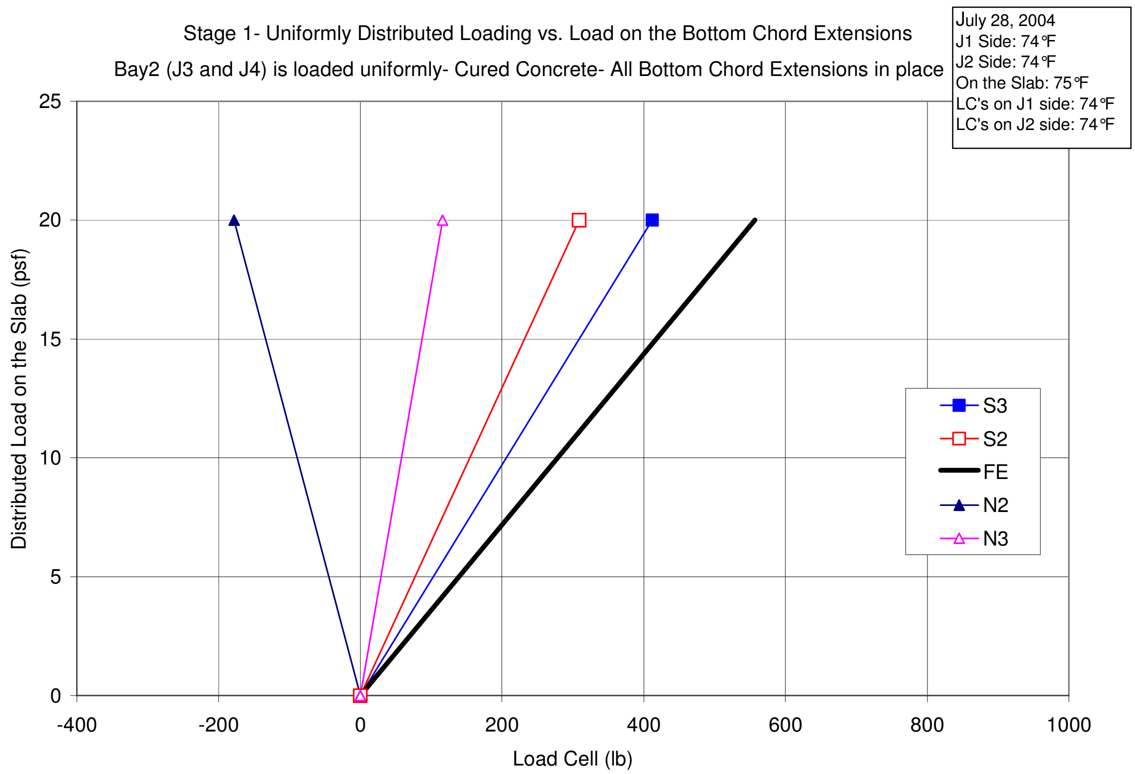


Figure C.69

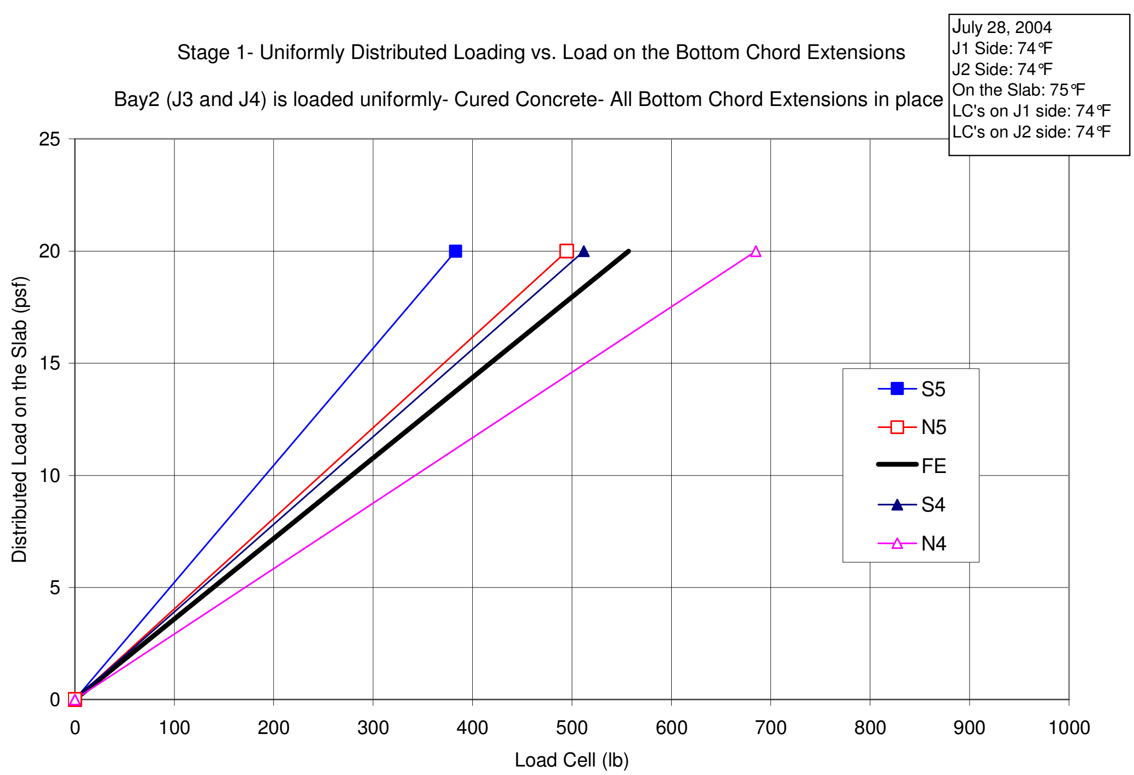


Figure C.70

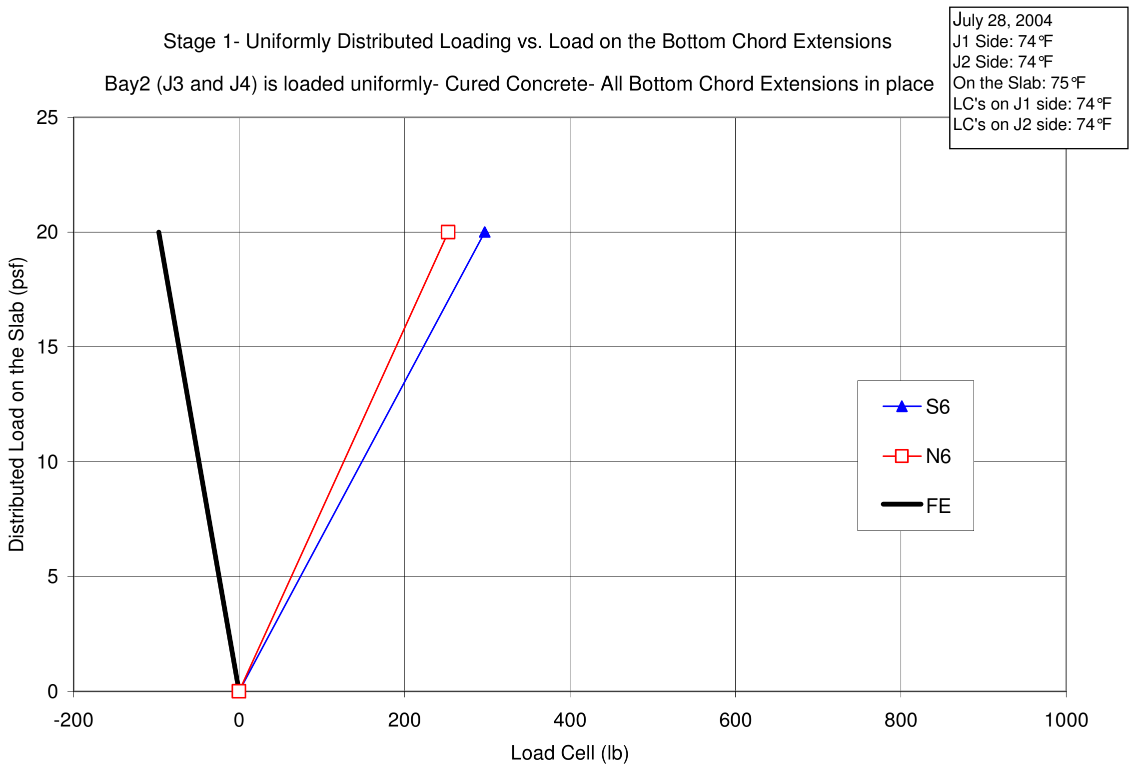


Figure C.71

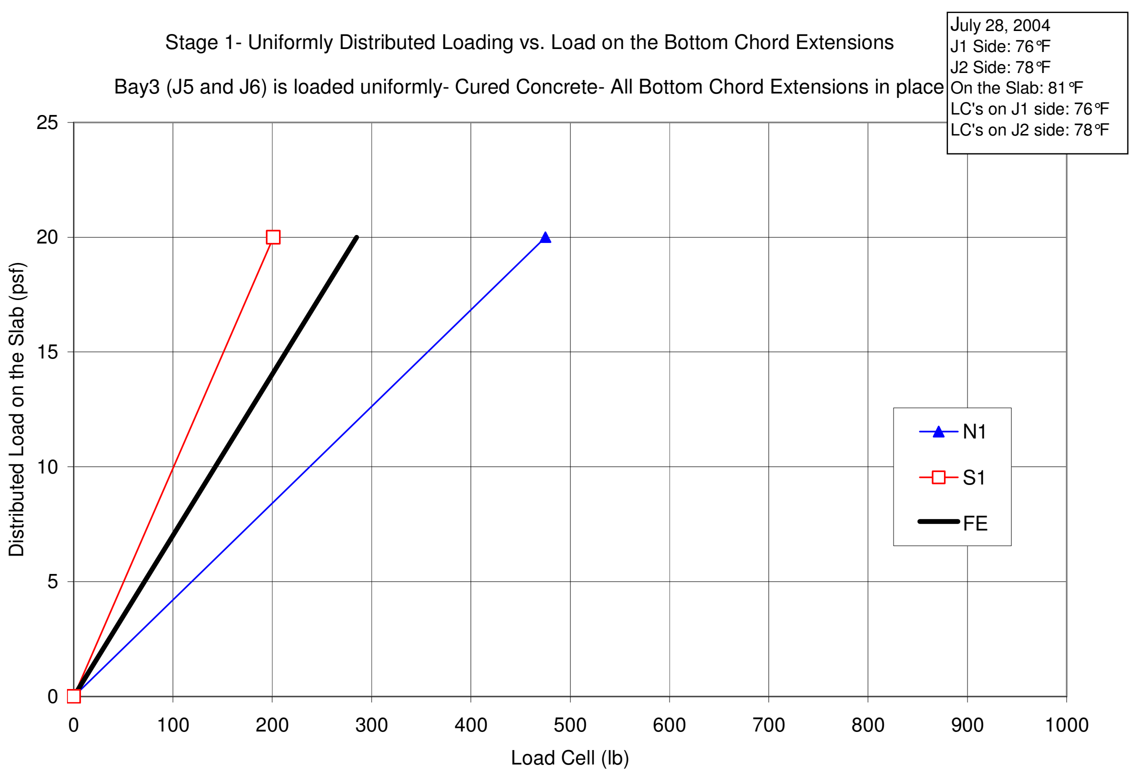


Figure C.72

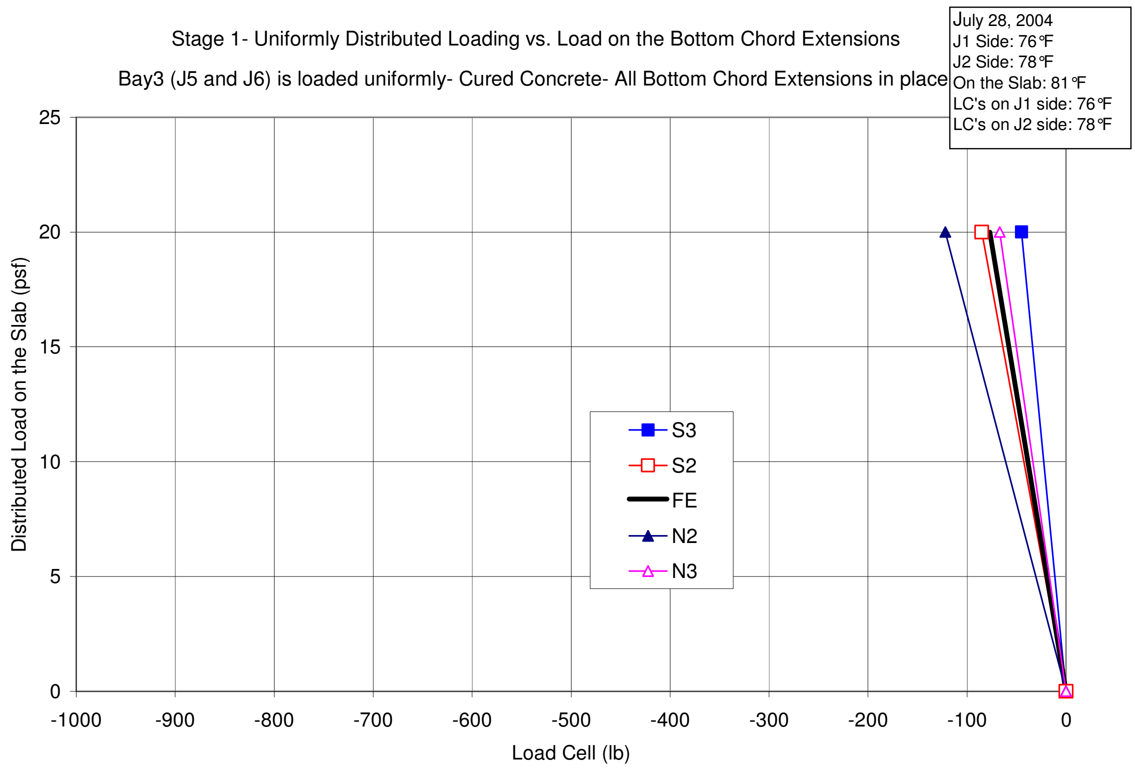


Figure C.73

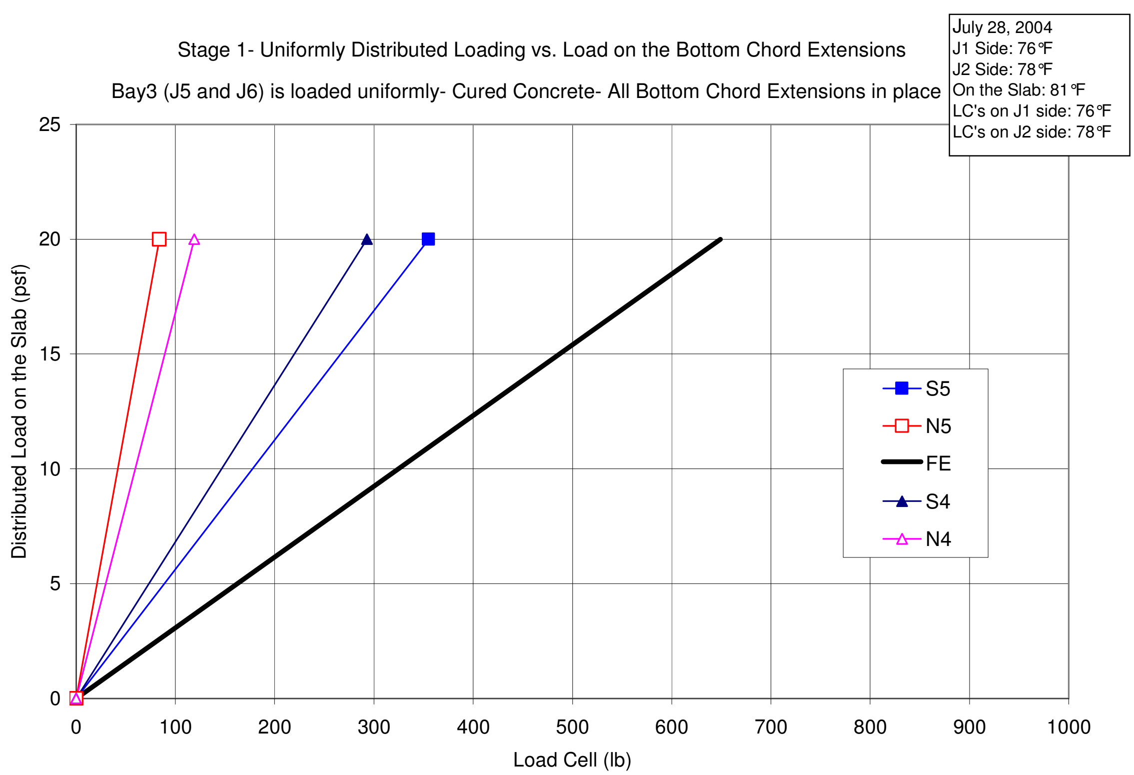


Figure C.74

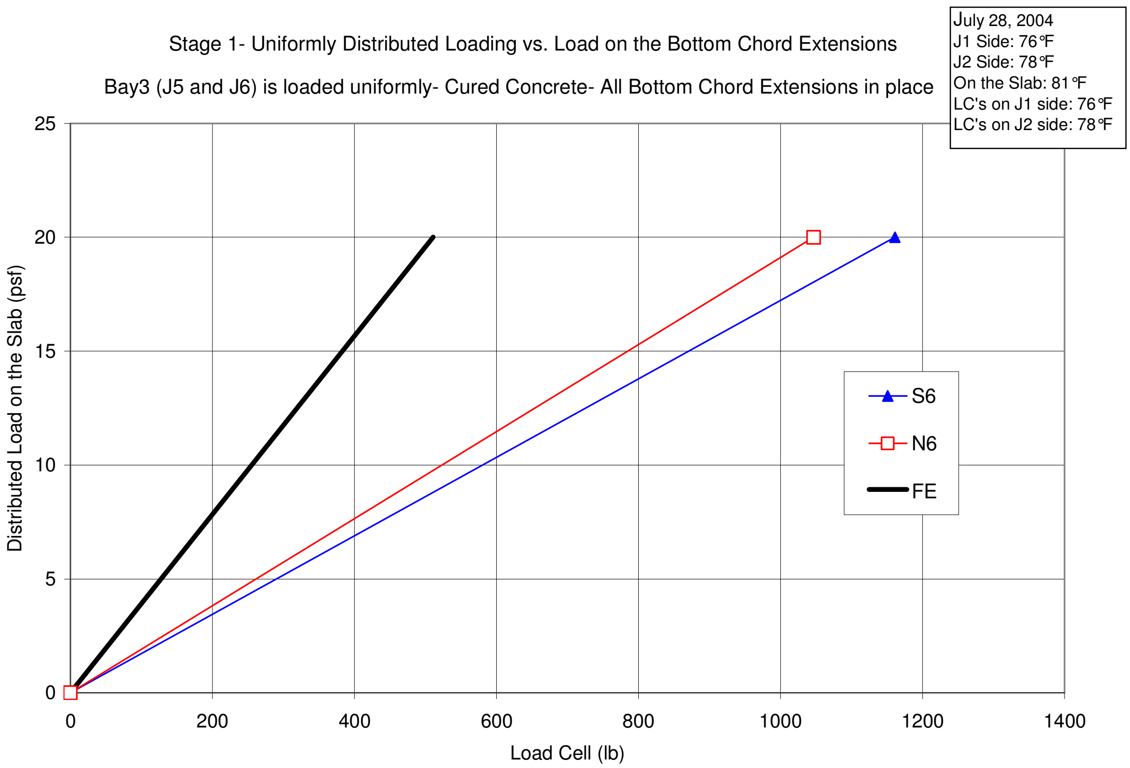


Figure C.75

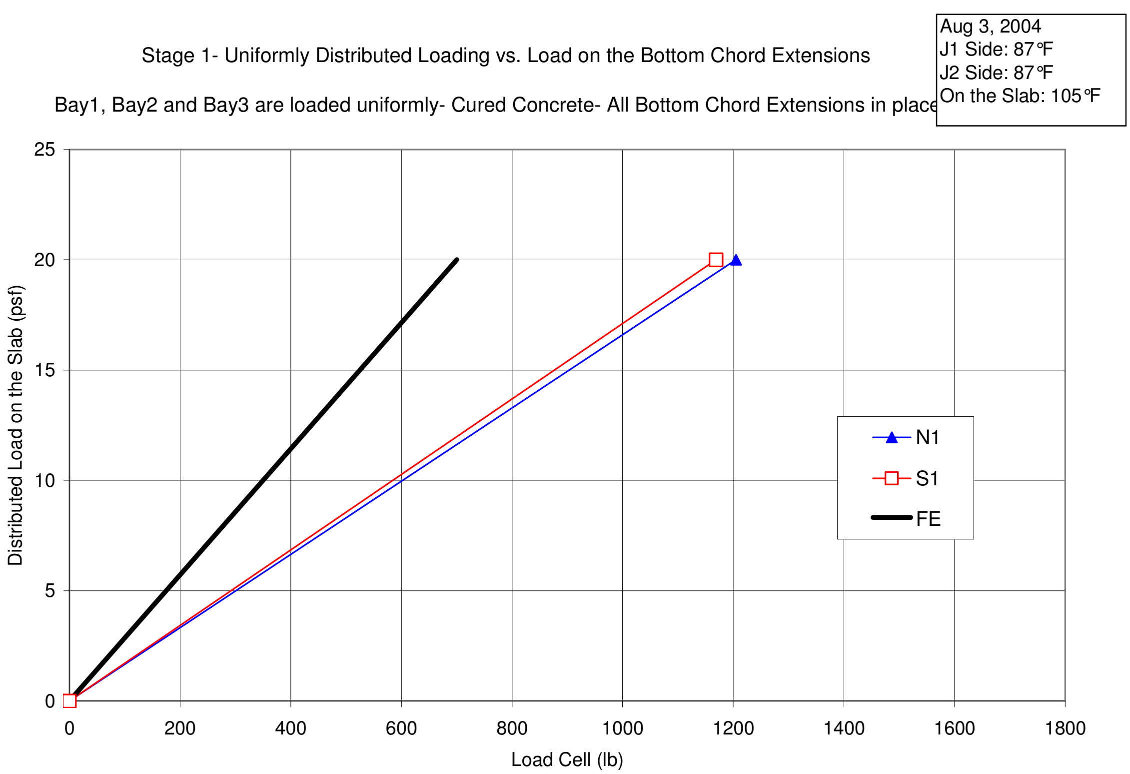


Figure C.76

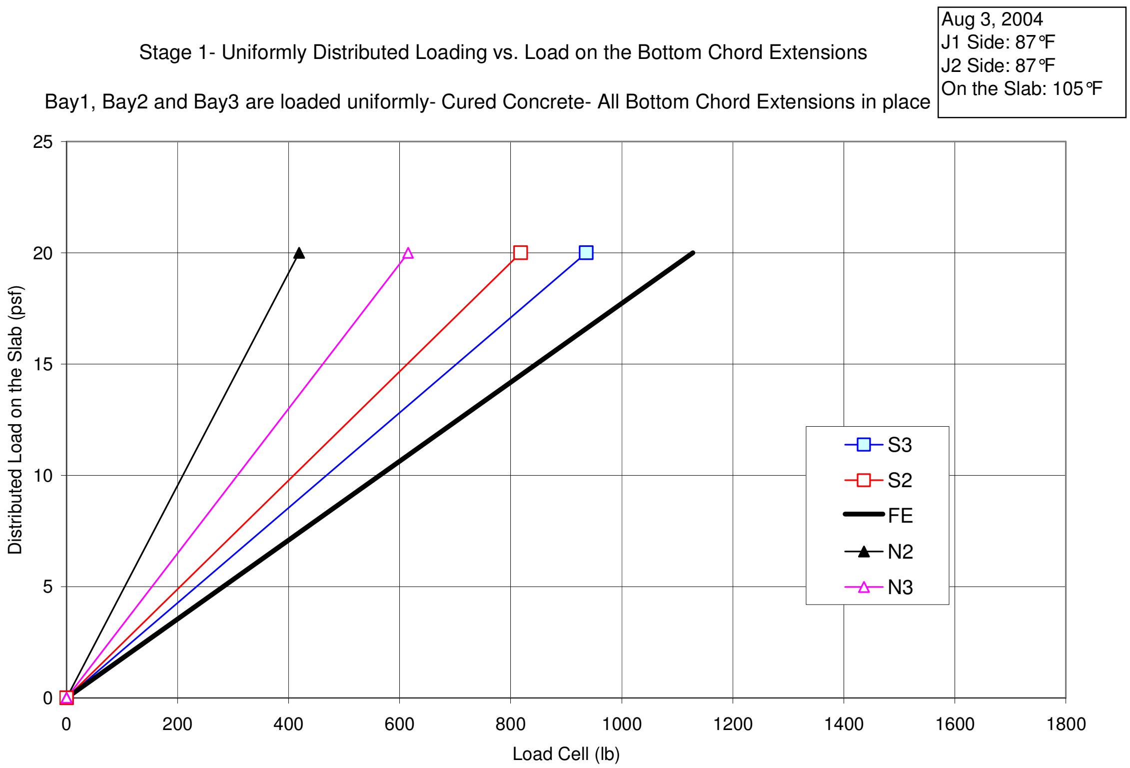


Figure C.77

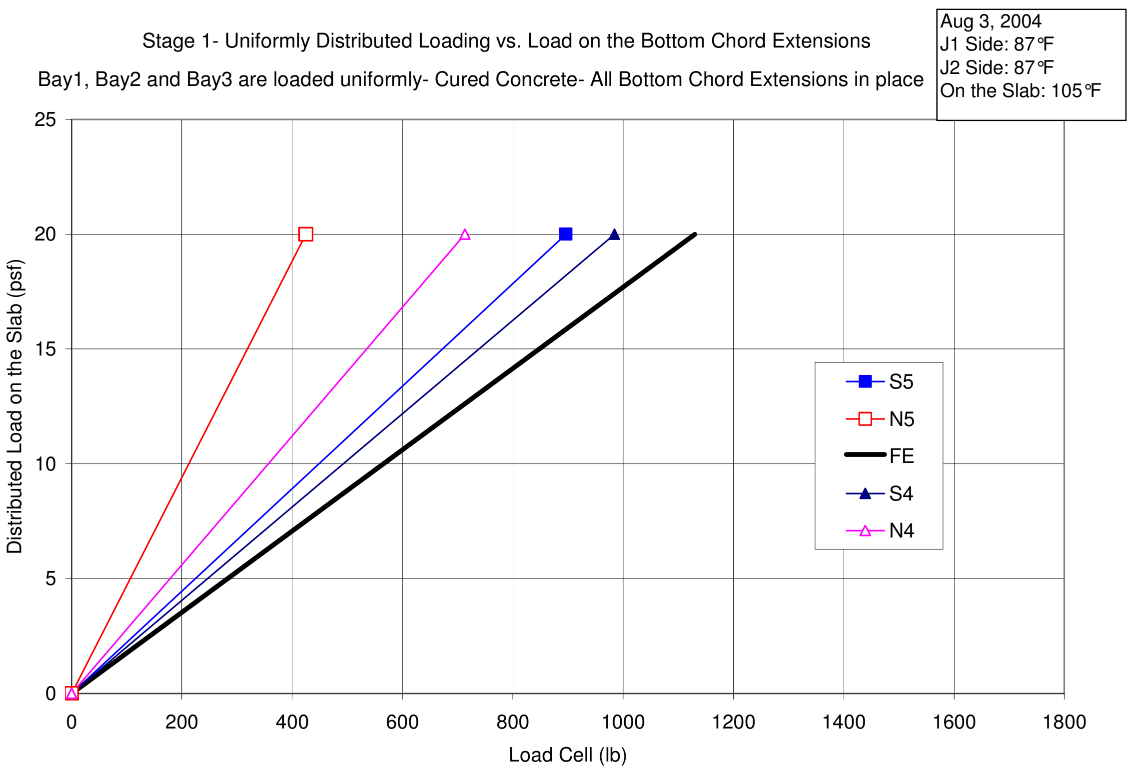
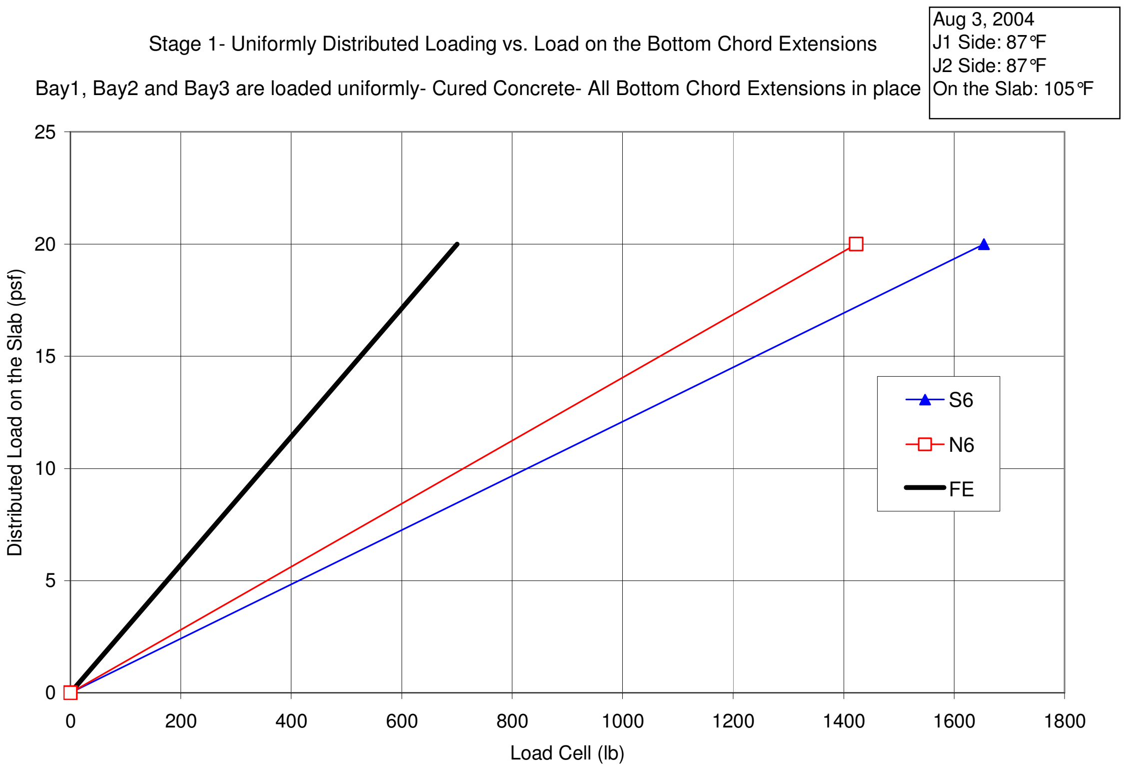


Figure C.78



Stage 1- Uniformly Distributed Loading vs. Load on the Bottom Chord Extensions
Bay1, Bay2 and Bay3 are loaded uniformly- Cured Concrete- All Bottom Chord Extensions in place
Aug 3, 2004
J1 Side: 87°F
J2 Side: 87°F
On the Slab: 105°F
Distributed Load on the Slab (psf)
Load Cell (lb)
S6
N6
FE
0
5
10
15
20
25
0
200
400
600
800
1000
1200
1400
1600
1800

Figure C.79

C.3.2 EXTERIOR BOTTOM CHORD EXTENSIONS TAKEN OUT (STAGE 2)

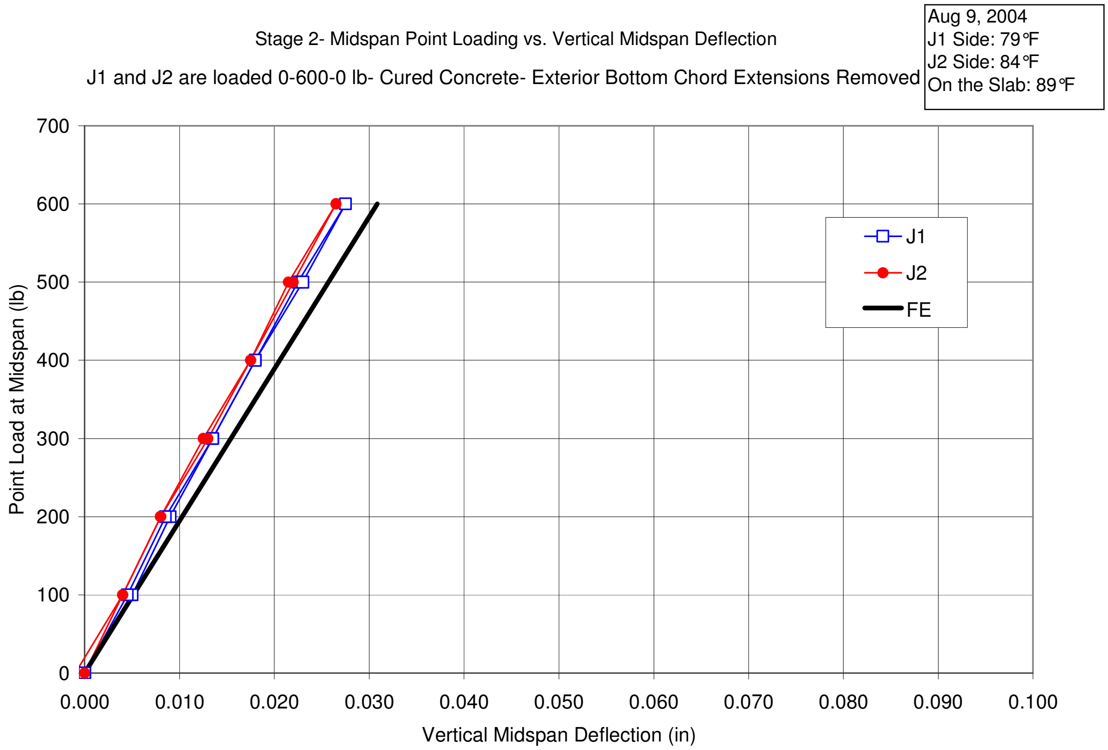


Figure C.80

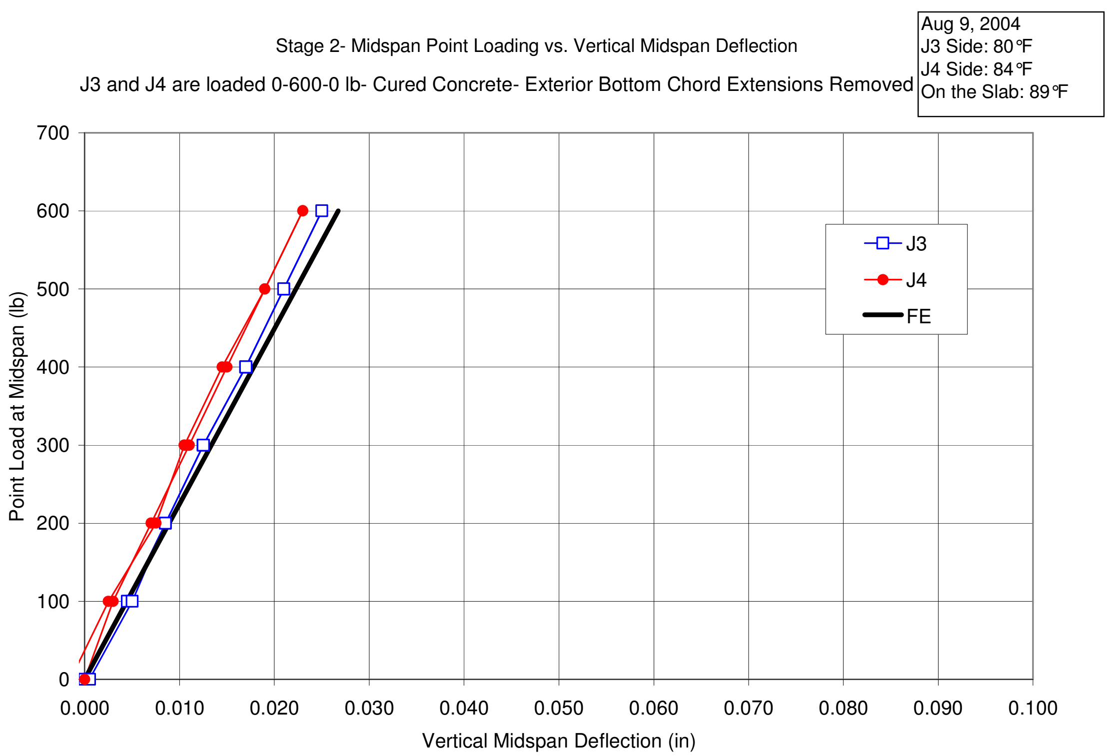


Figure C.81

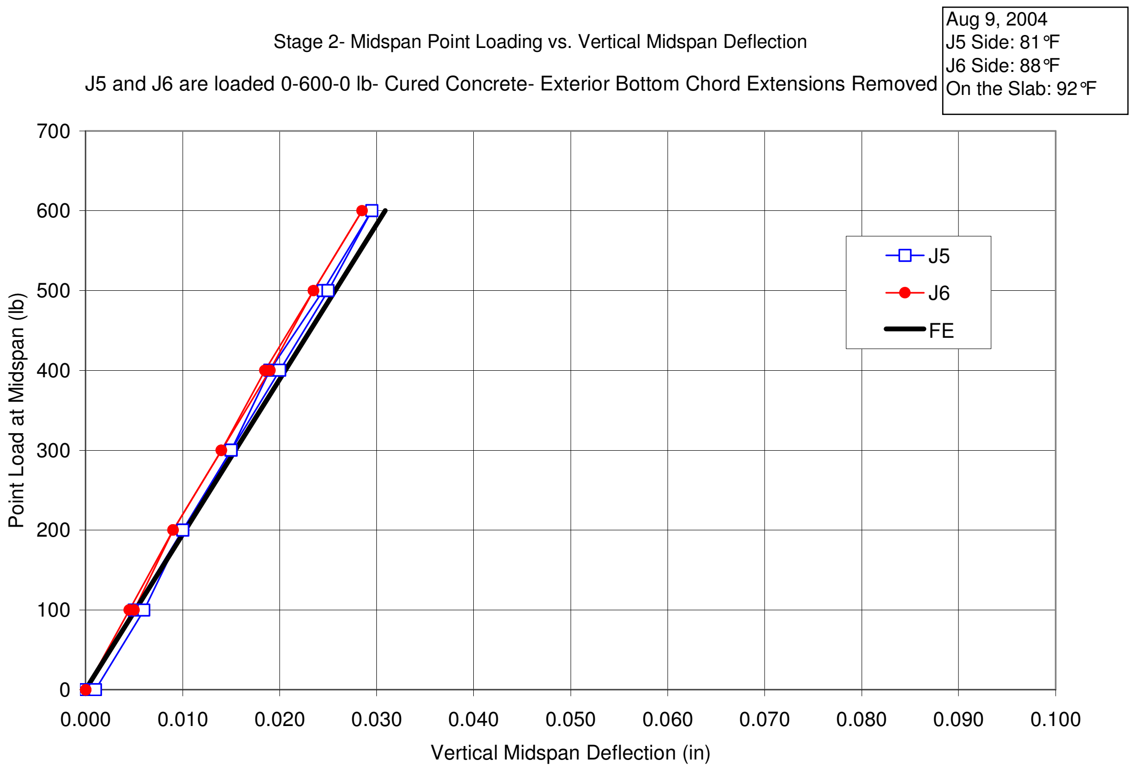


Figure C.82

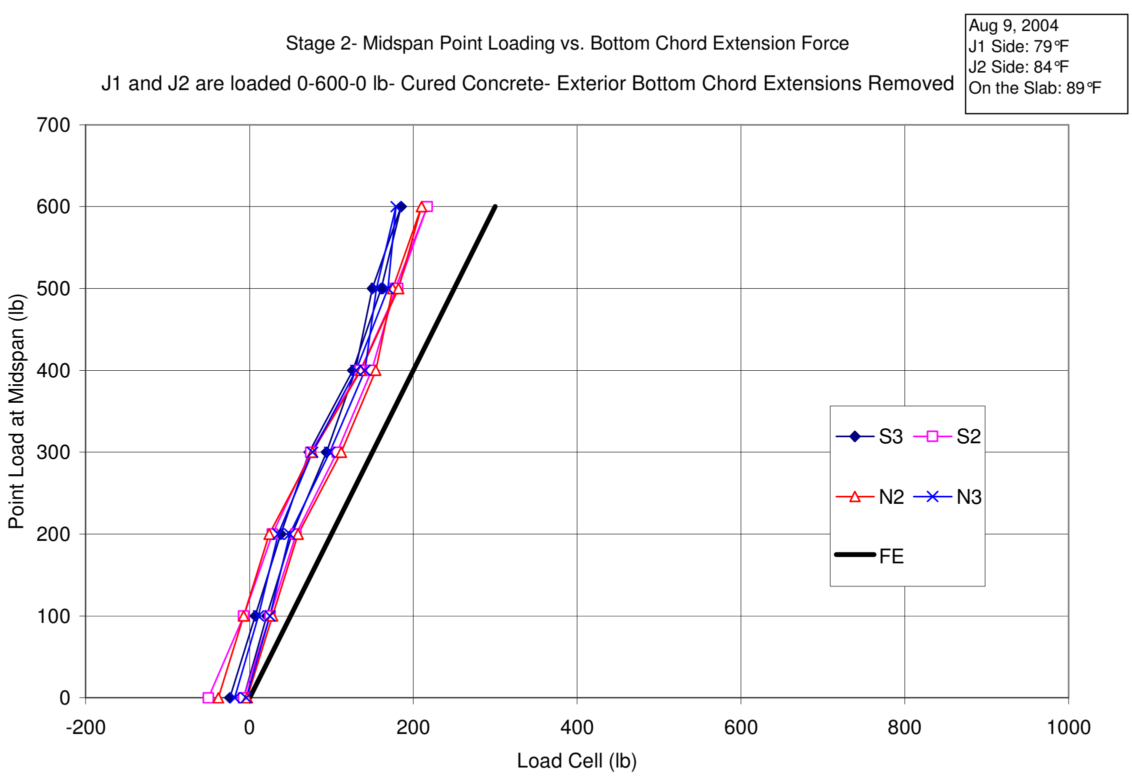


Figure C.83

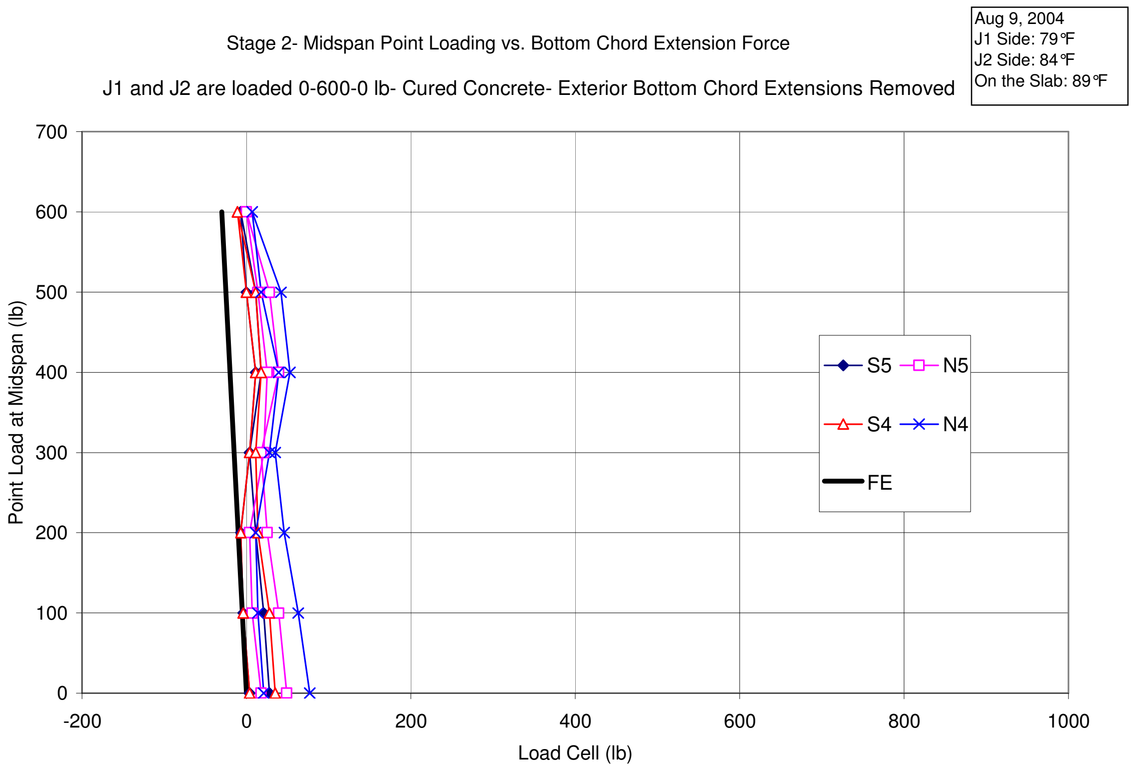


Figure C.84

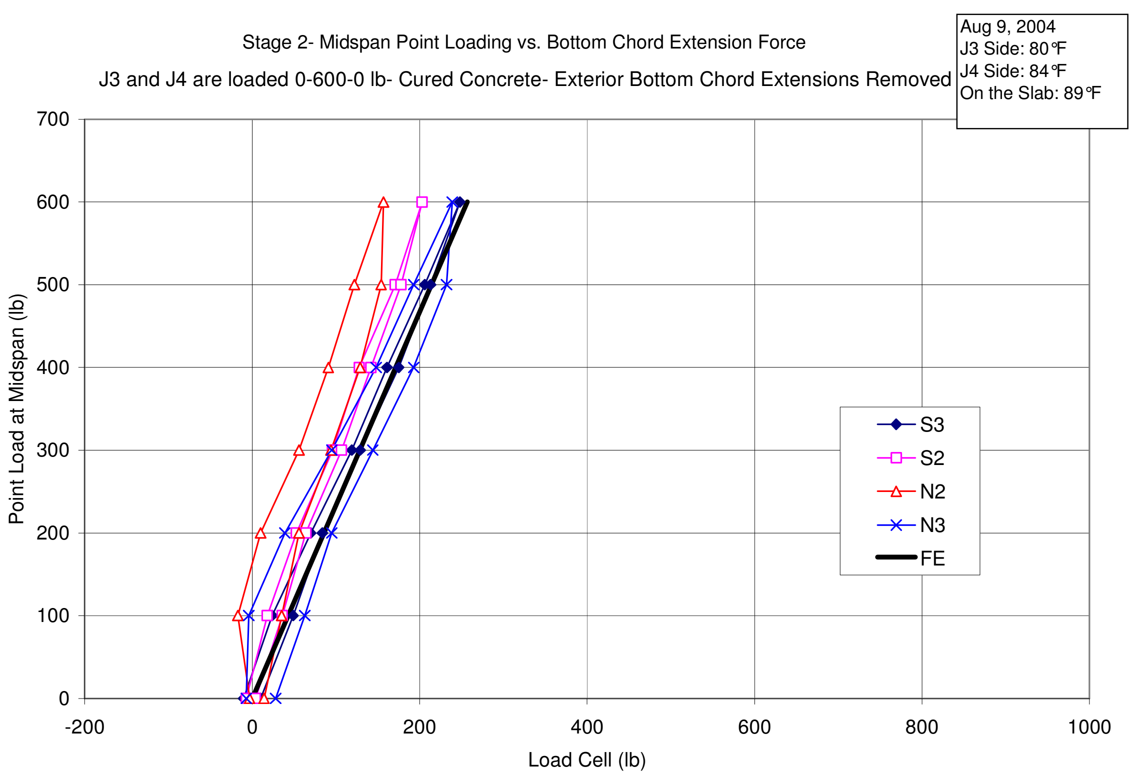


Figure C.85

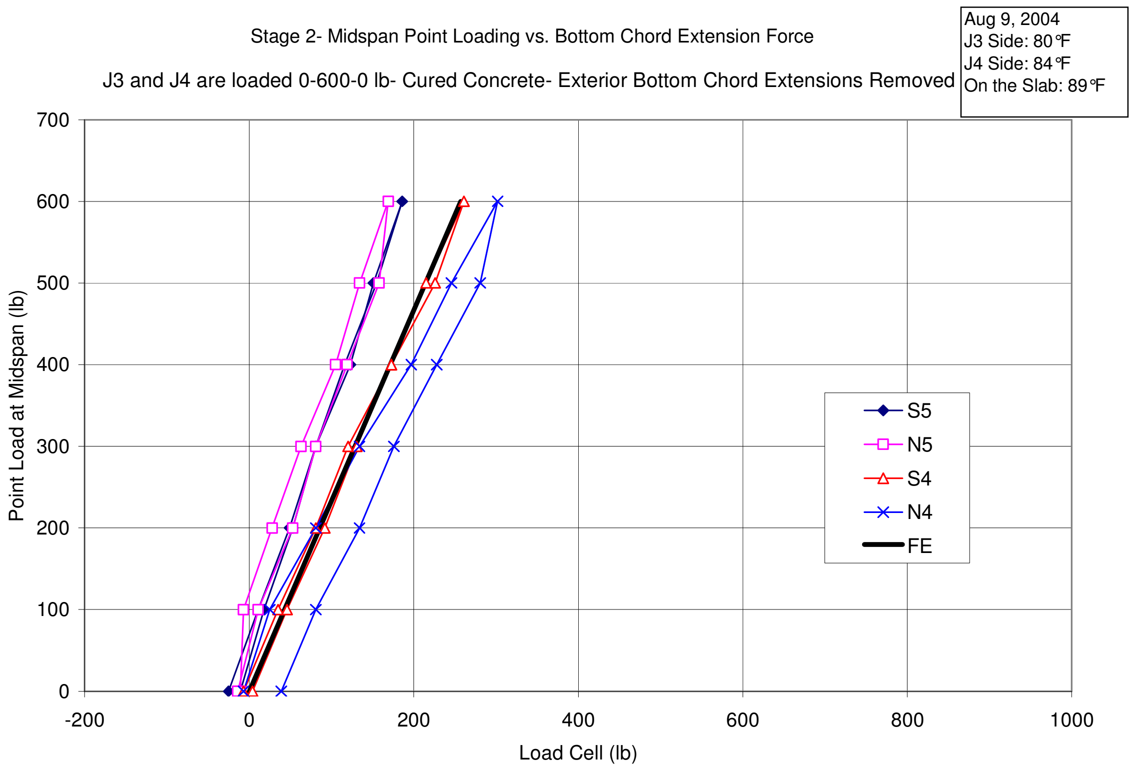


Figure C.86

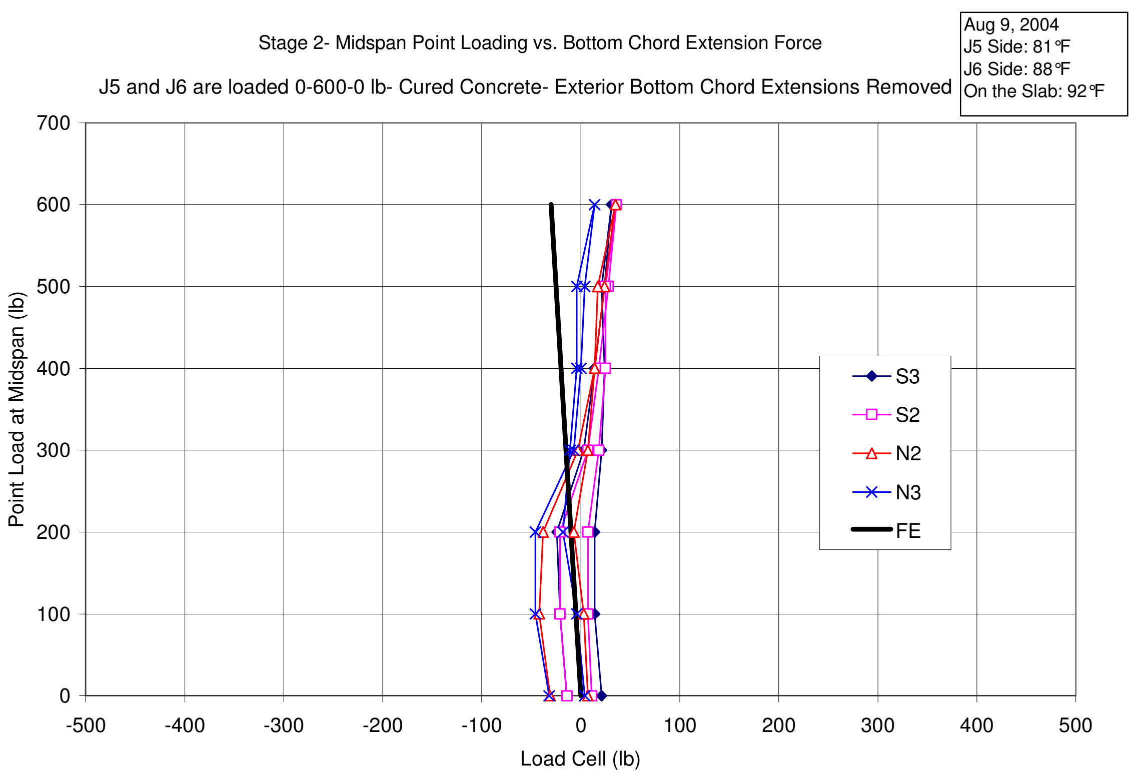


Figure C.87

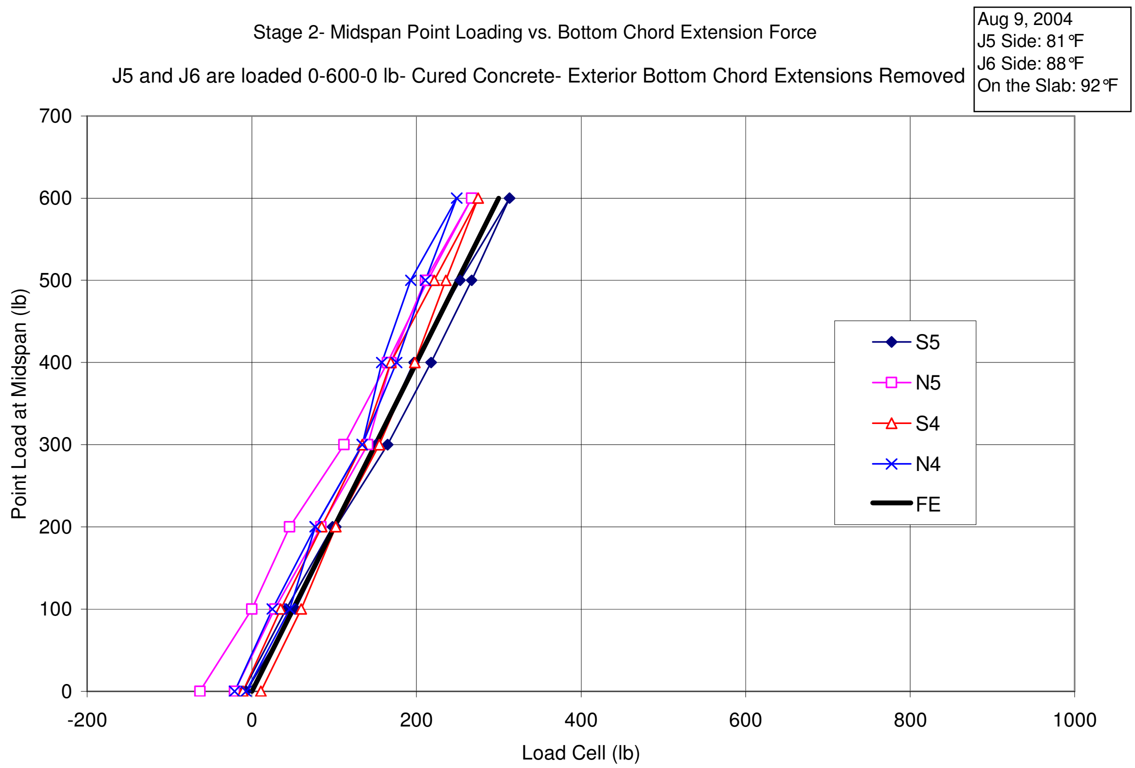


Figure C.88

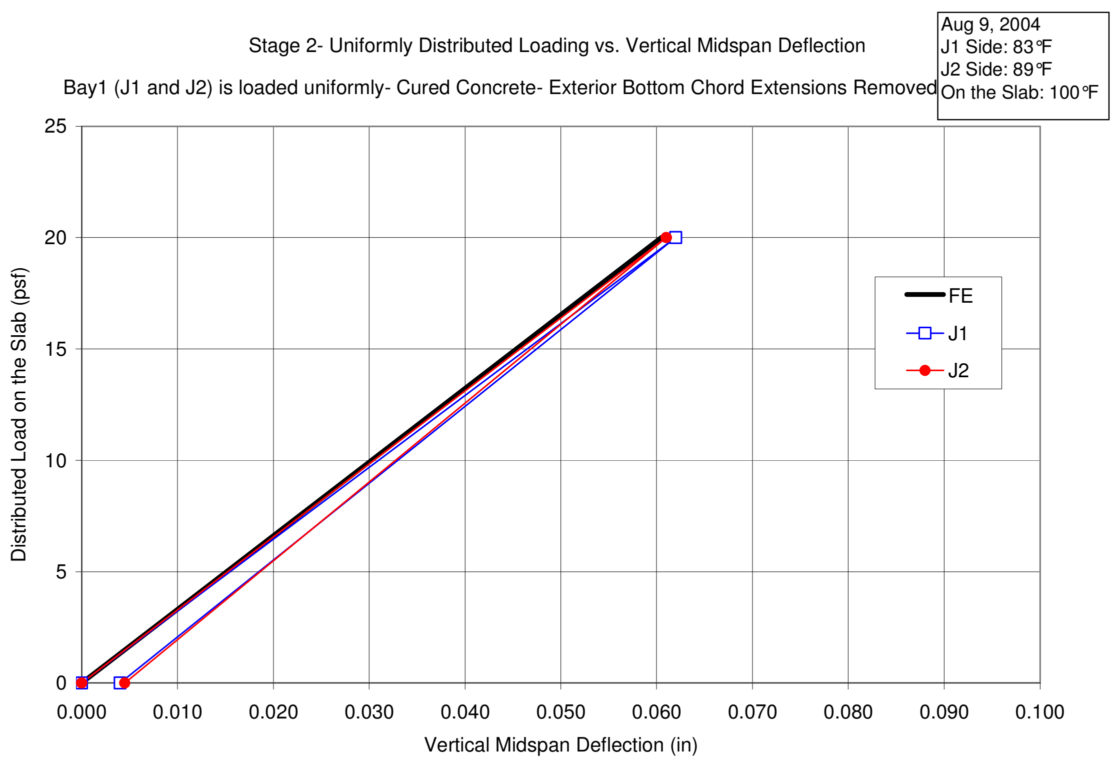


Figure C.89

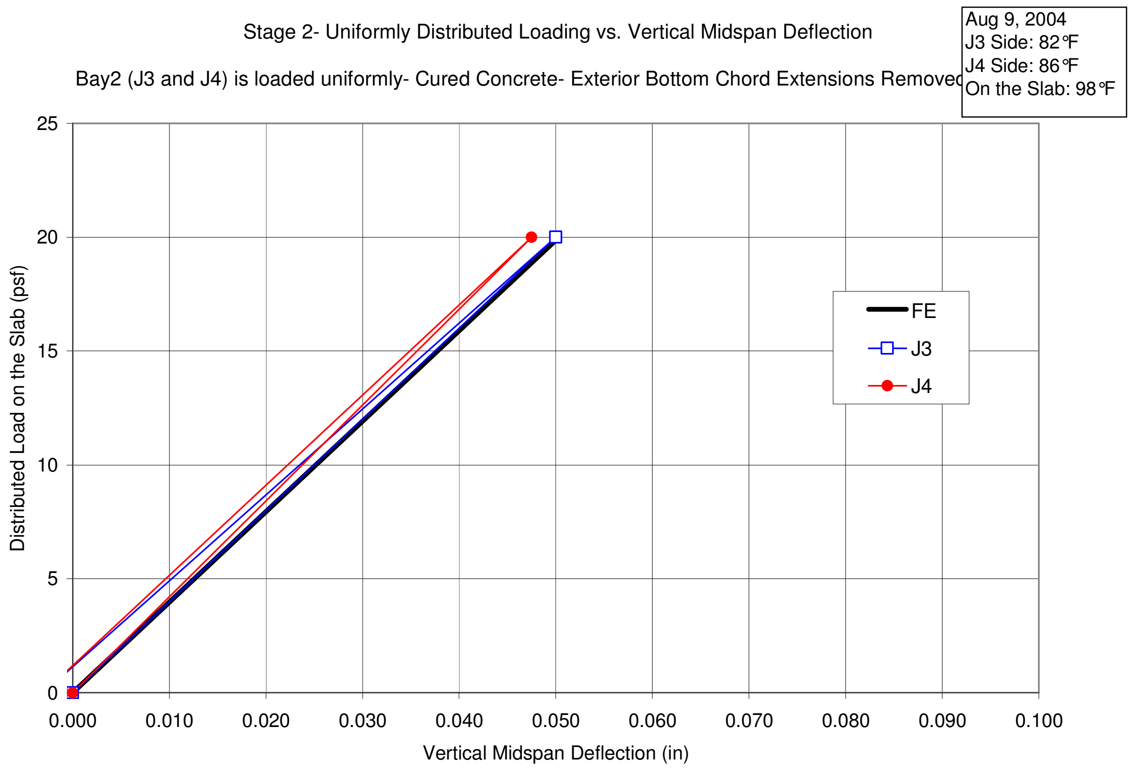


Figure C.90

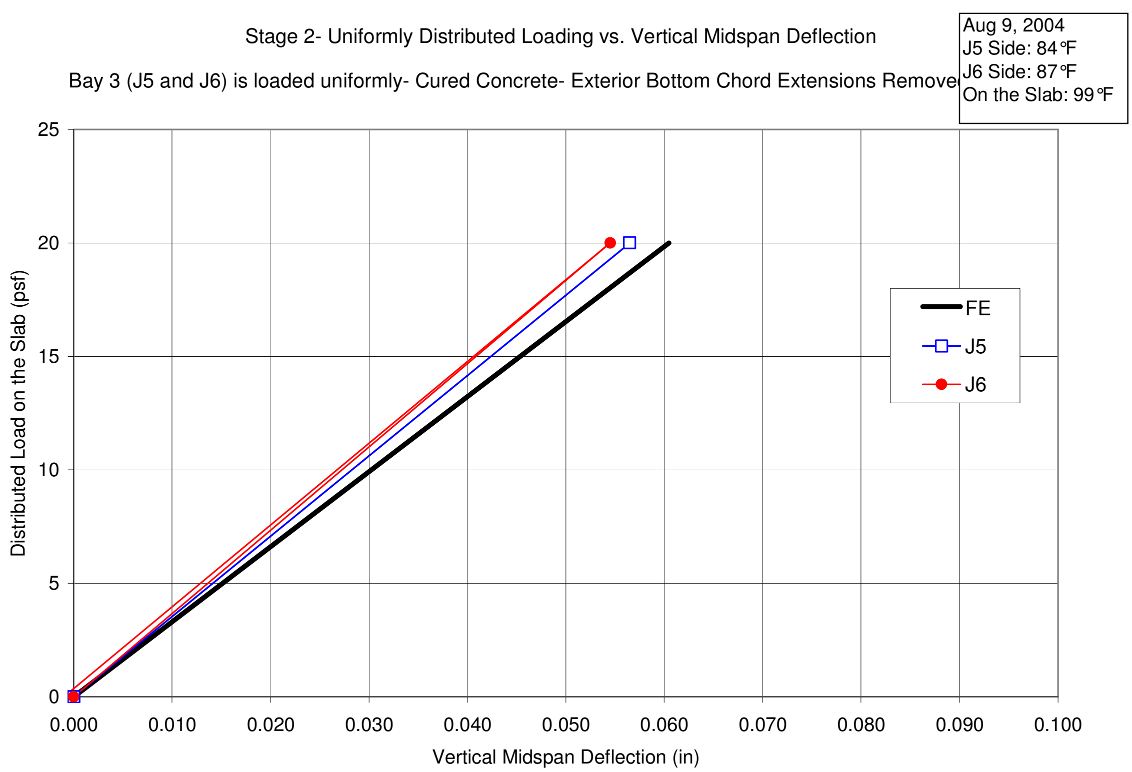


Figure C.91

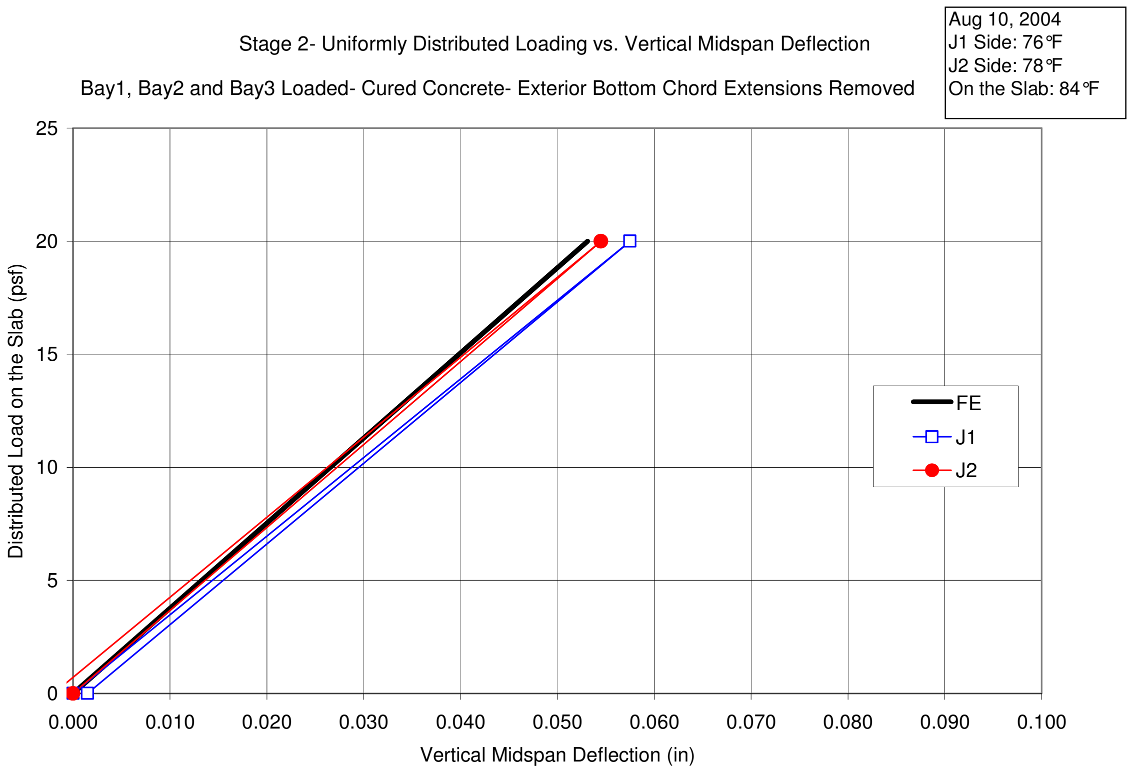


Figure C.92

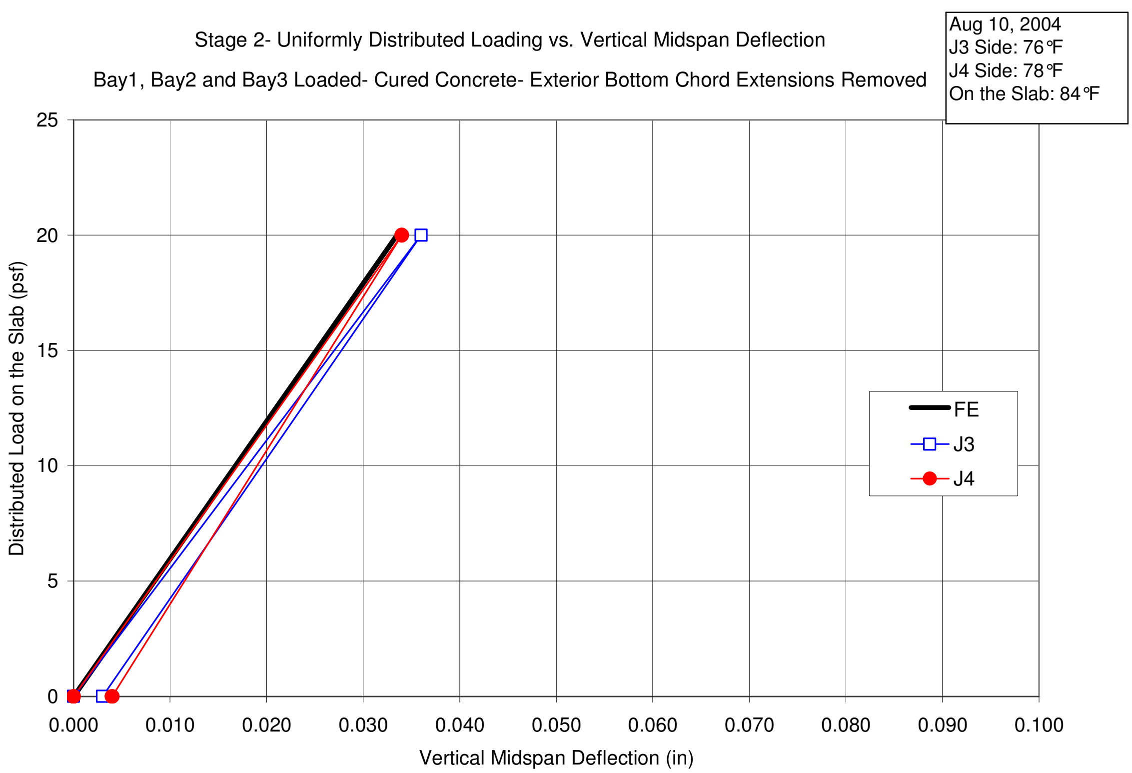


Figure C.93

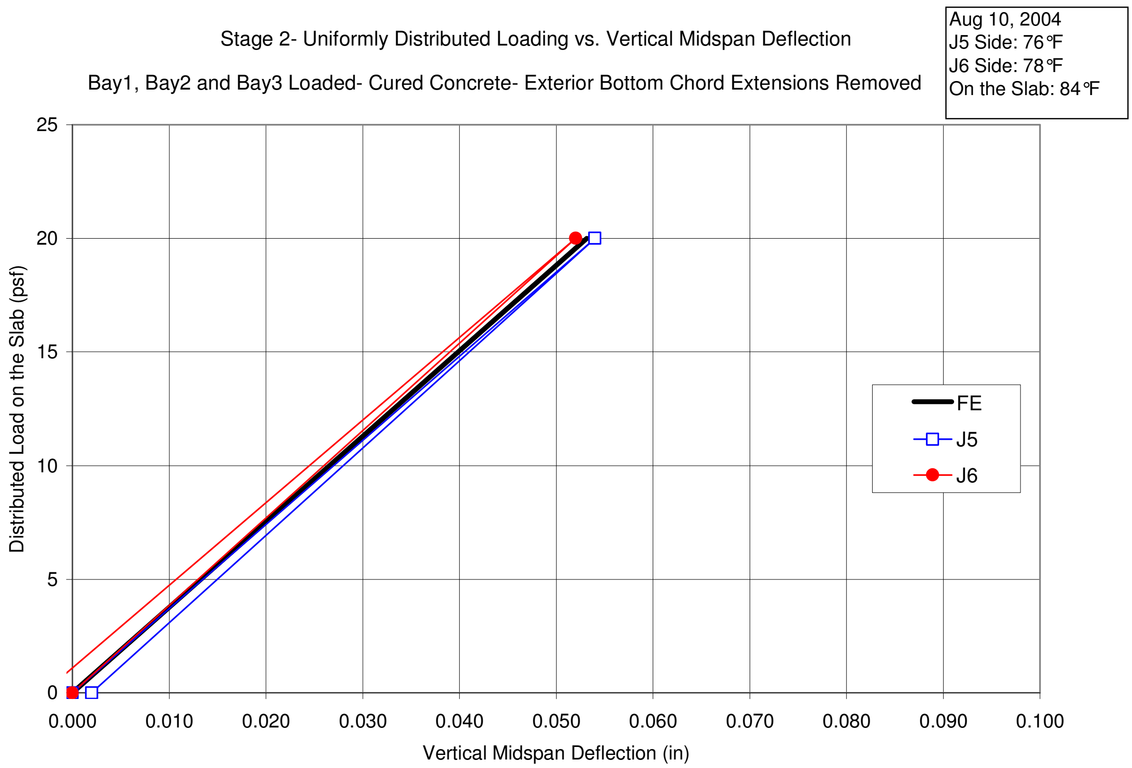


Figure C.94

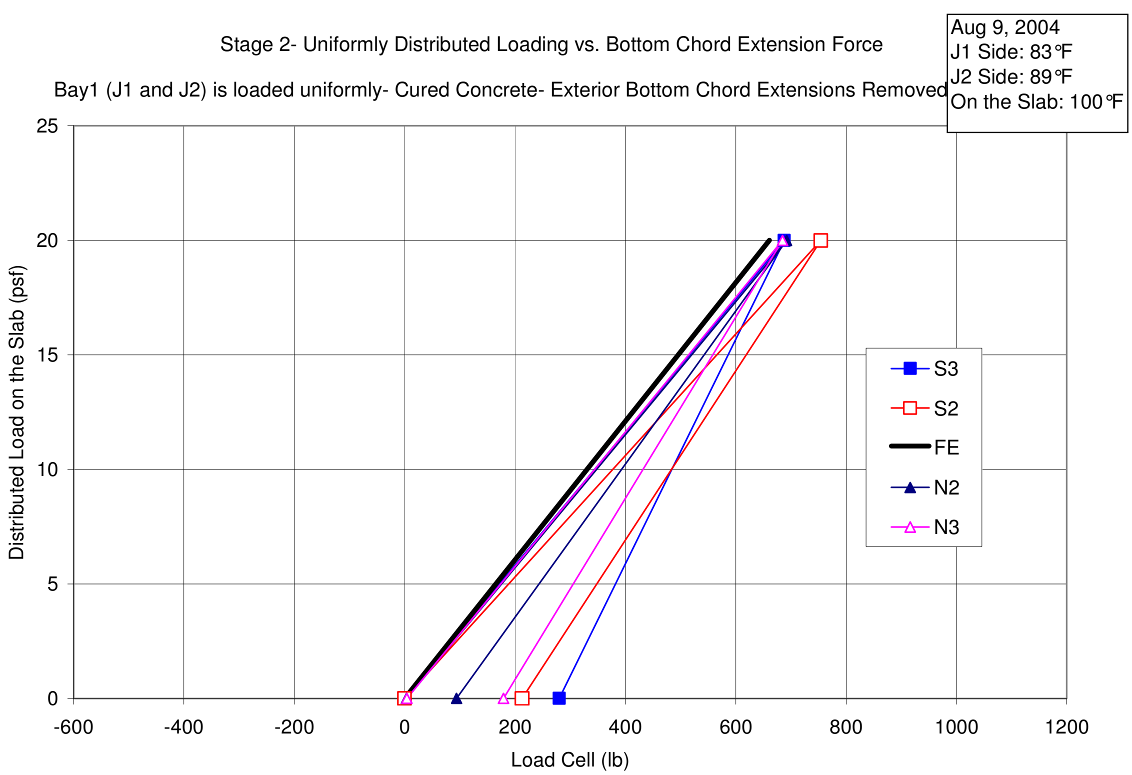


Figure C.95

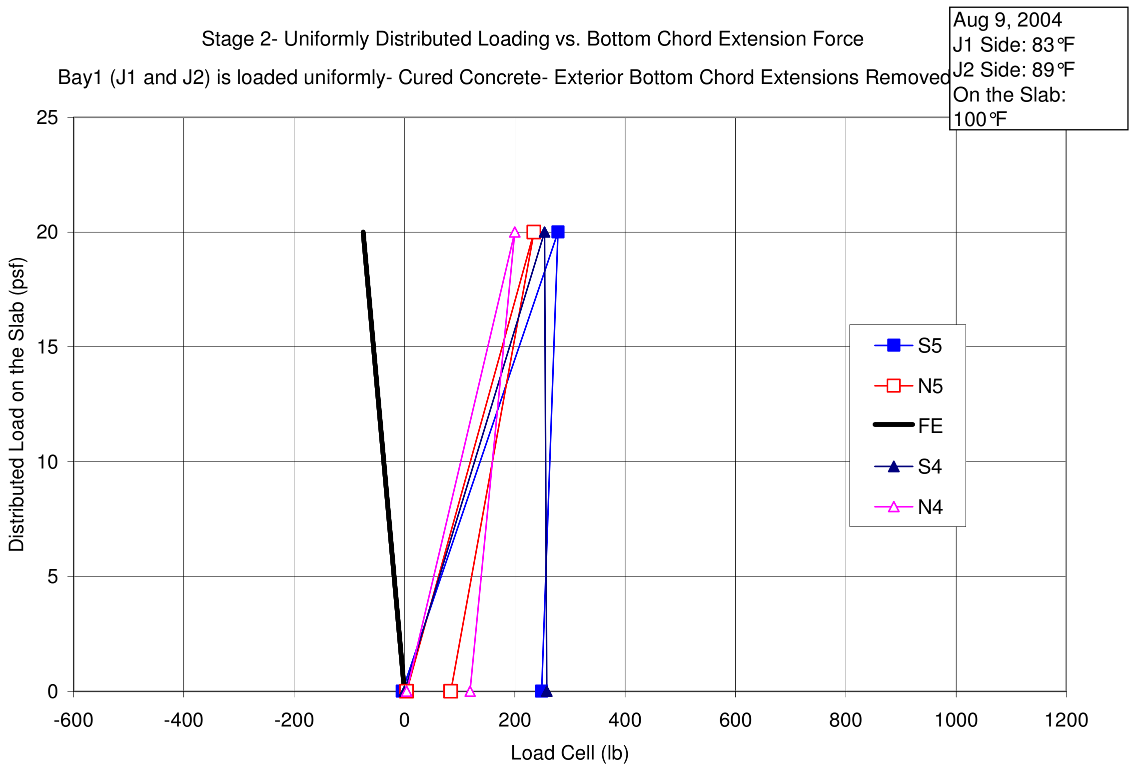


Figure C.96

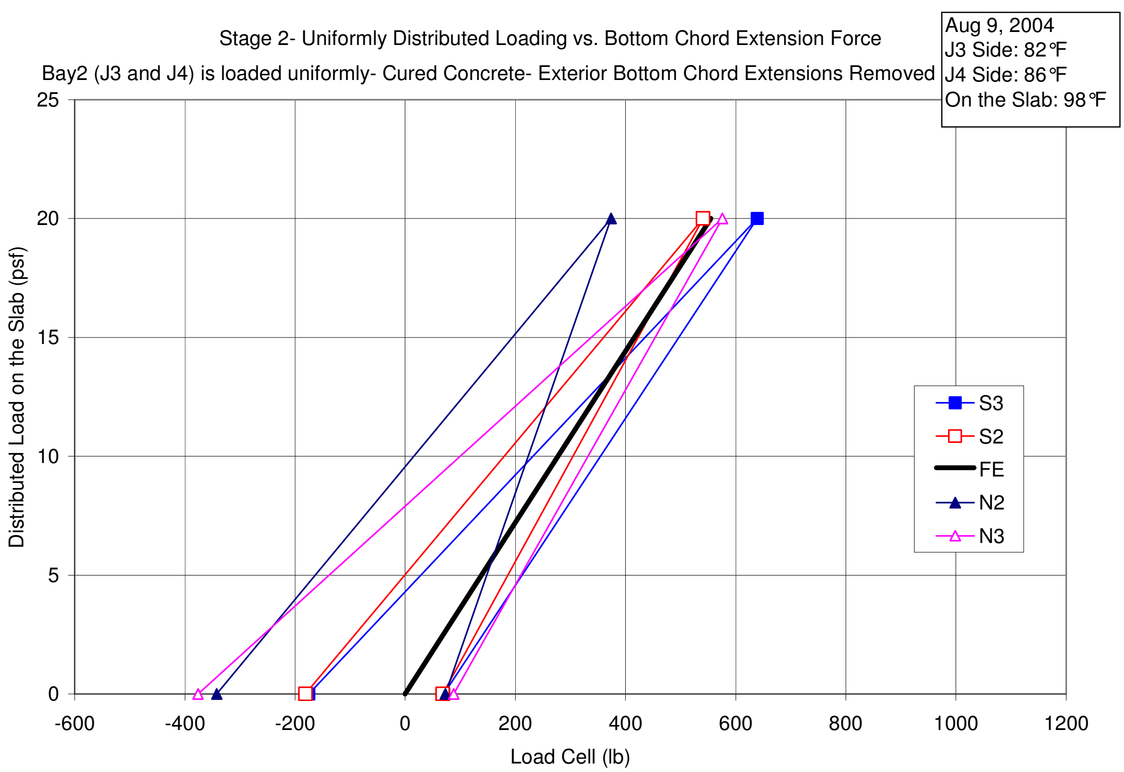


Figure C.97

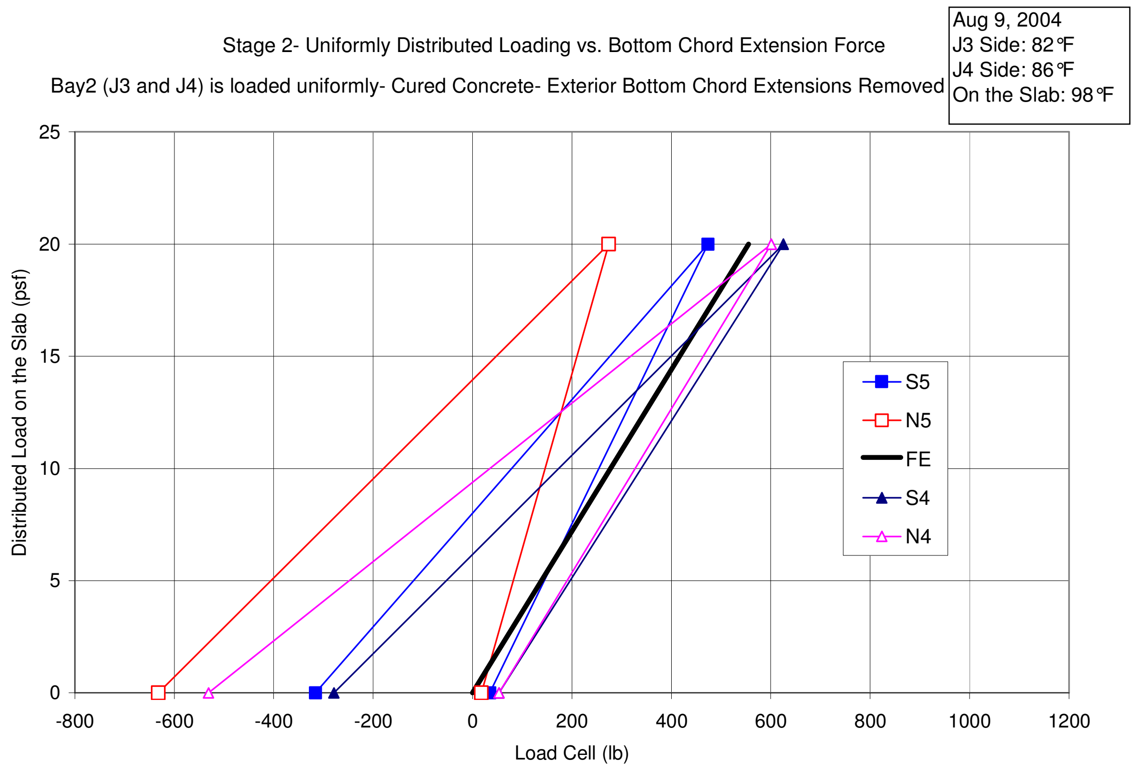


Figure C.98

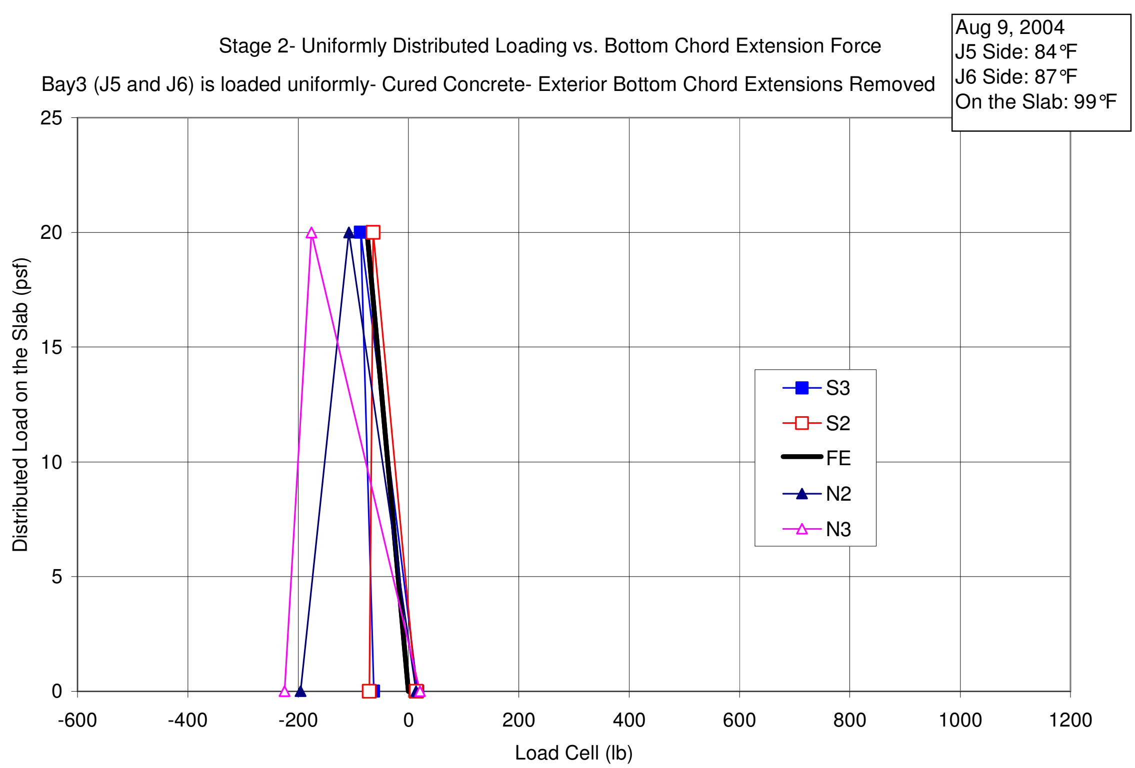


Figure C.99

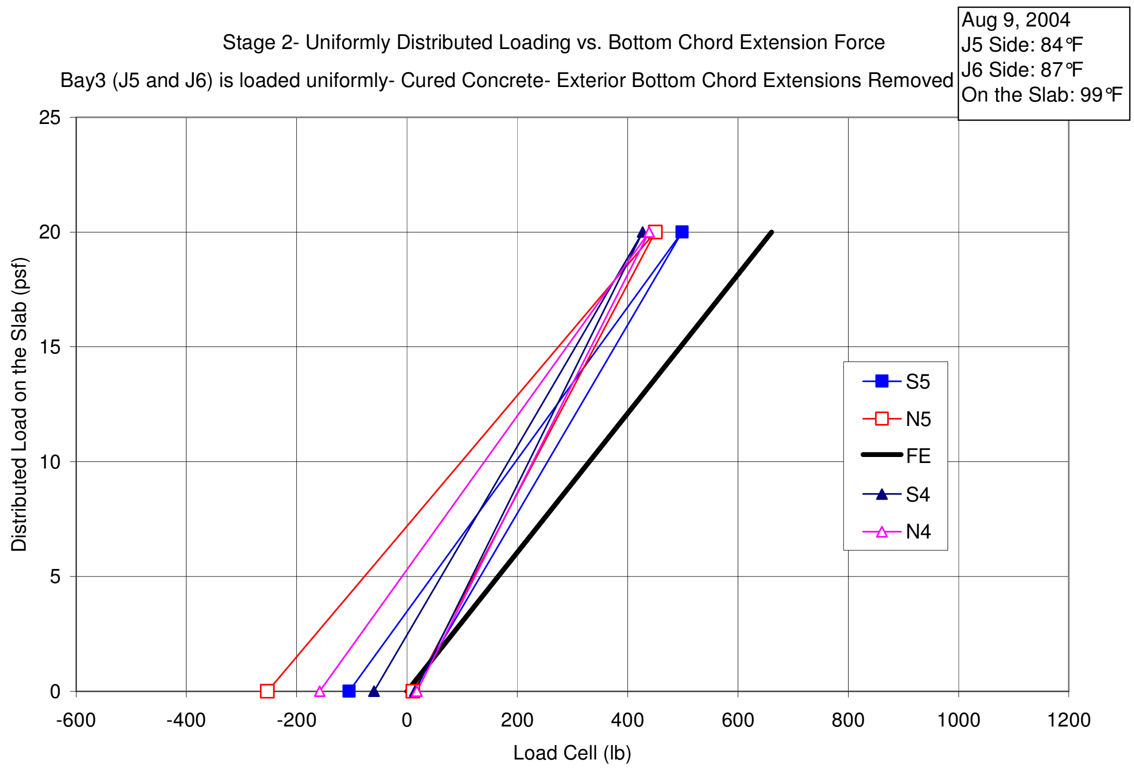


Figure C.100

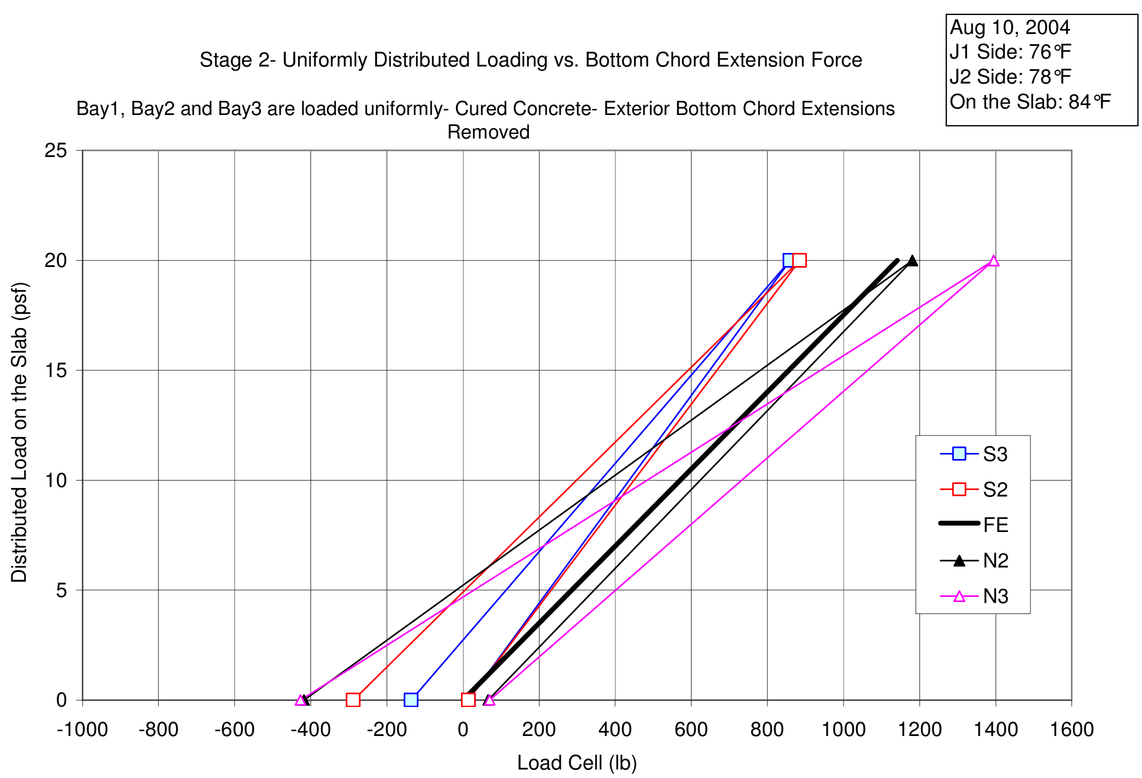


Figure C.101

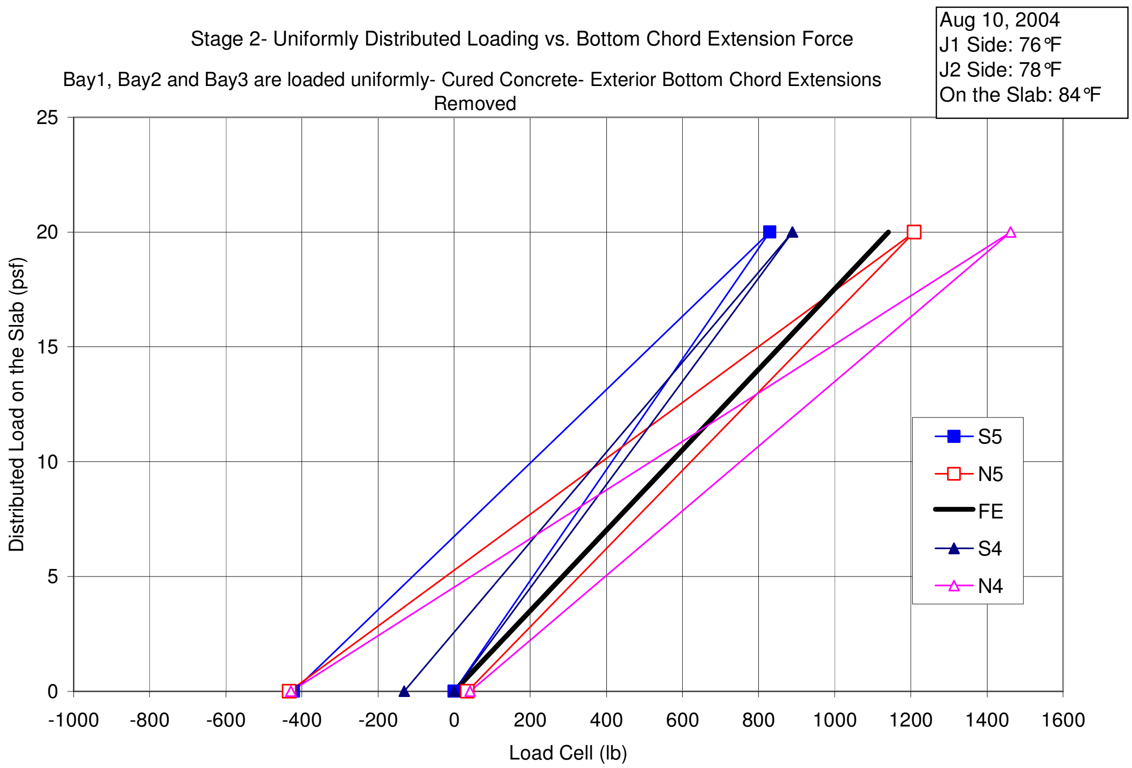

Aug 10, 2004
J1 Side: 76°F
J2 Side: 78°F
On the Slab: 84°F
Stage 2- Uniformly Distributed Loading vs. Bottom Chord Extension Force
Bay1, Bay2 and Bay3 are loaded uniformly- Cured Concrete- Exterior Bottom Chord Extensions Removed
Distributed Load on the Slab (psf)
Load Cell (lb)
S5
N5
FE
S4
N4
25
20
15
10
5
0
-1000
-800
-600
-400
-200
0
200
400
600
800
1000
1200
1400
1600

Figure C.102

C.3.3 INTERIOR BOTTOM CHORD EXTENSIONS TAKEN OUT (STAGE 3)

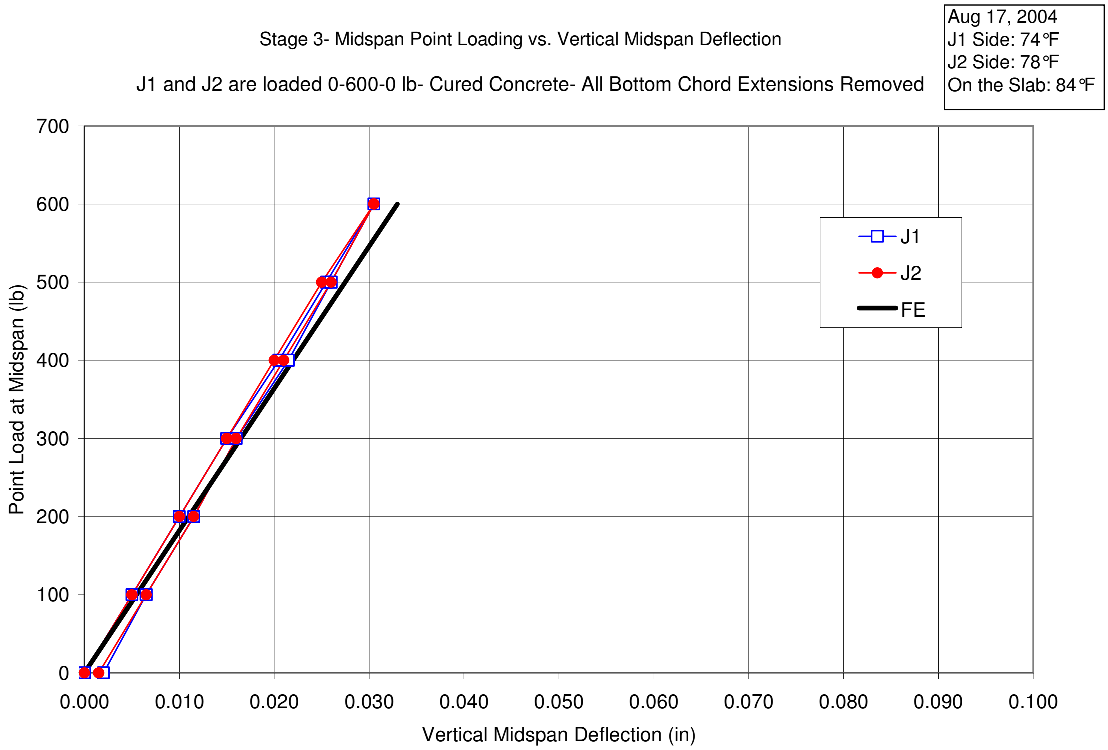


Figure C.103

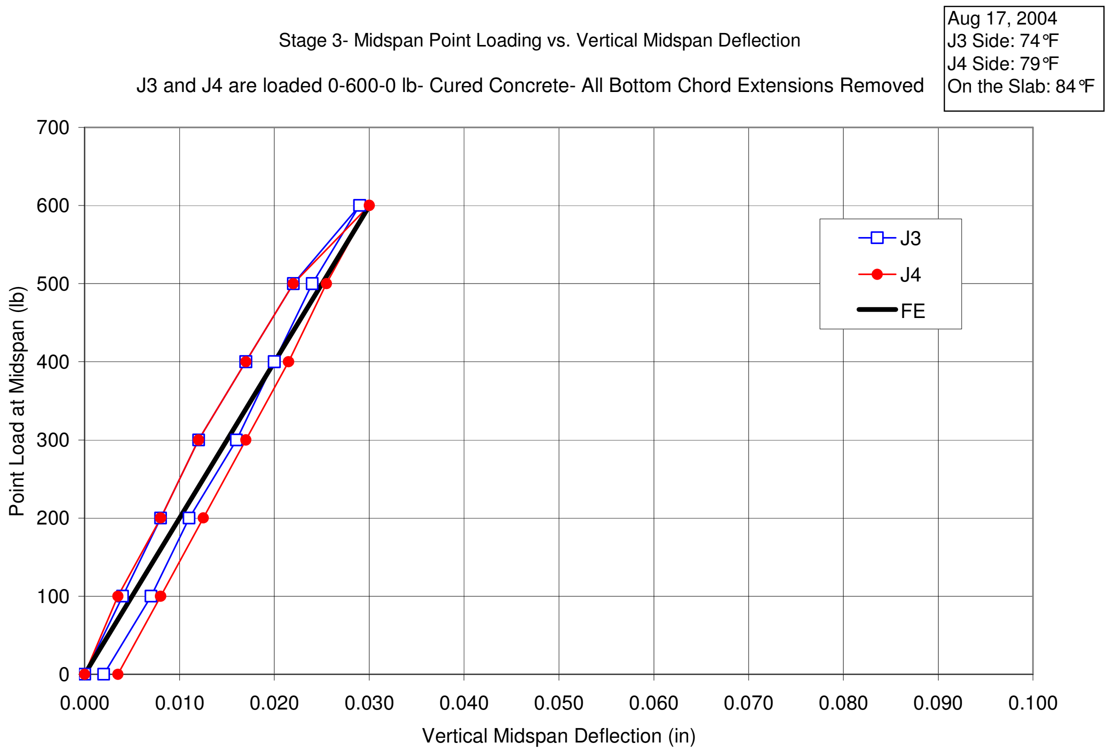


Figure C.104

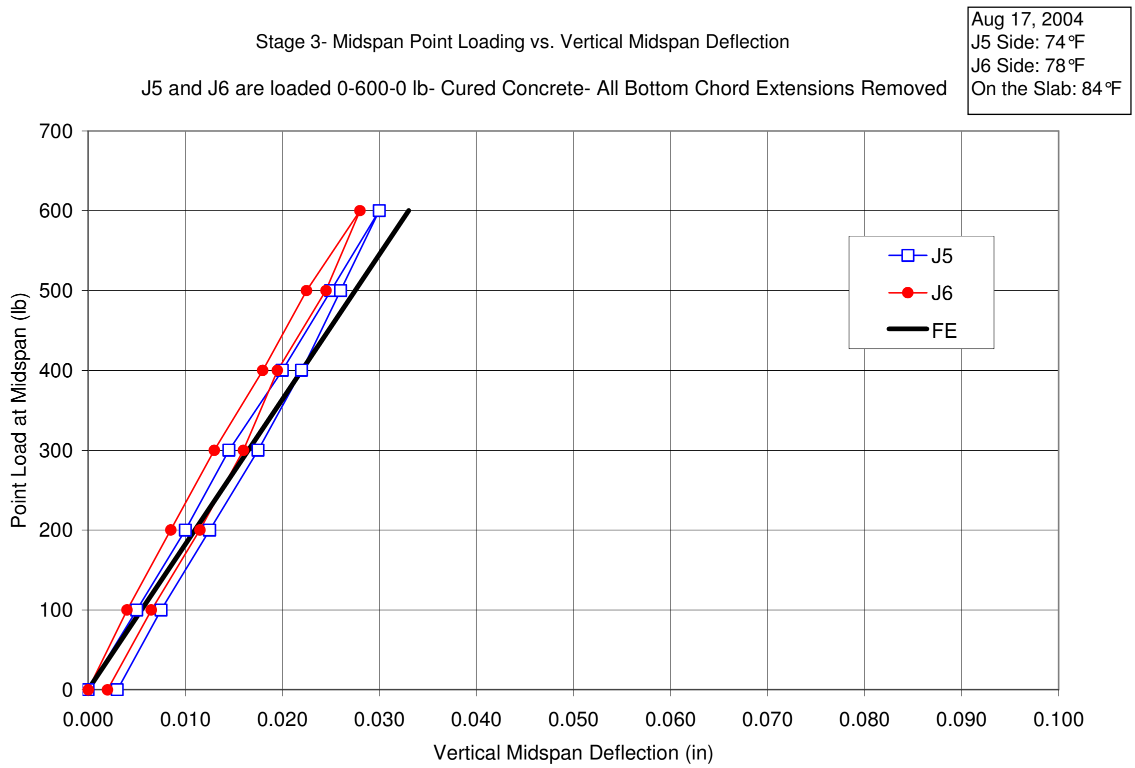


Figure C.105

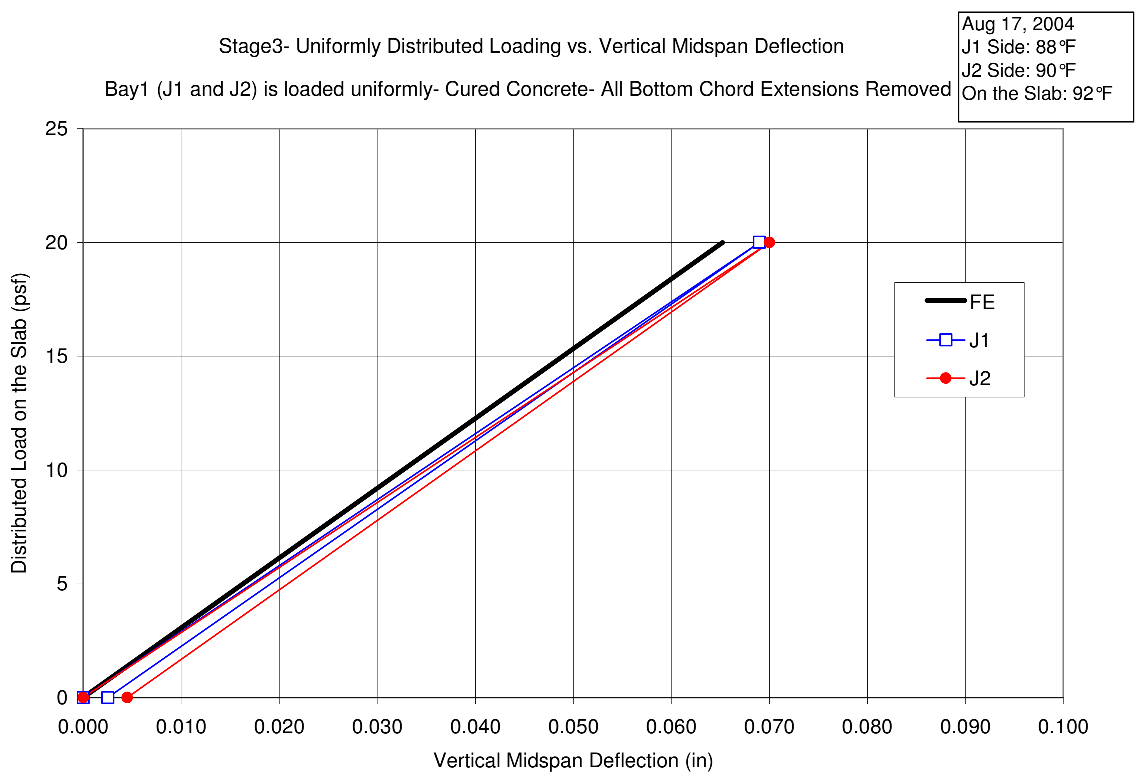


Figure C.106

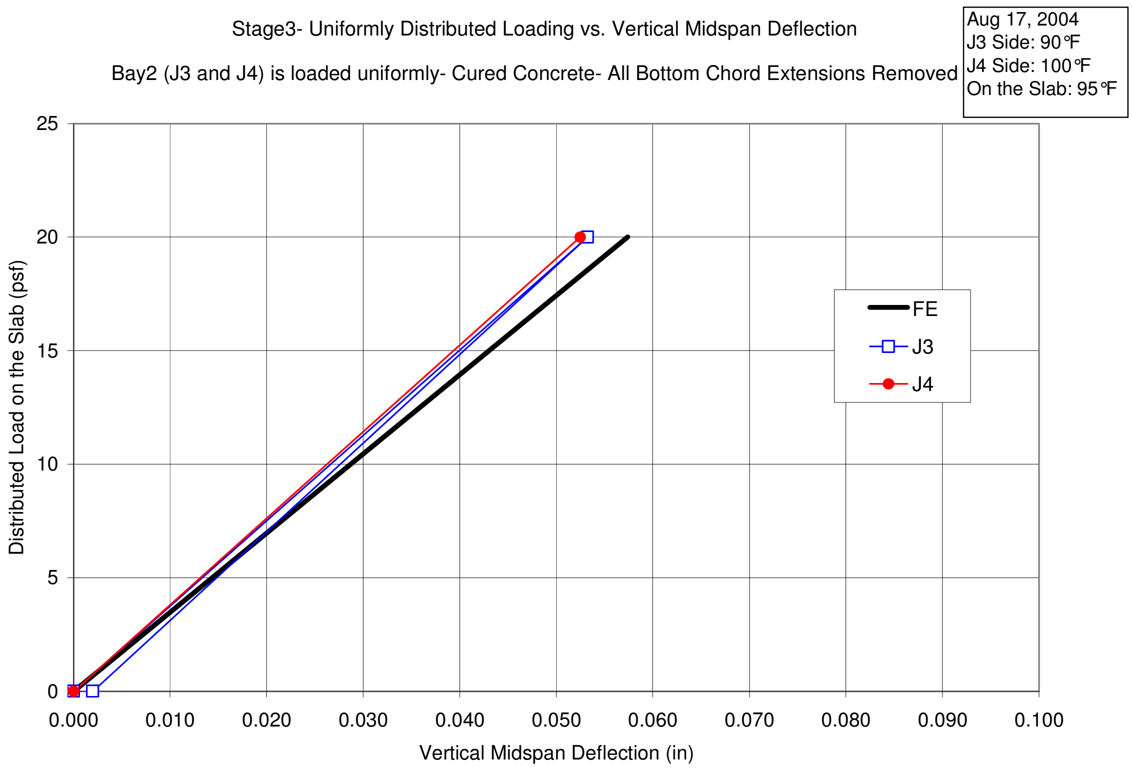


Figure C.107

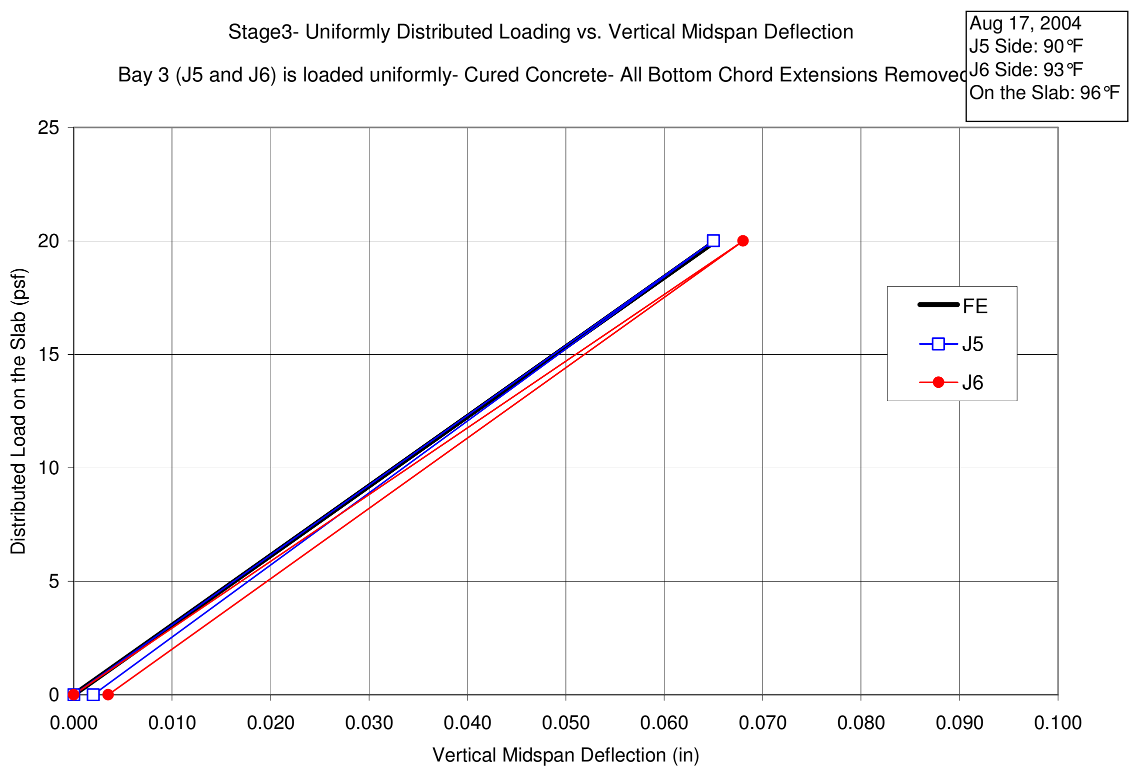


Figure C.108

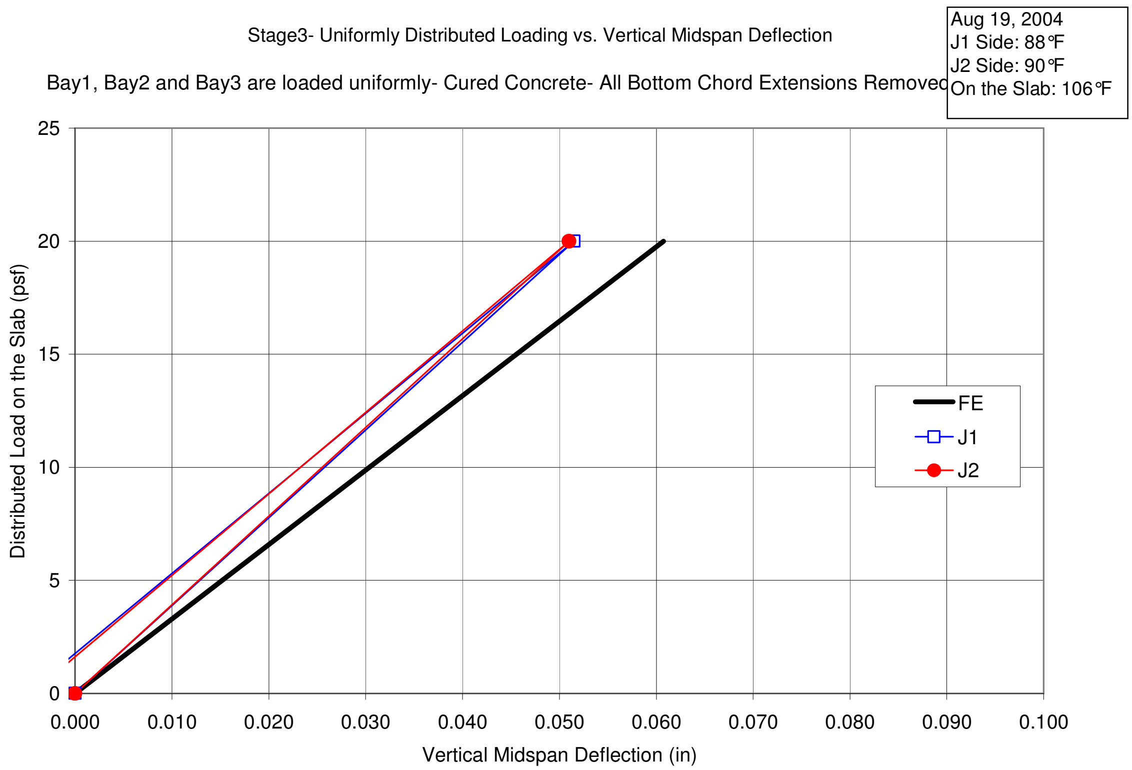


Figure C.109

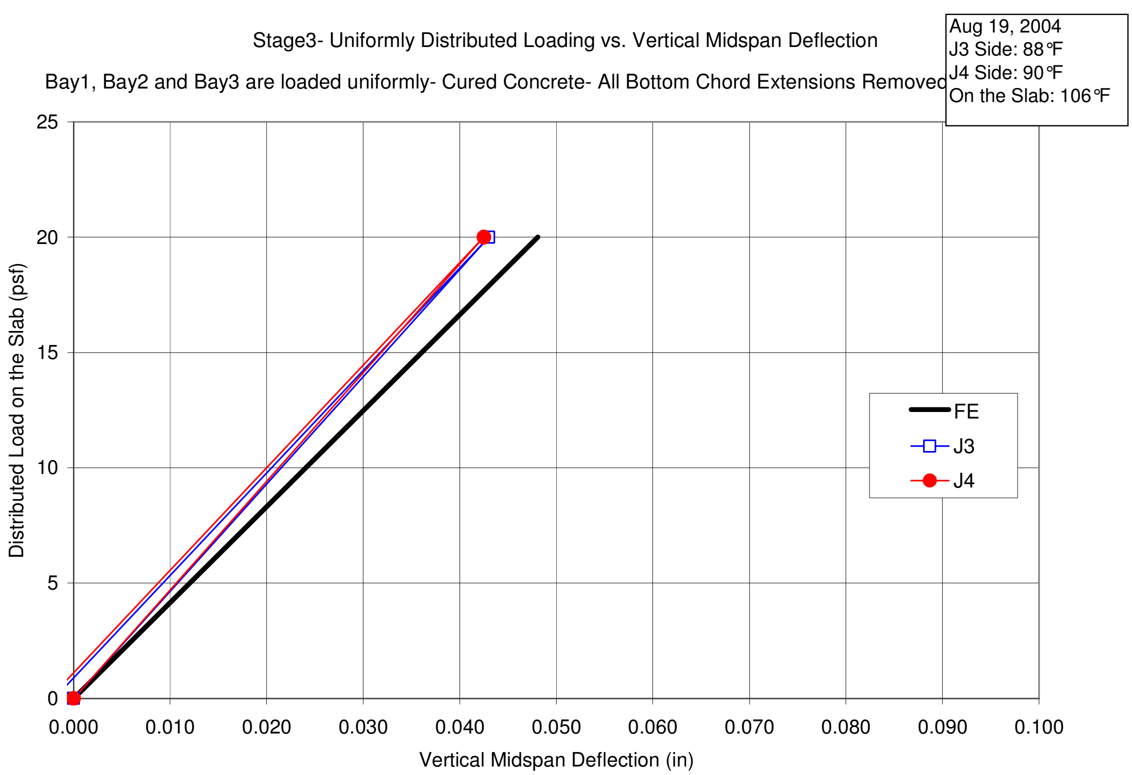


Figure C.110

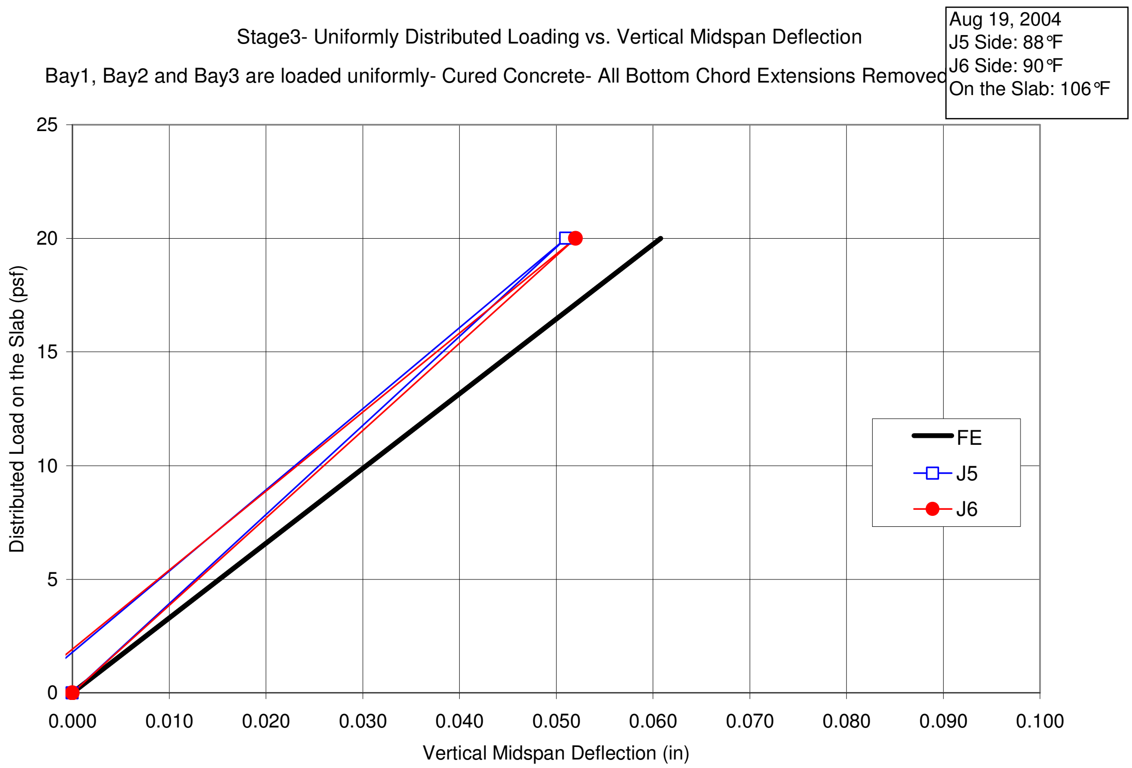

Aug 19, 2004
J5 Side: 88°F
J6 Side: 90°F
On the Slab: 106°F
Stage3- Uniformly Distributed Loading vs. Vertical Midspan Deflection
Bay1, Bay2 and Bay3 are loaded uniformly- Cured Concrete- All Bottom Chord Extensions Removed
Distributed Load on the Slab (psf)
25
20
15
10
5
0
0.000
0.010
0.020
0.030
0.040
0.050
0.060
0.070
0.080
0.090
0.100
Vertical Midspan Deflection (in)
FE
J5
J6

Figure C.111

C.3.4 INTERIOR BOTTOM CHORD EXTENSIONS RE-INSTALLED (STAGE 4)

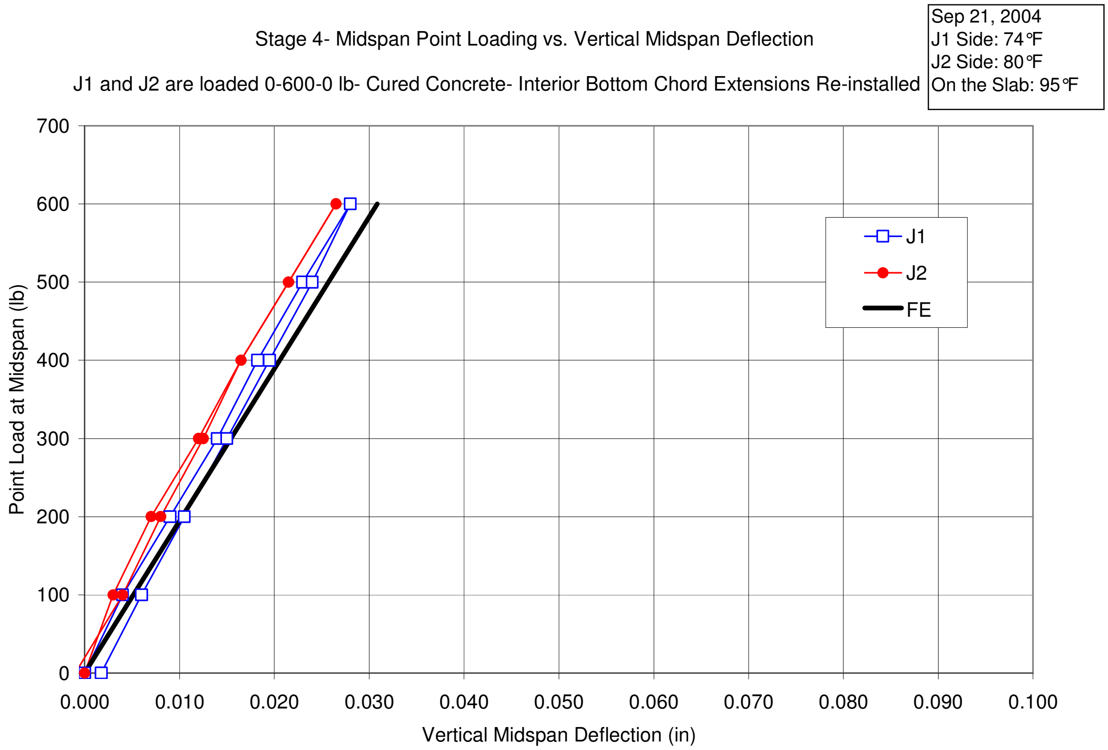


Figure C.112

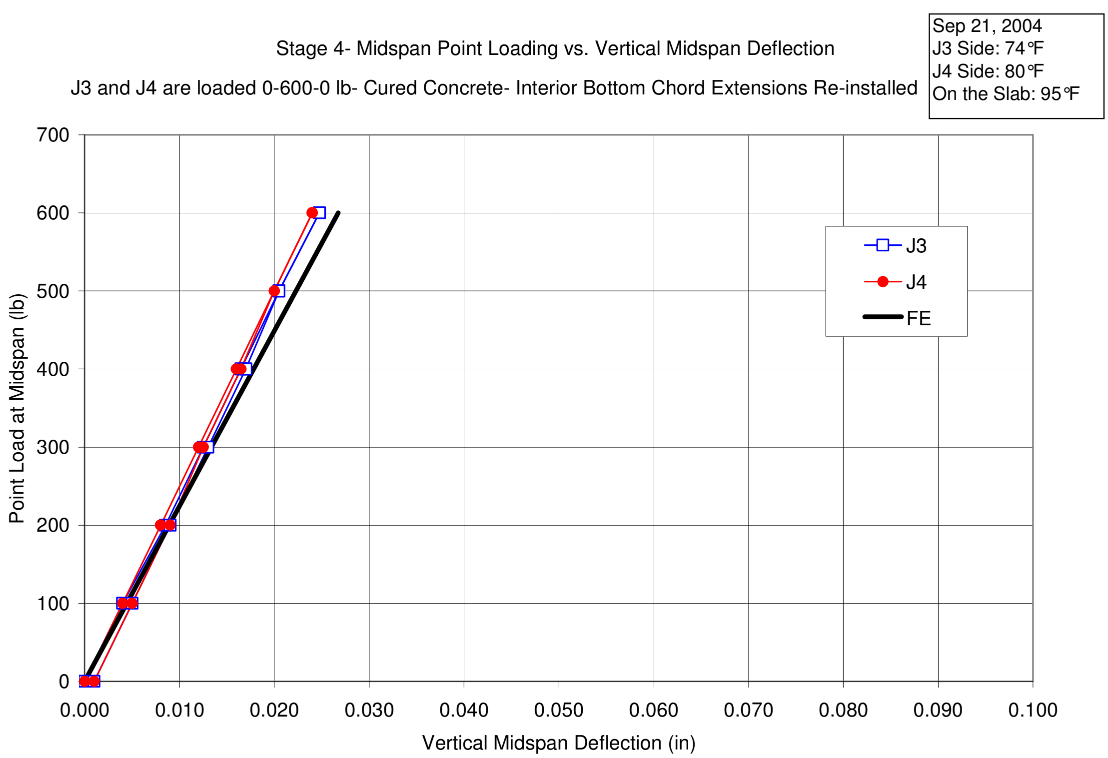


Figure C.113

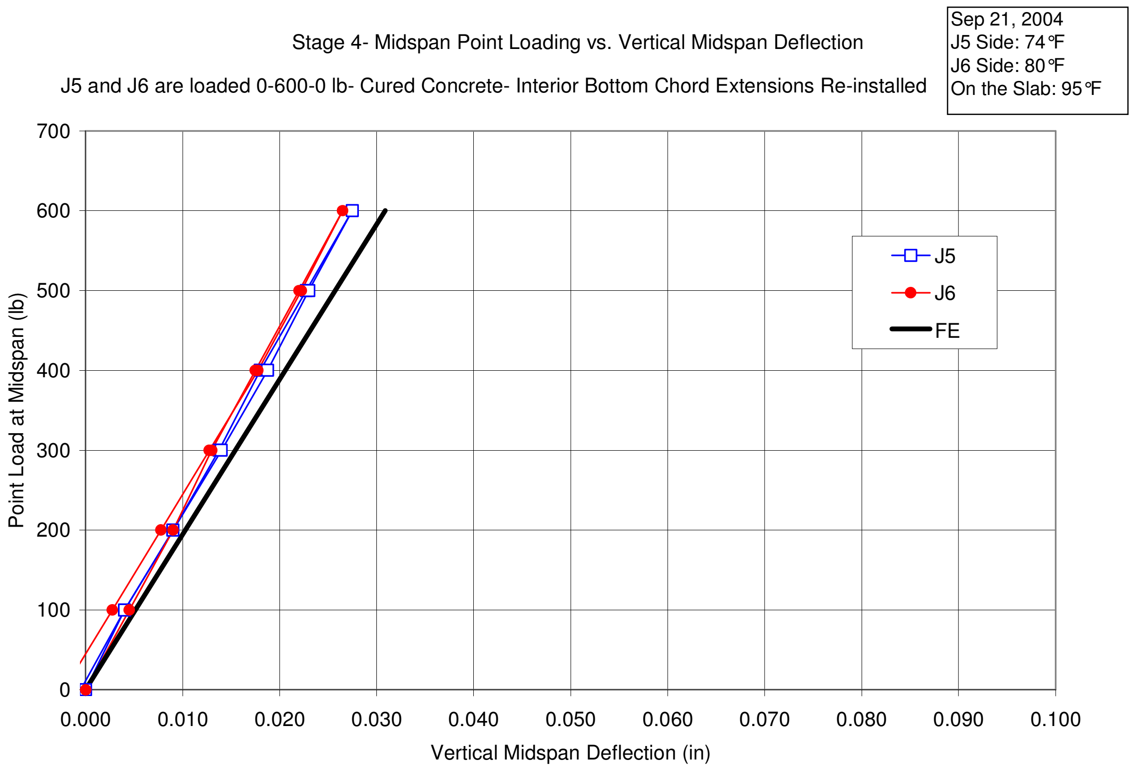


Figure C.114

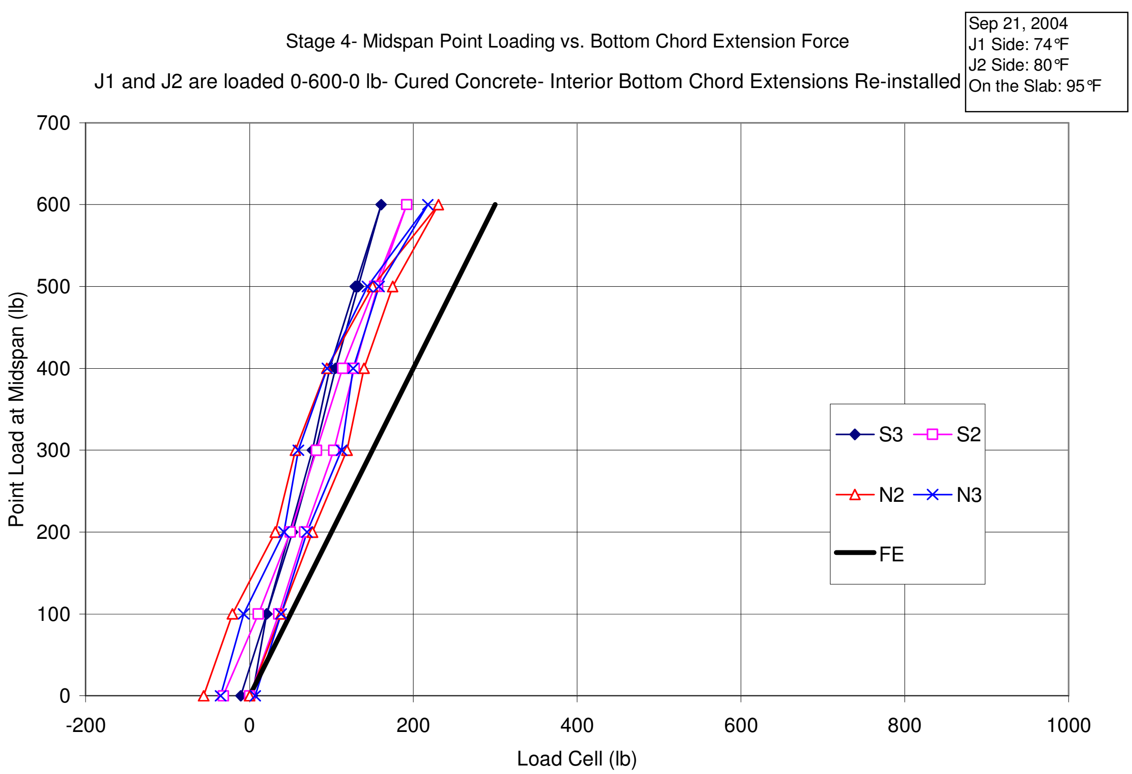


Figure C.115

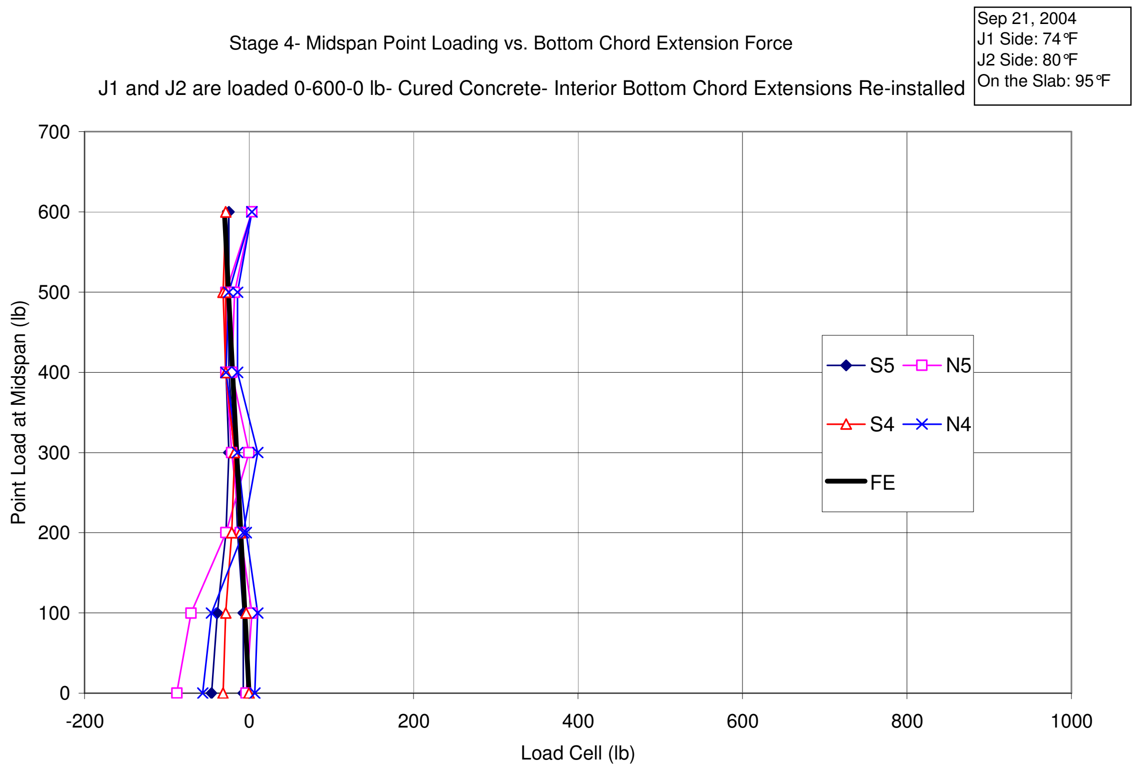


Figure C.116

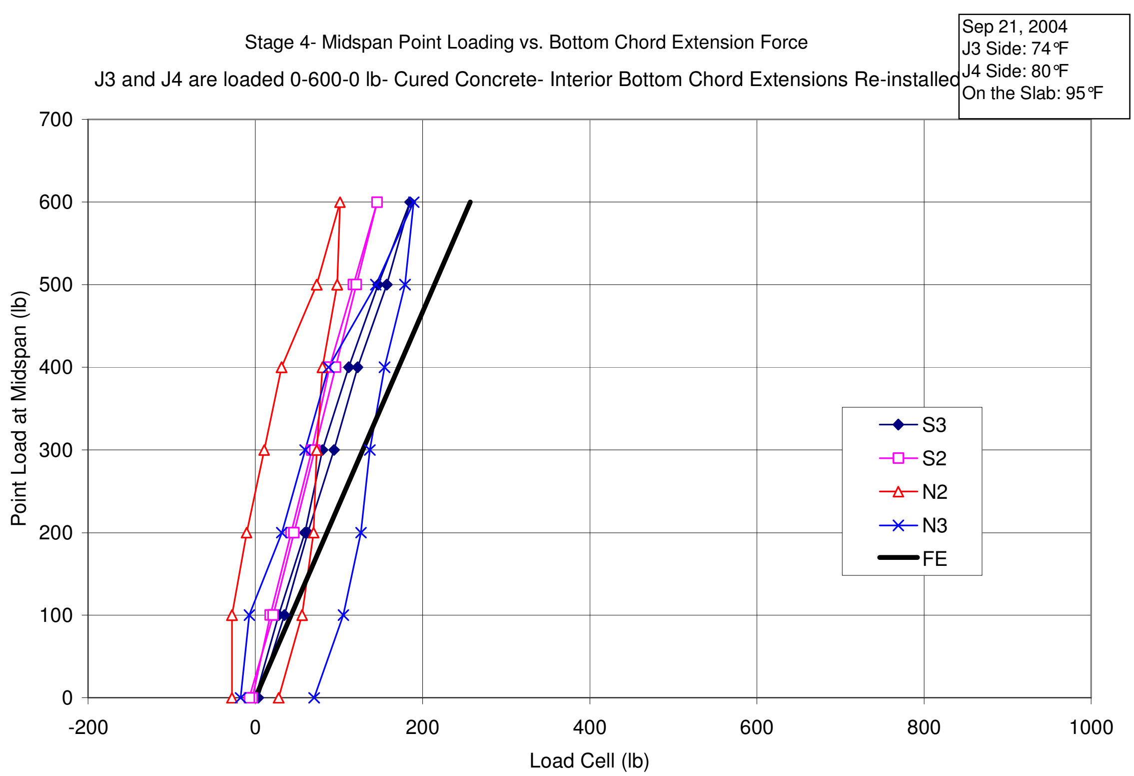


Figure C.117

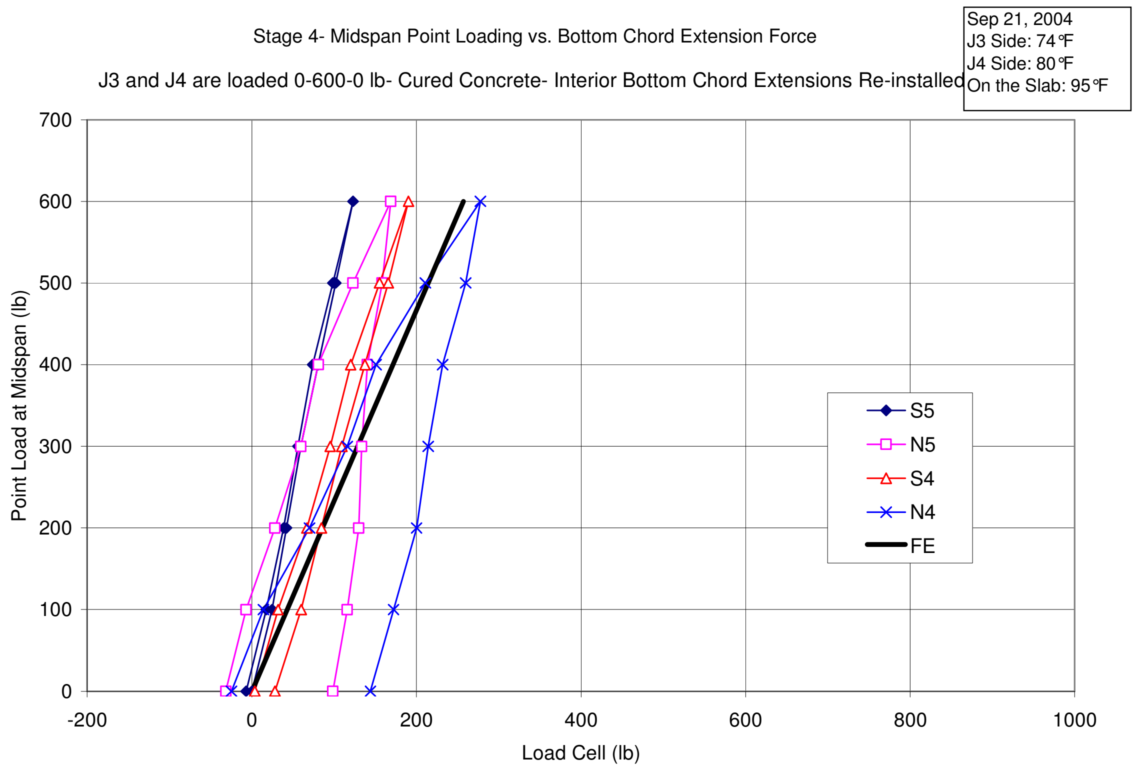


Figure C.118

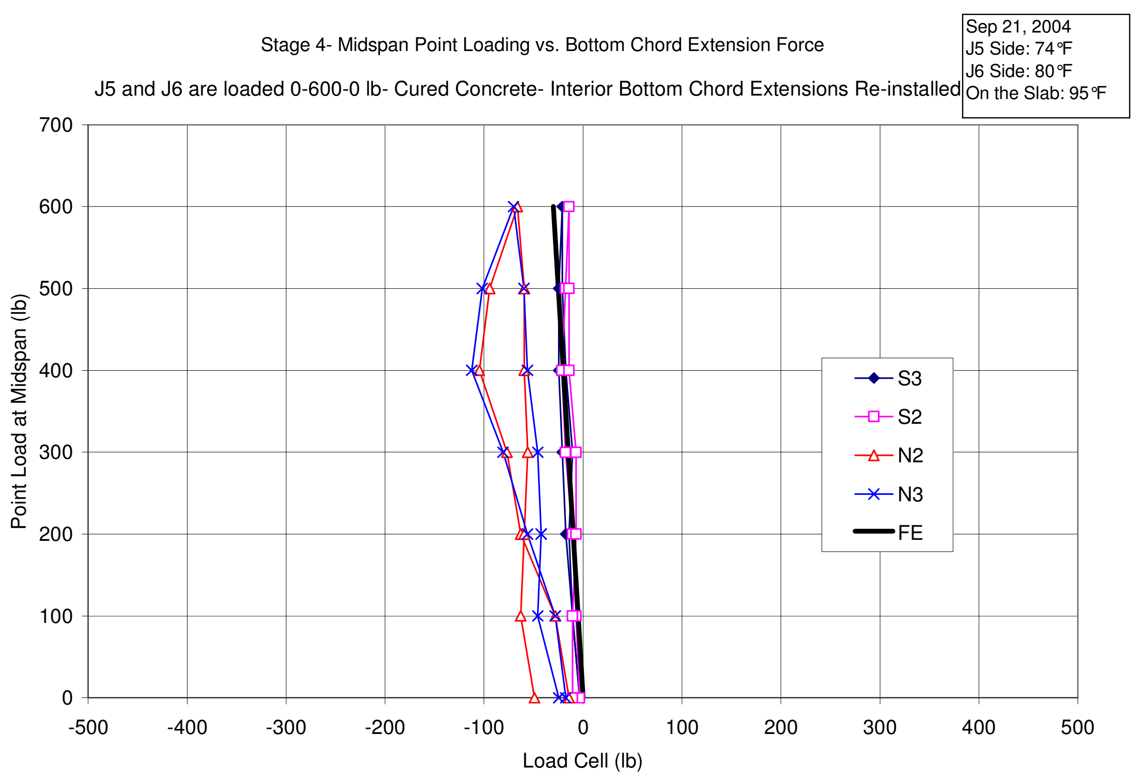


Figure C.119

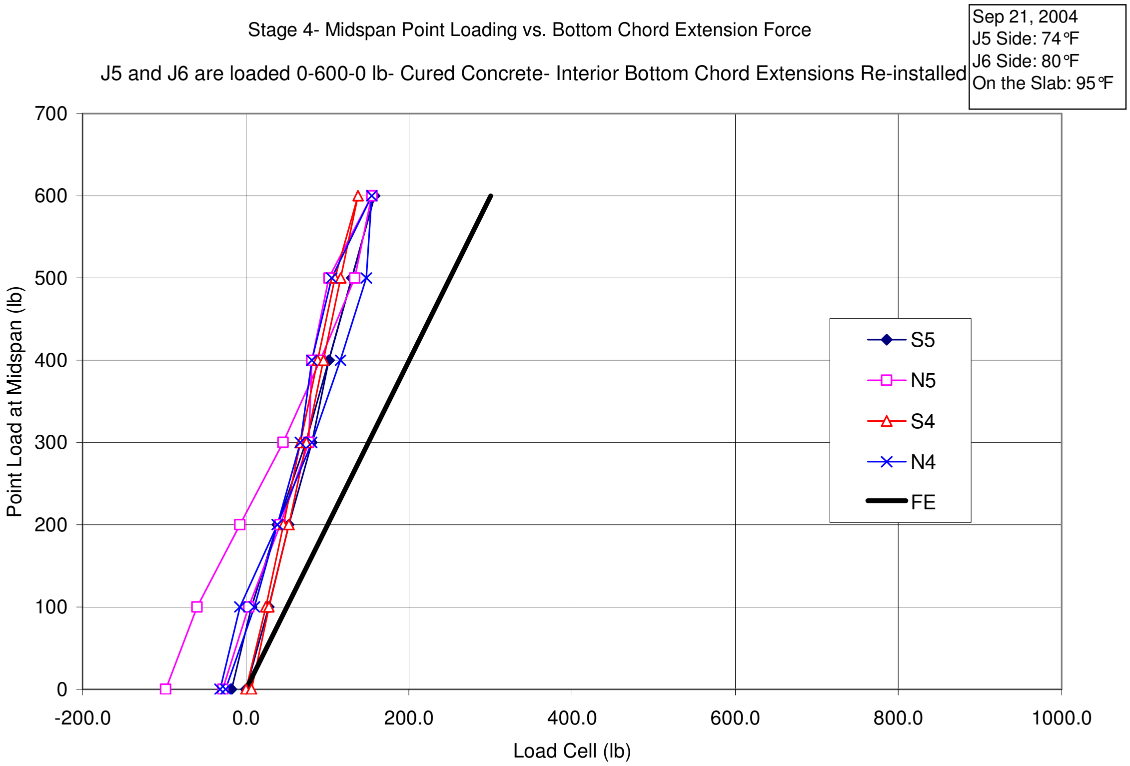


Figure C.120

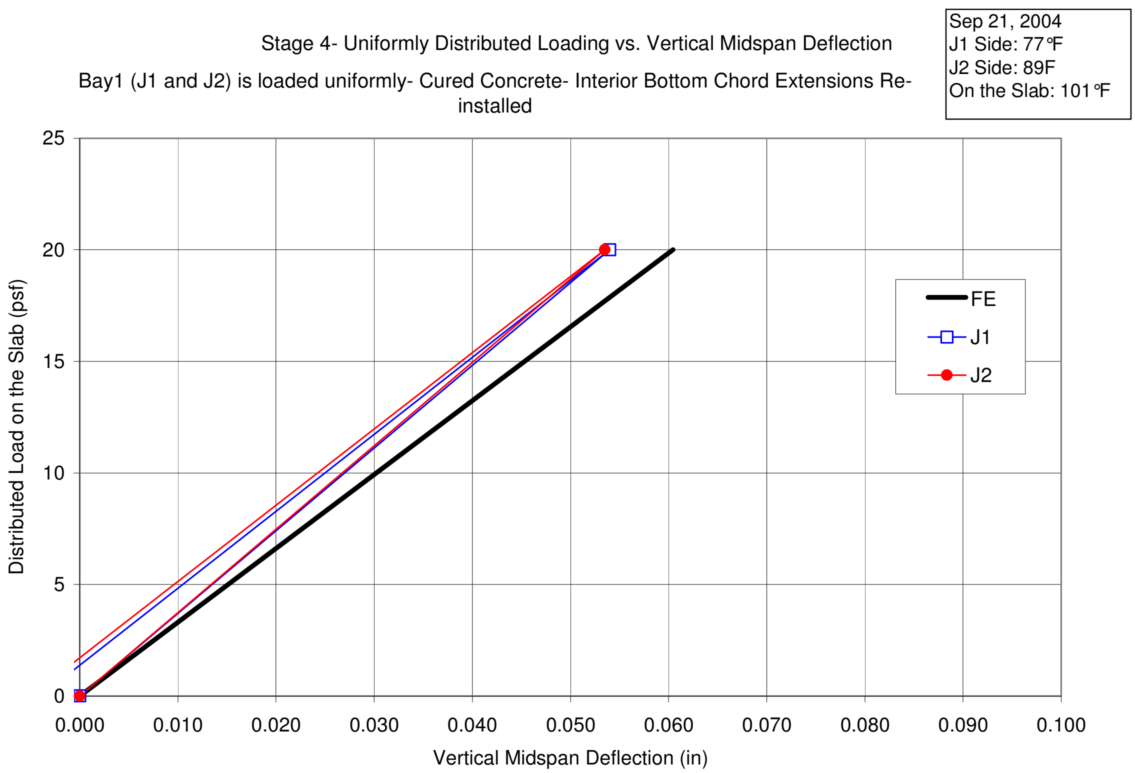


Figure C.121

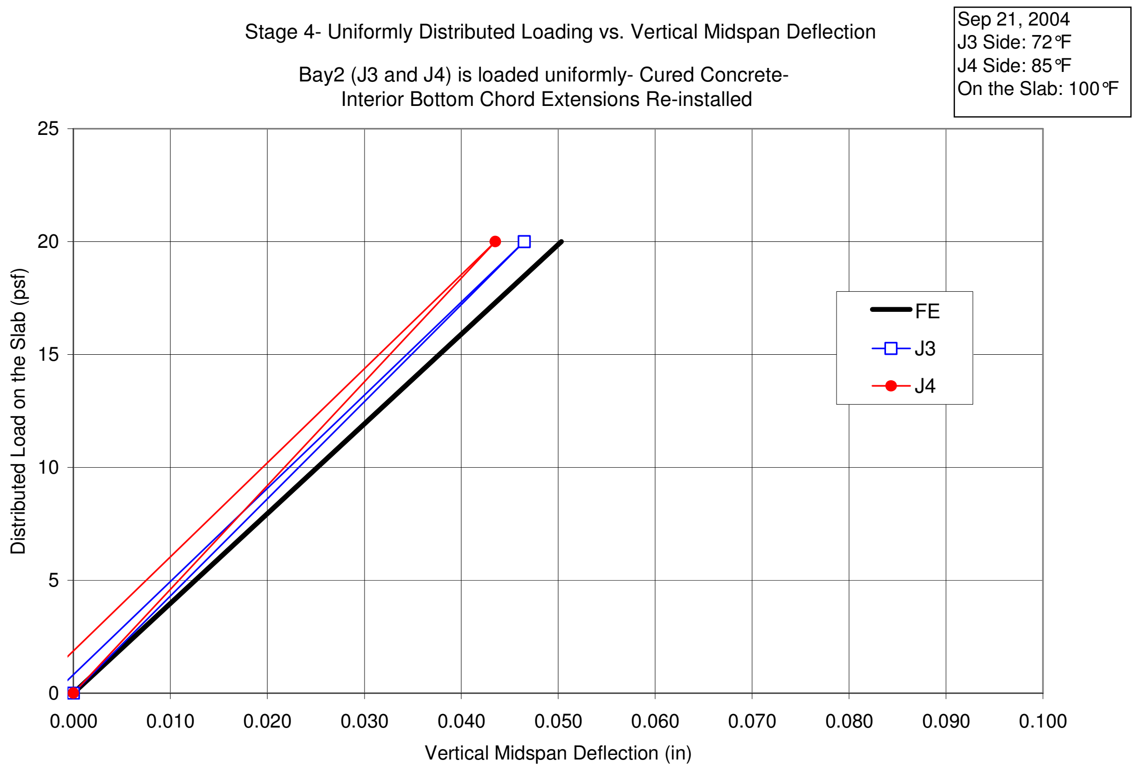


Figure C.122

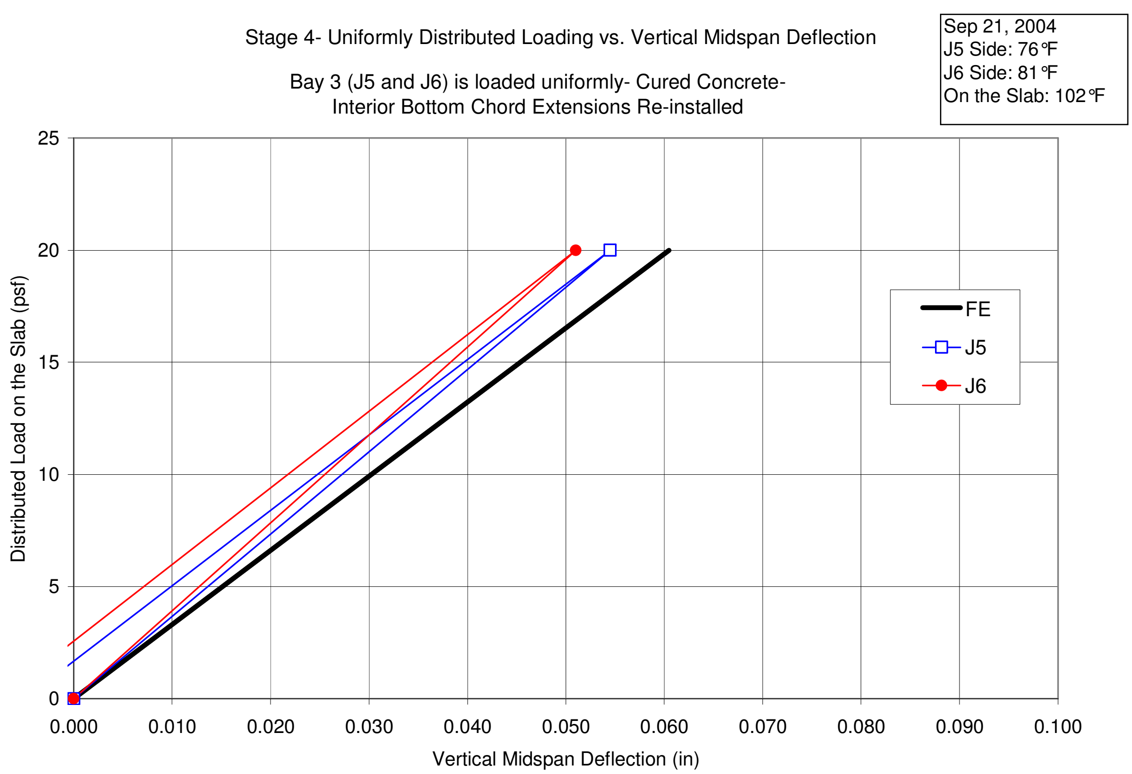


Figure C.123

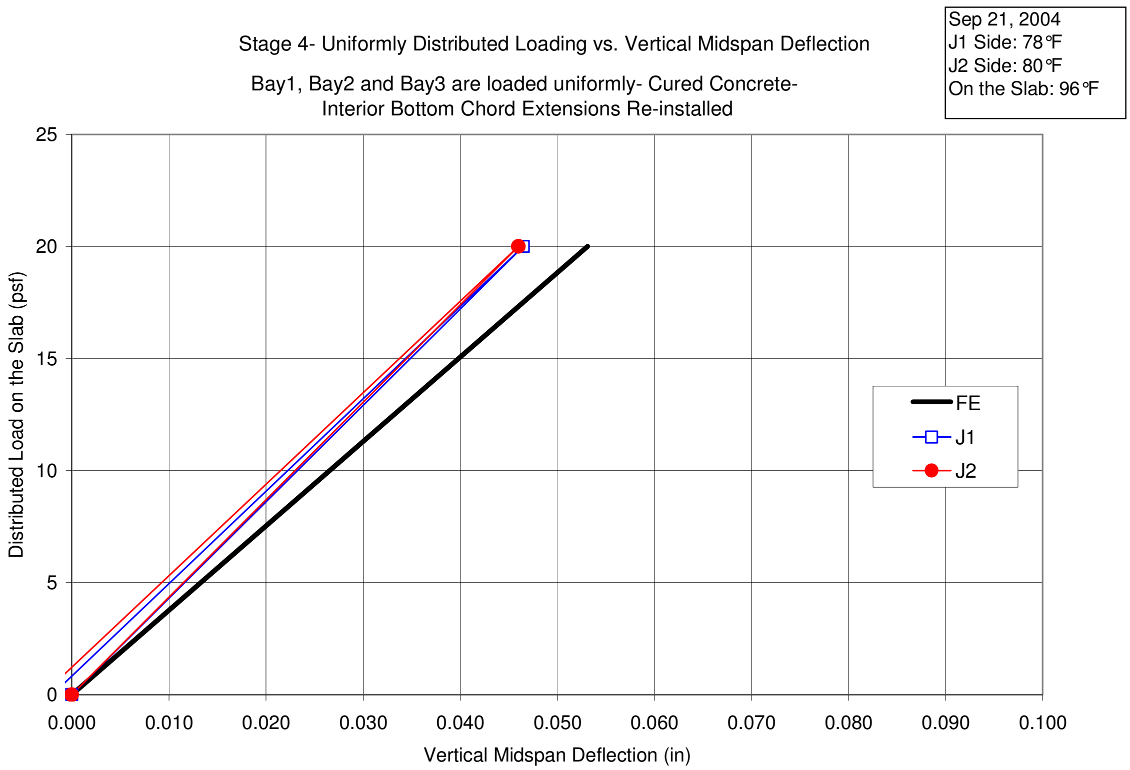


Figure C.124

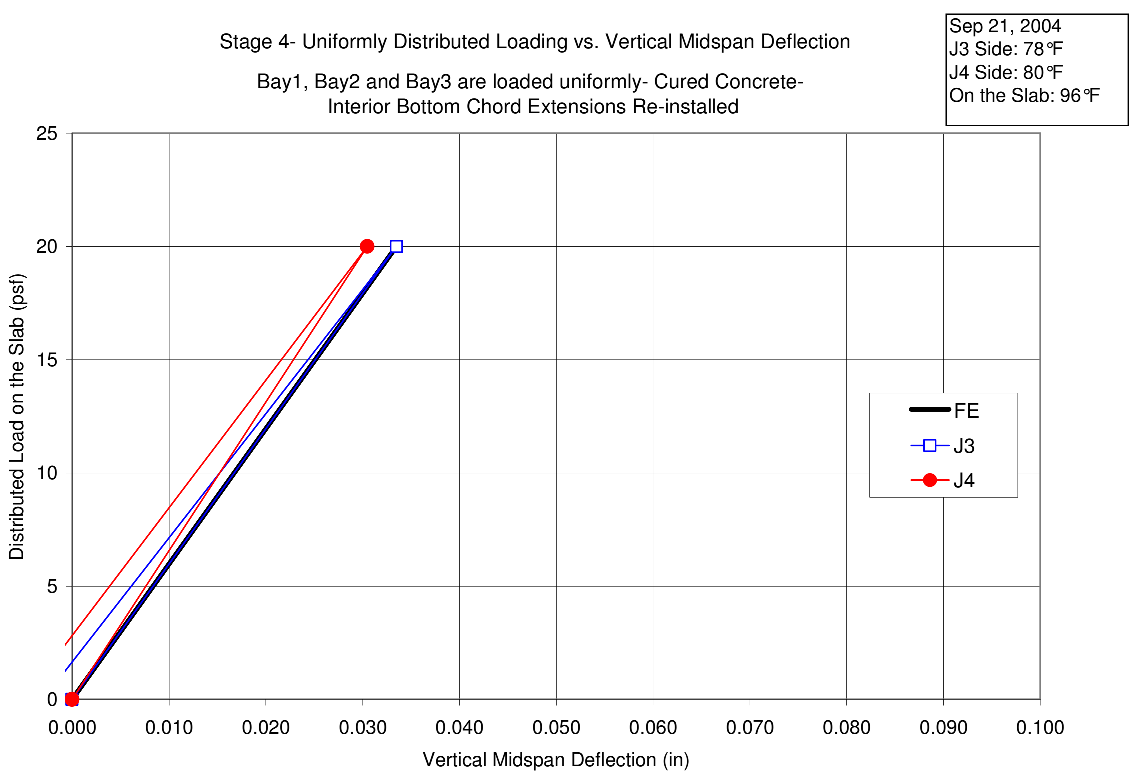


Figure C.125

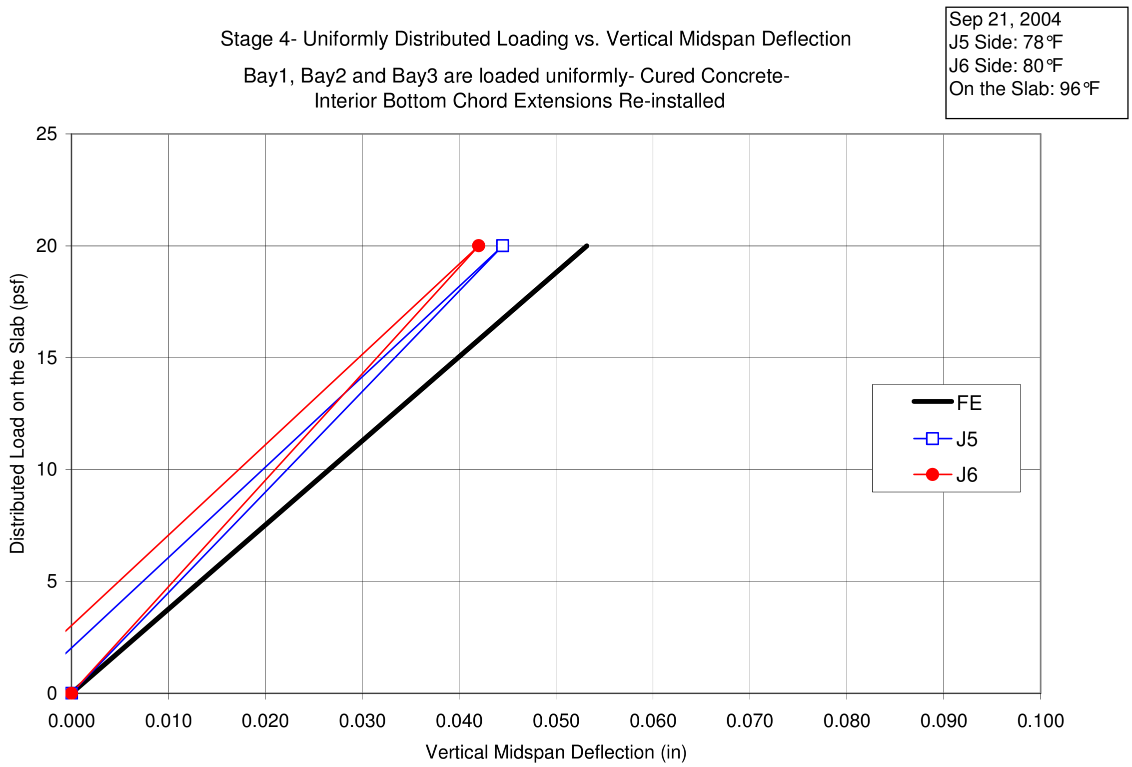


Figure C.126

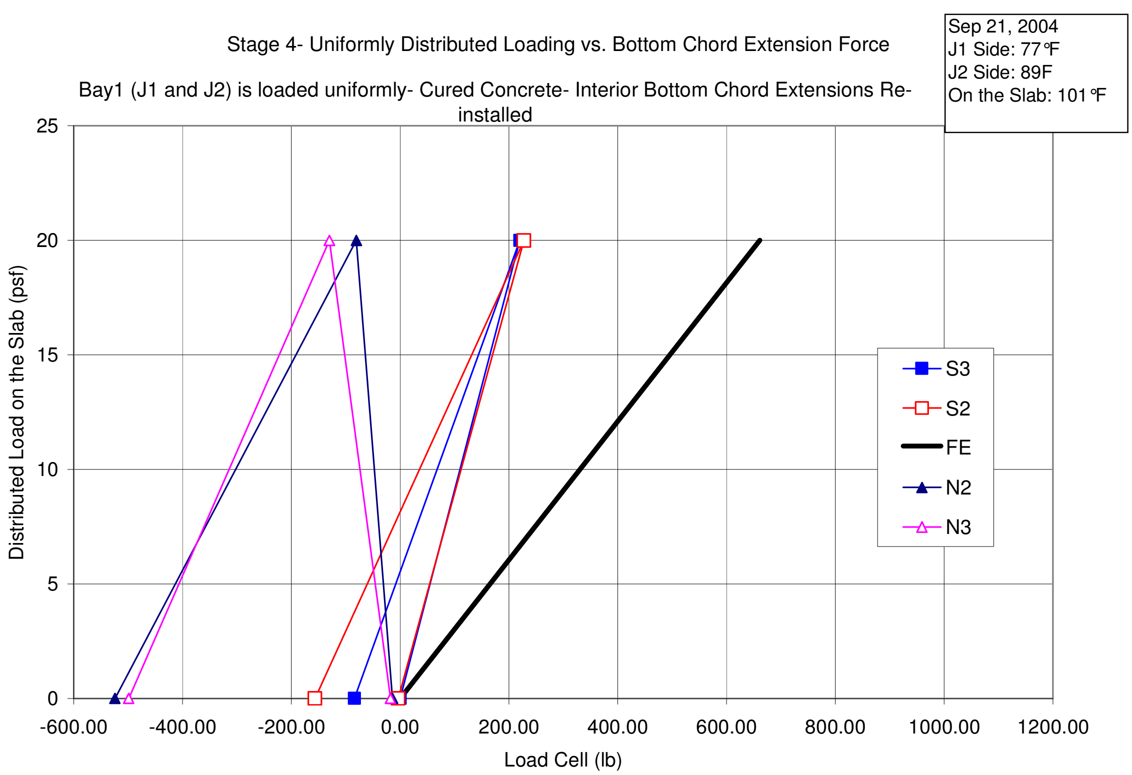


Figure C.127

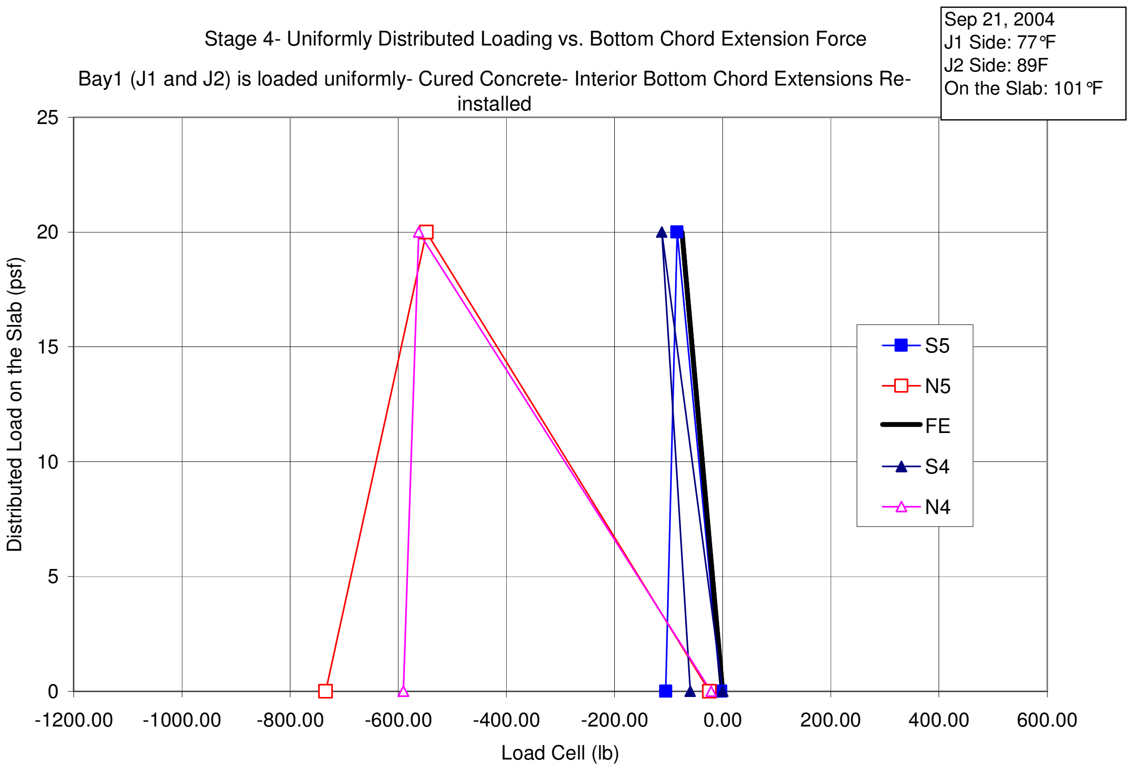


Figure C.128

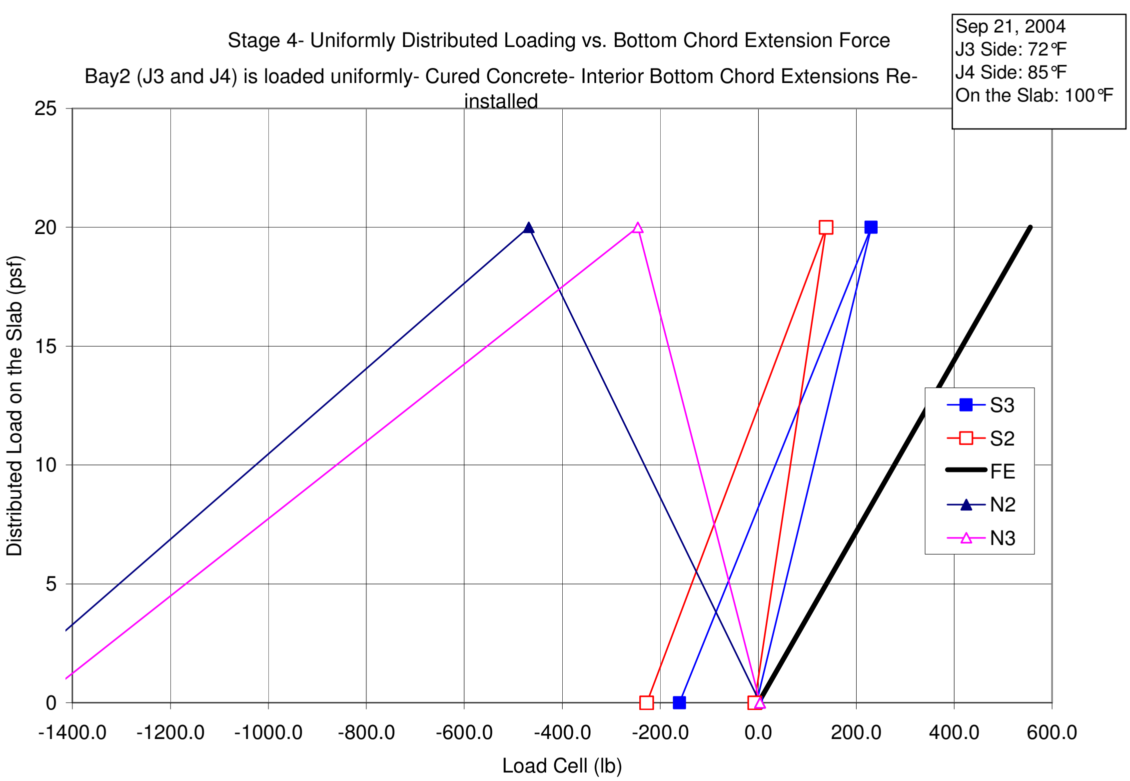


Figure C.129

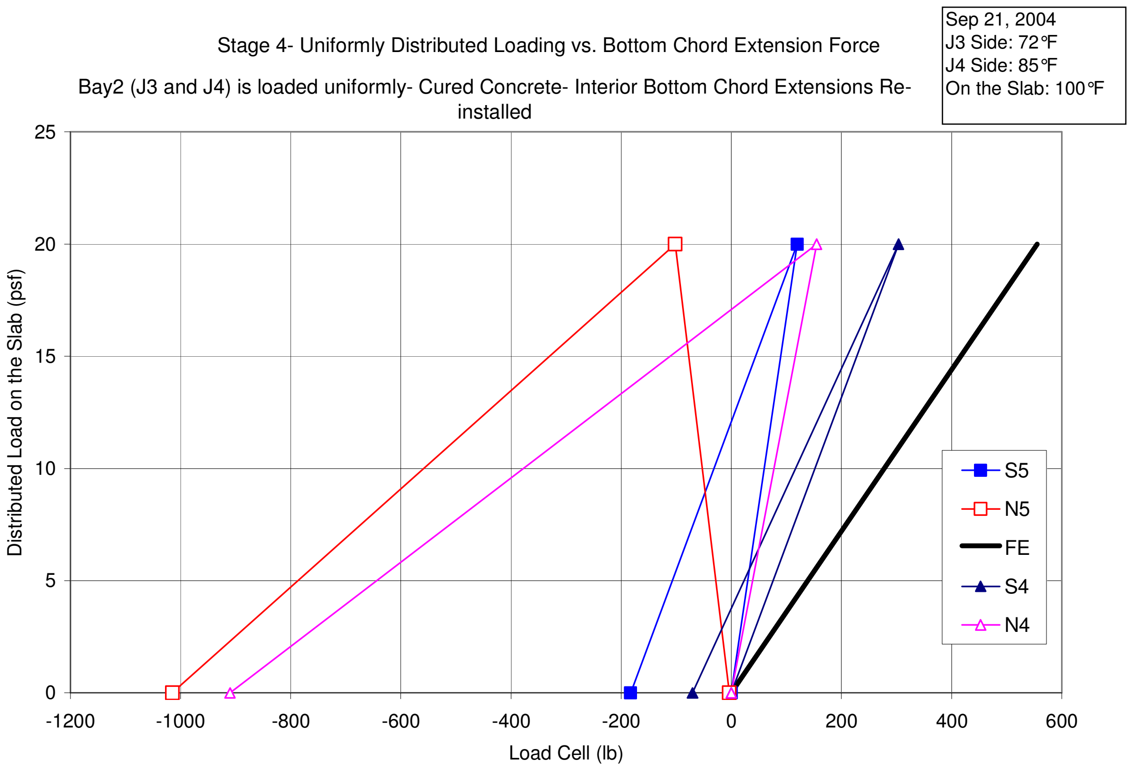


Figure C.130

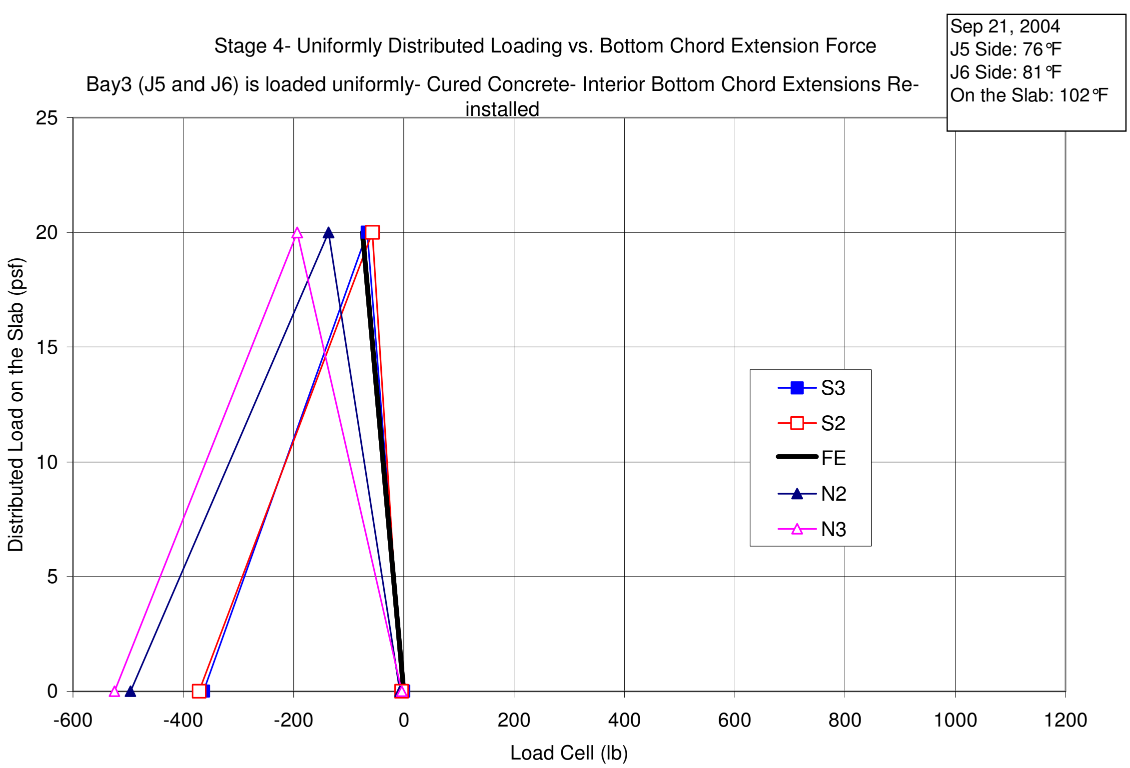


Figure C.131

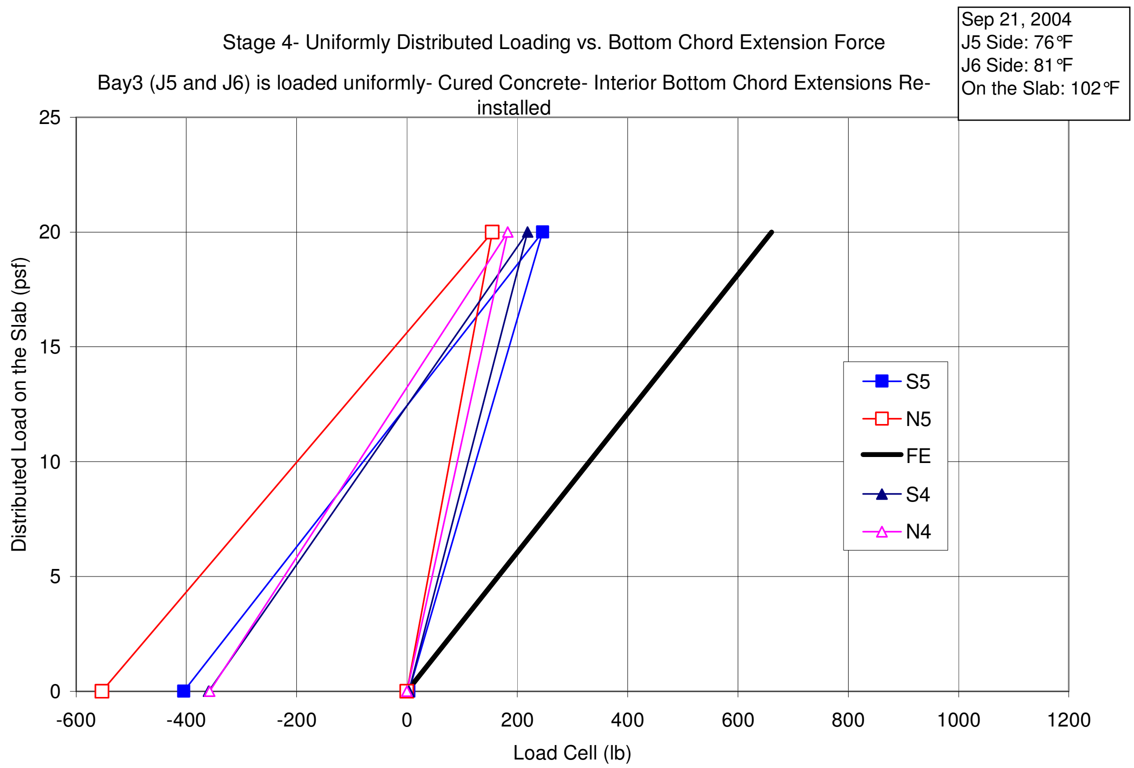


Figure C.132

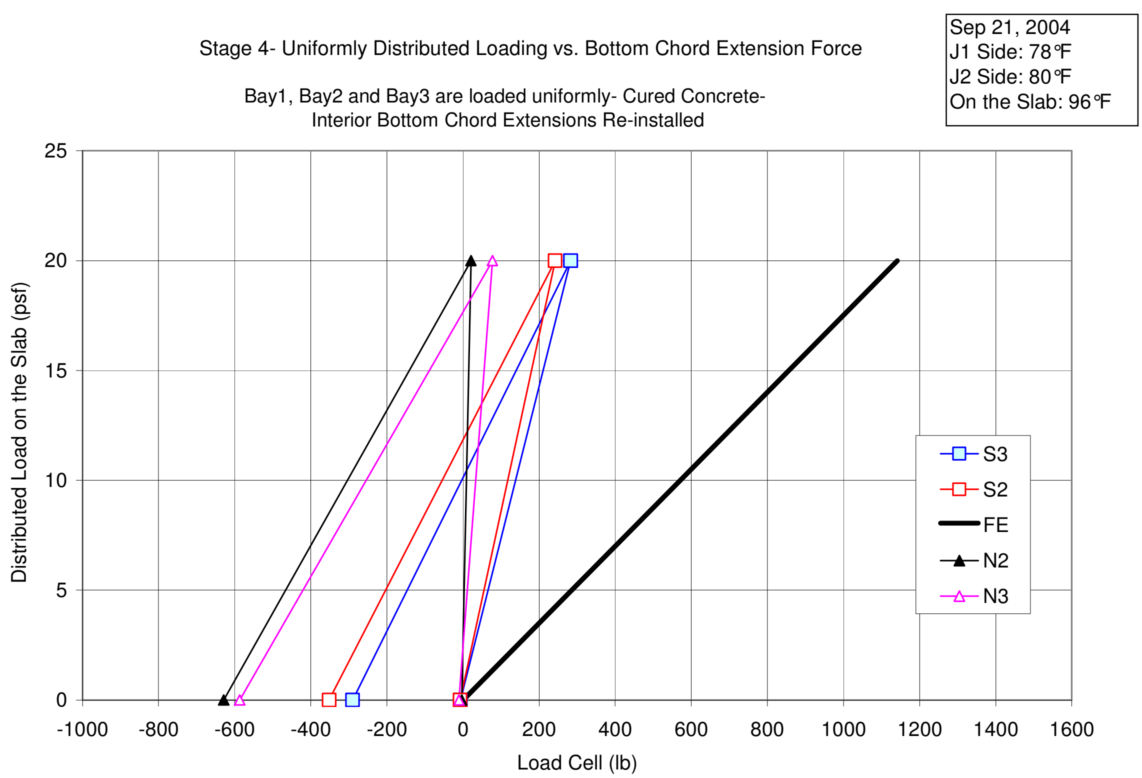
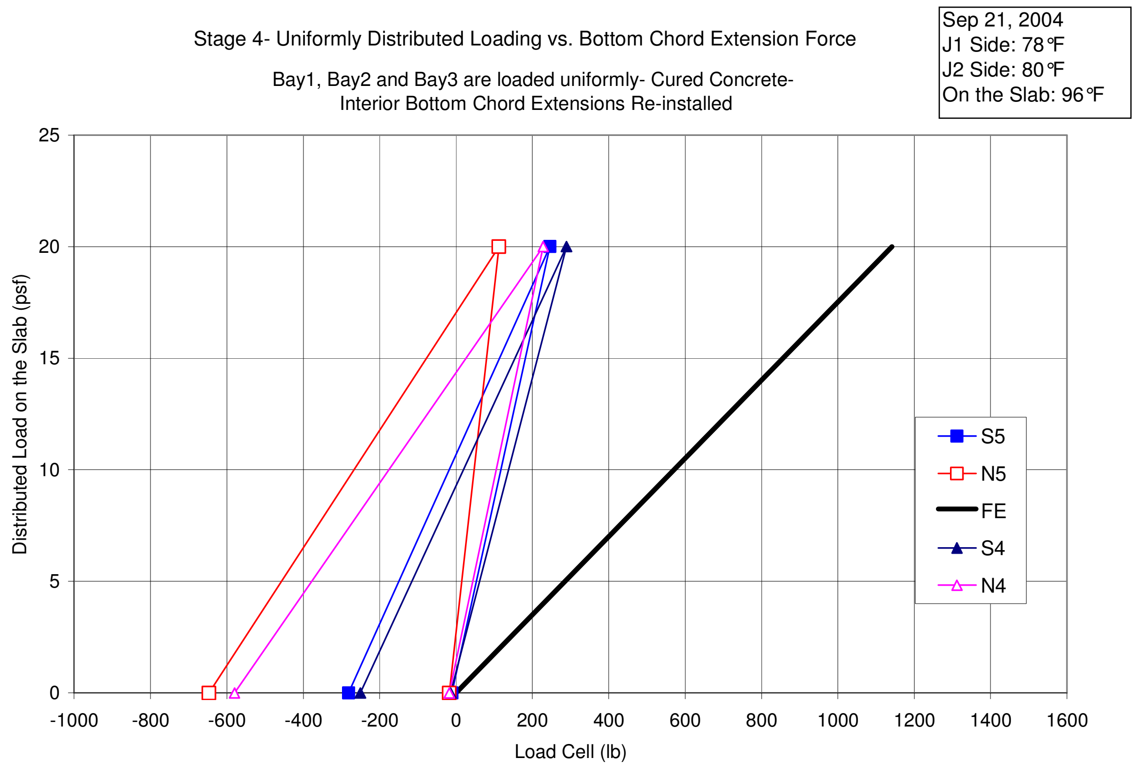


Figure C.133



Sep 21, 2004
J1 Side: 78°F
J2 Side: 80°F
On the Slab: 96°F
Stage 4- Uniformly Distributed Loading vs. Bottom Chord Extension Force
Bay1, Bay2 and Bay3 are loaded uniformly- Cured Concrete-
Interior Bottom Chord Extensions Re-installed
Distributed Load on the Slab (psf)
25
20
15
10
5
0
-1000
-800
-600
-400
-200
0
200
400
600
800
1000
1200
1400
1600
Load Cell (lb)
S5
N5
FE
S4
N4

Figure C.134

C.3.5 EXTERIOR BOTTOM CHORD EXTENSIONS RE-INSTALLED(STAGE 5)

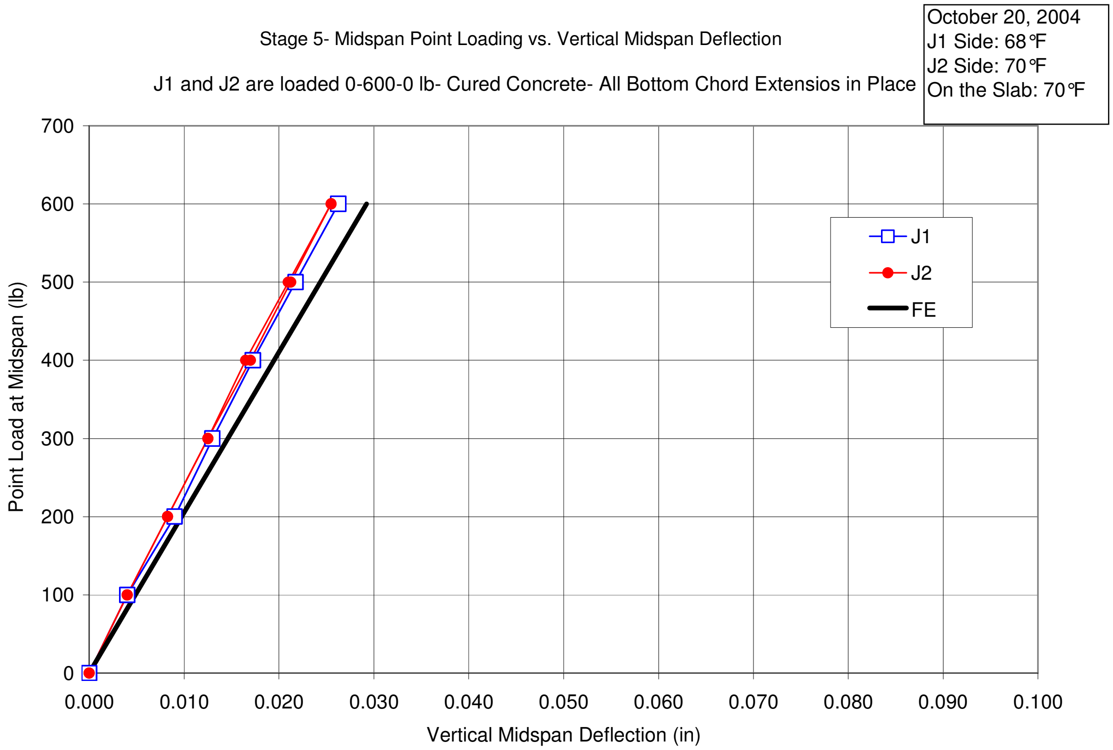


Figure C.135

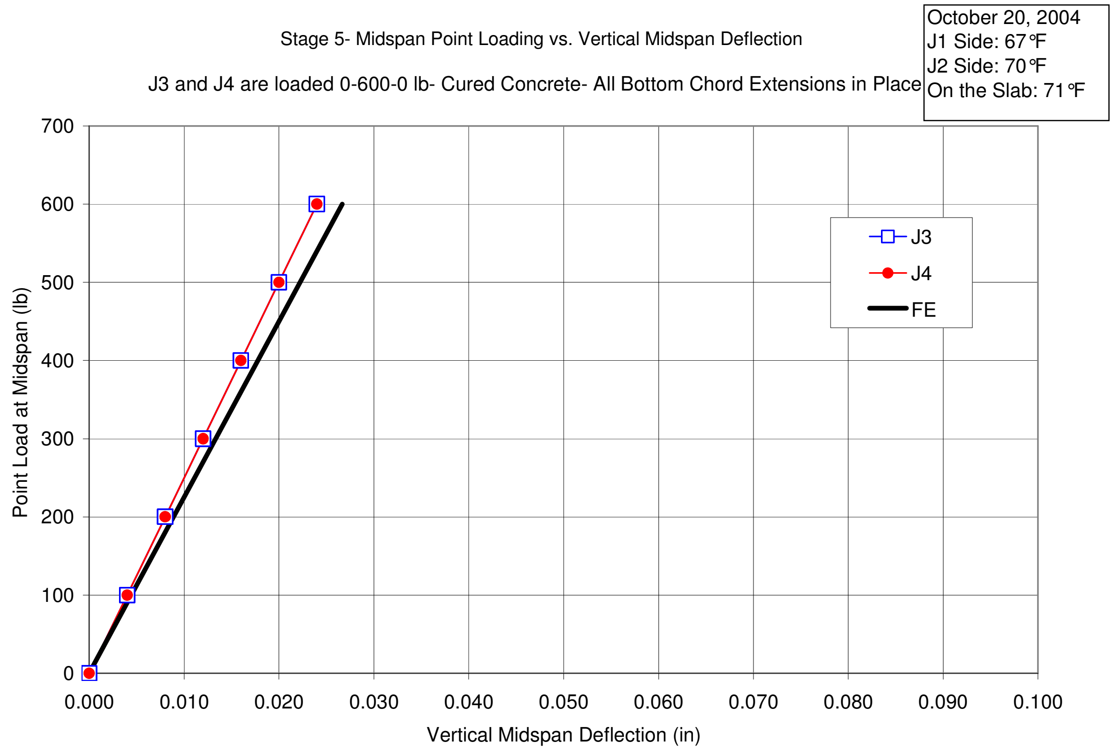


Figure C.136

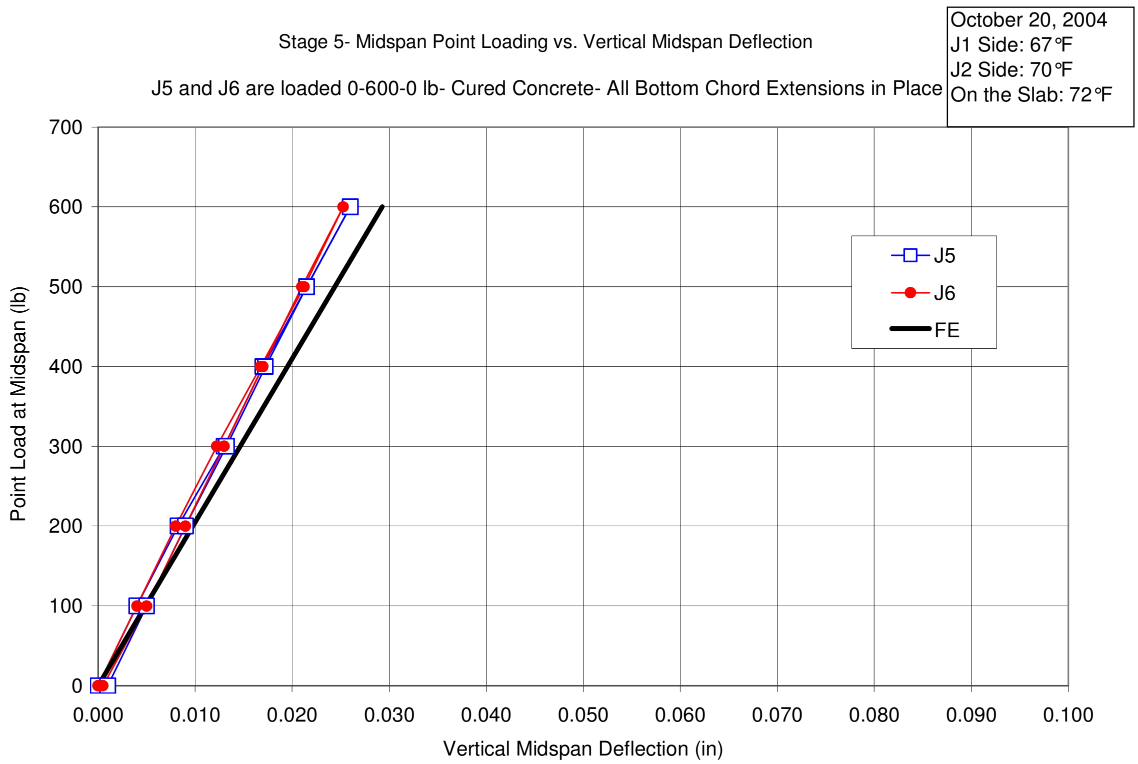


Figure C.137

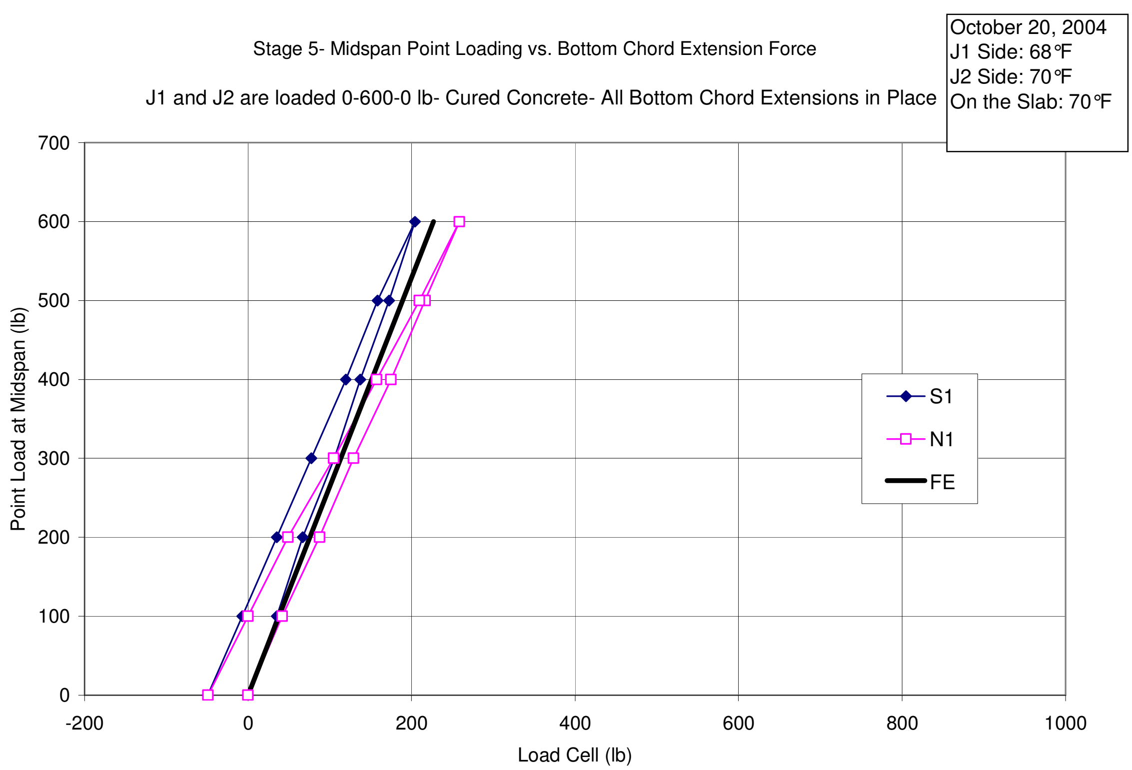


Figure C.138

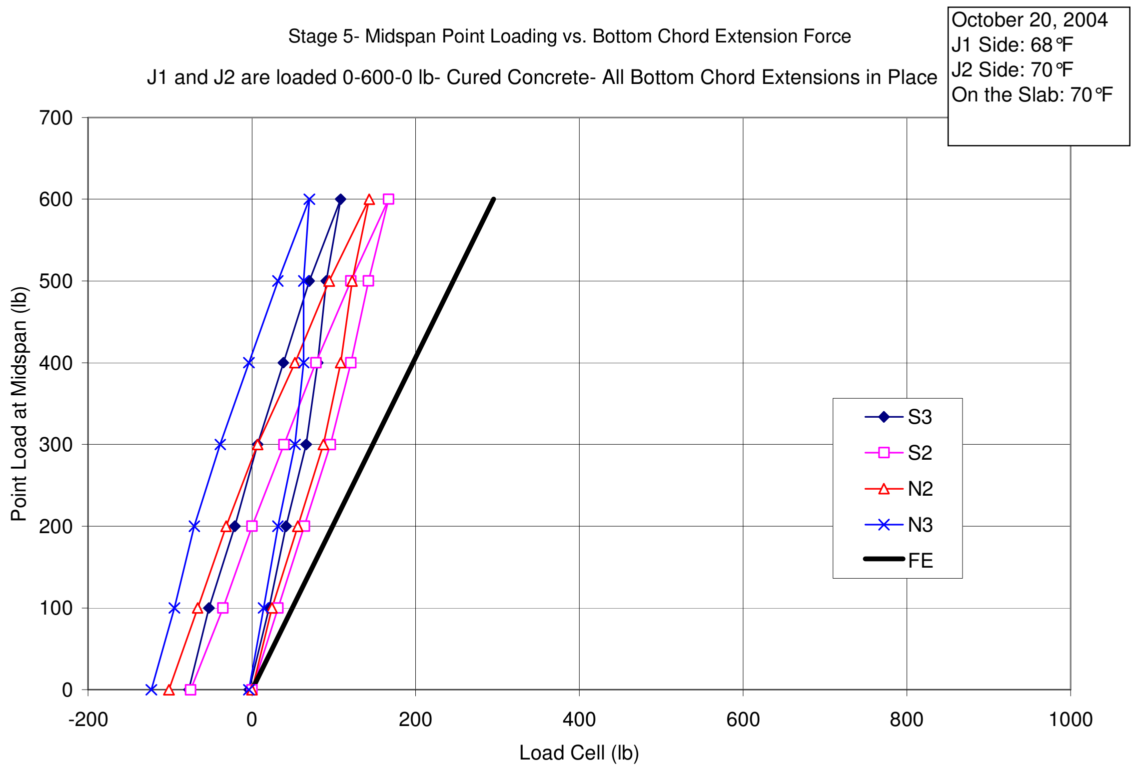


Figure C.139

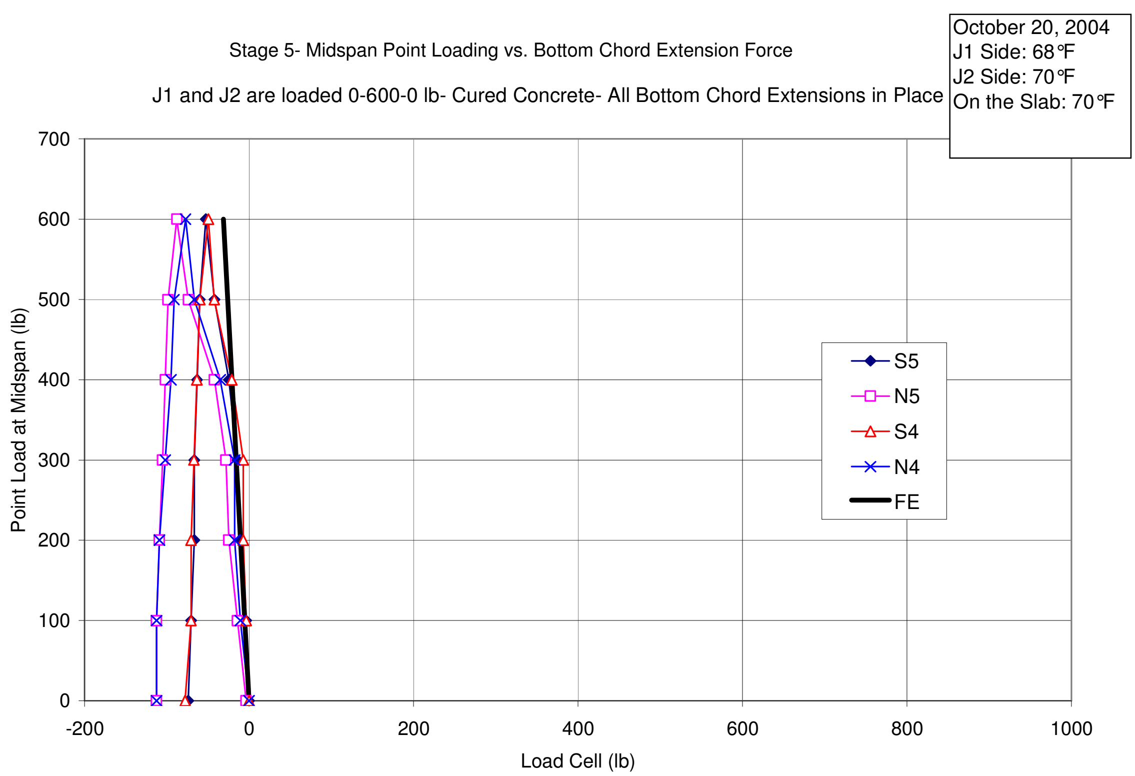


Figure C.140

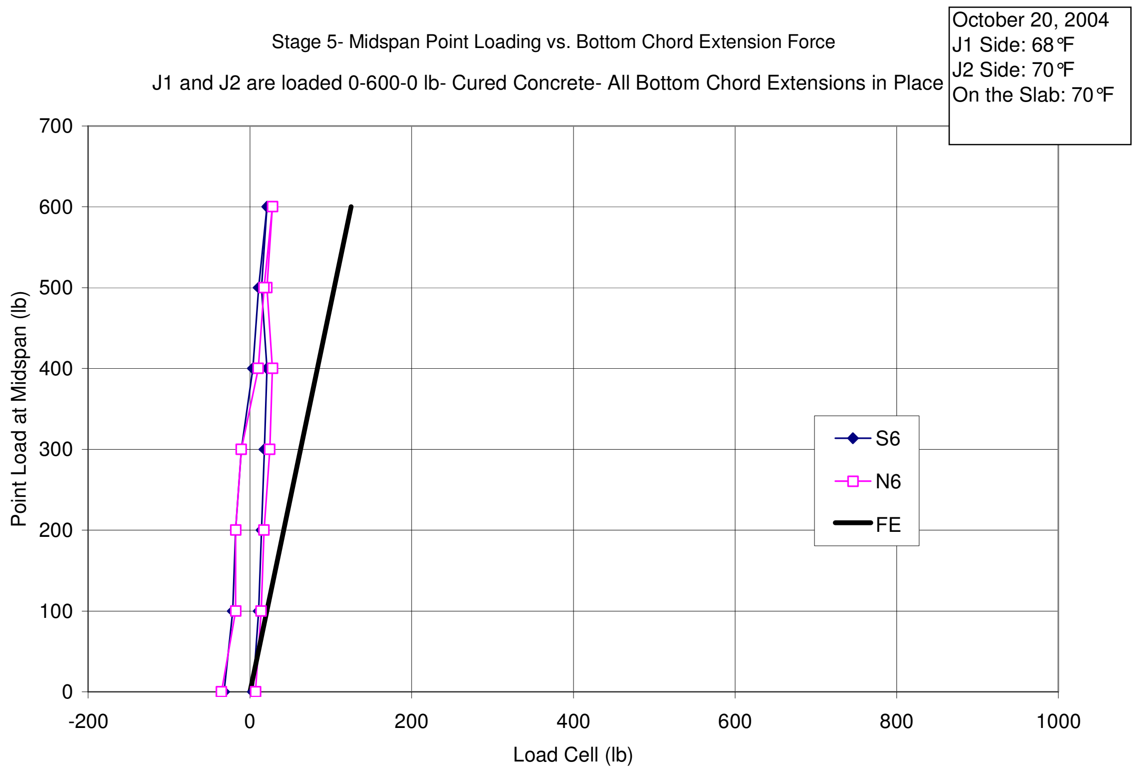


Figure C.141

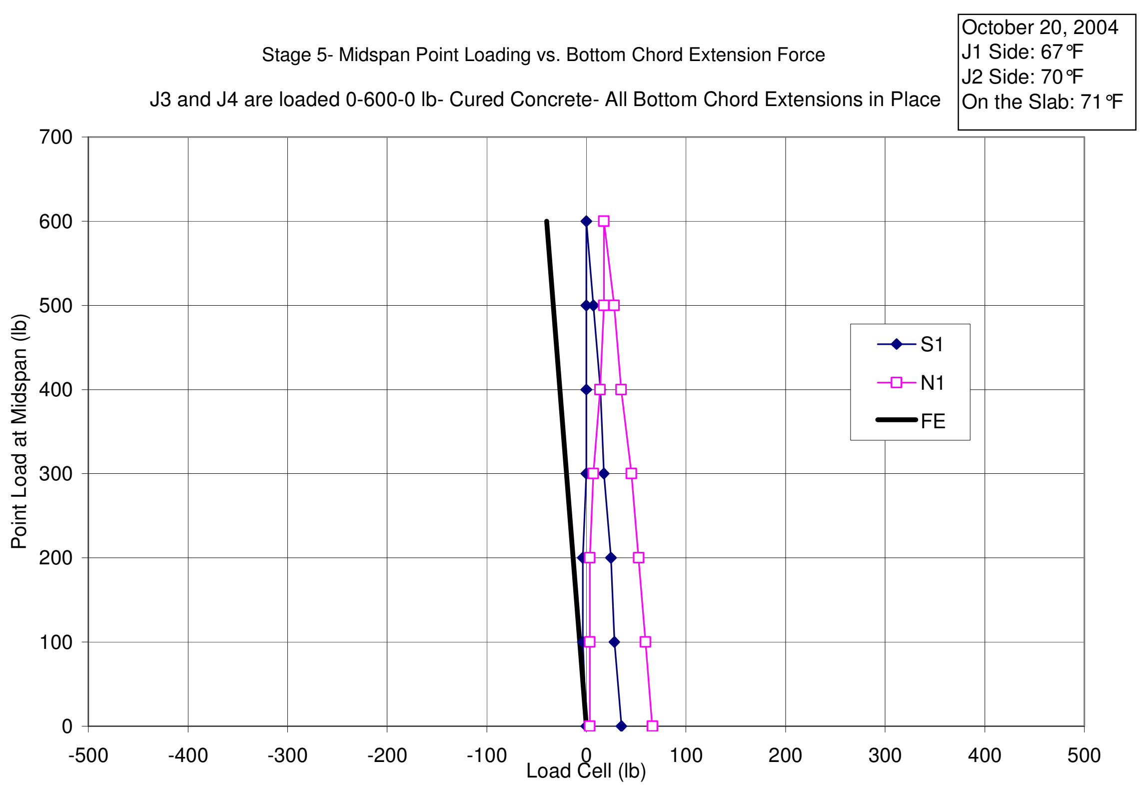


Figure C.142

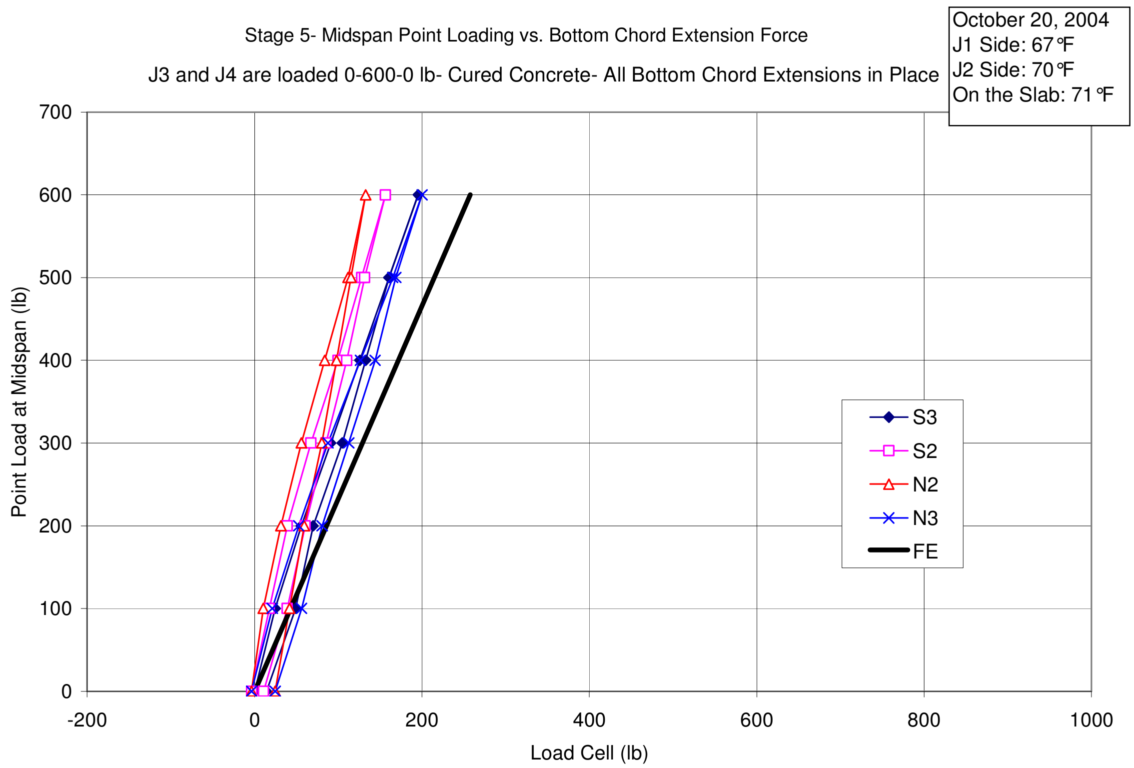


Figure C.143

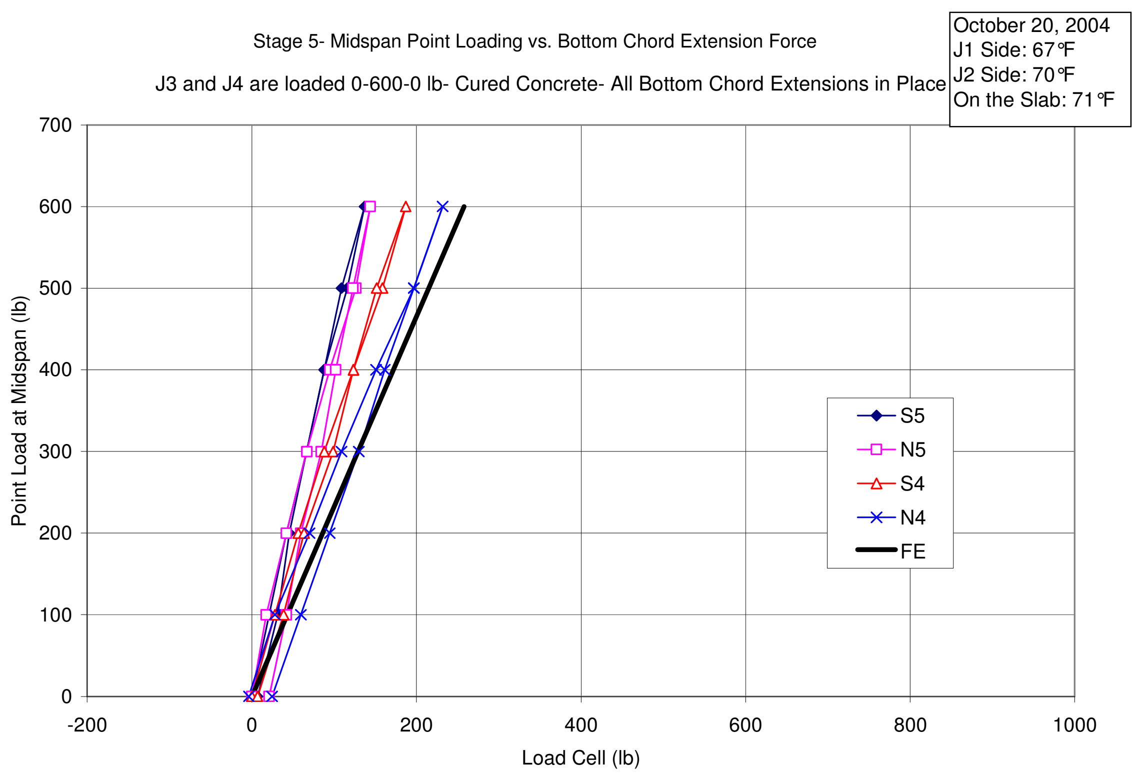


Figure C.144

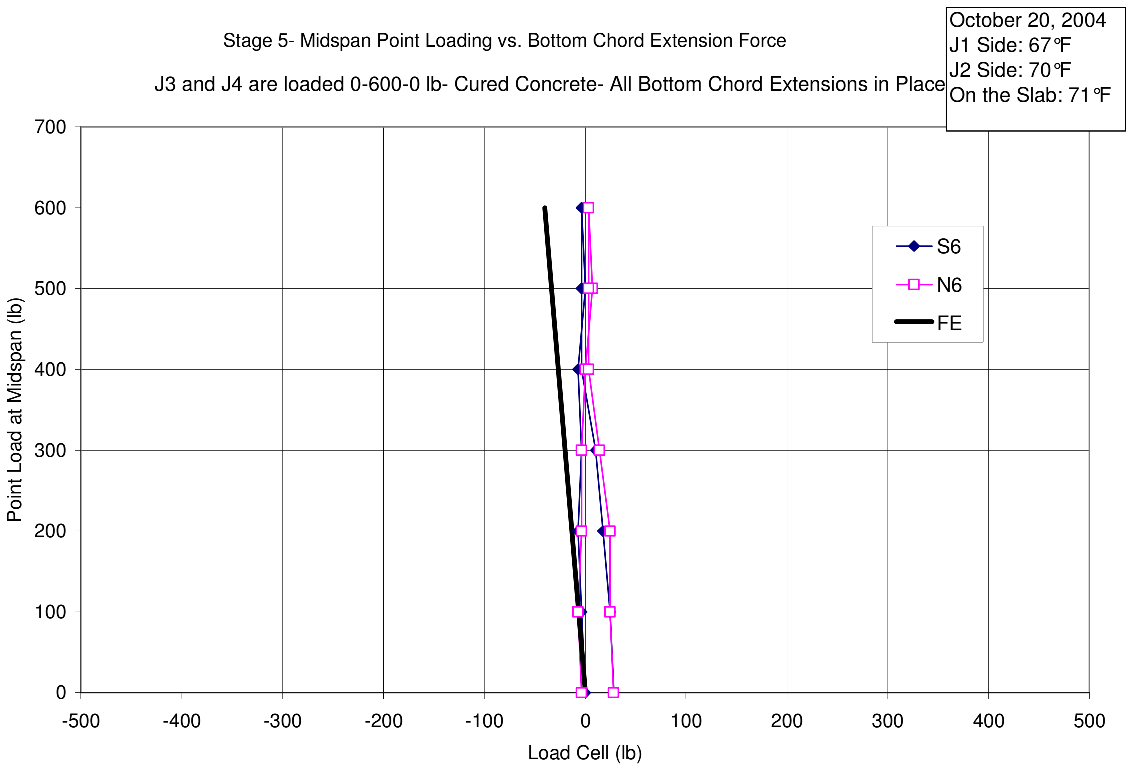


Figure C.145

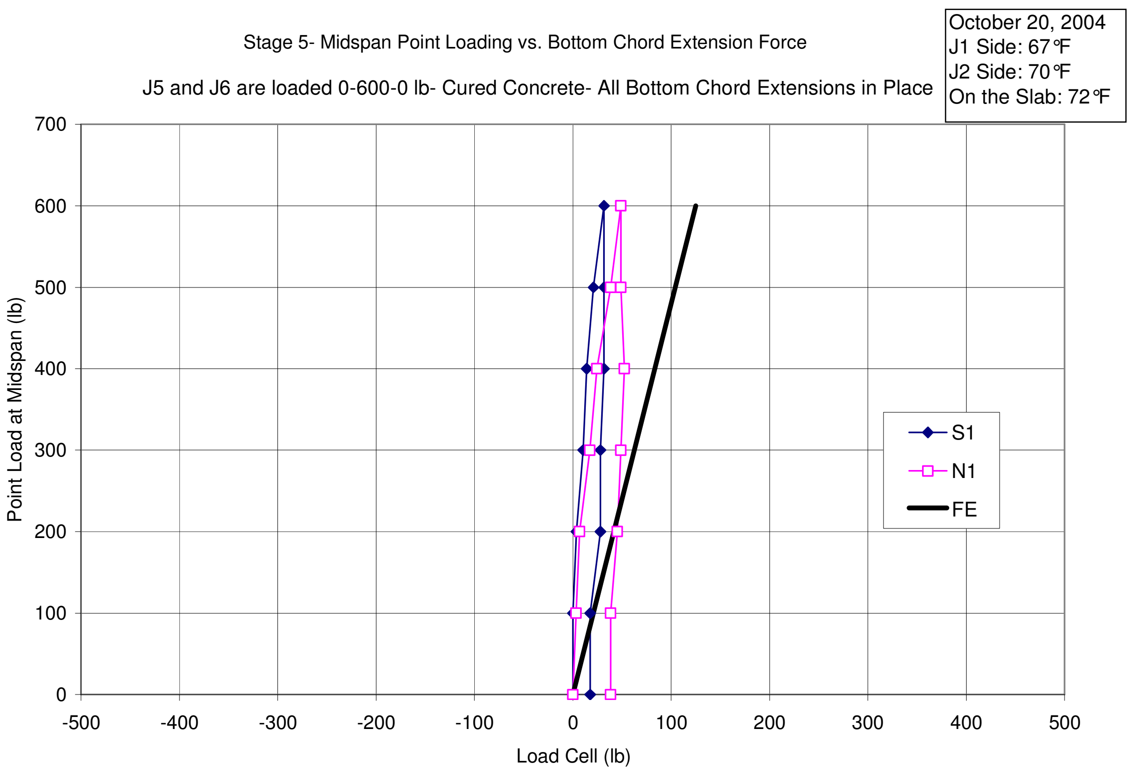


Figure C.146

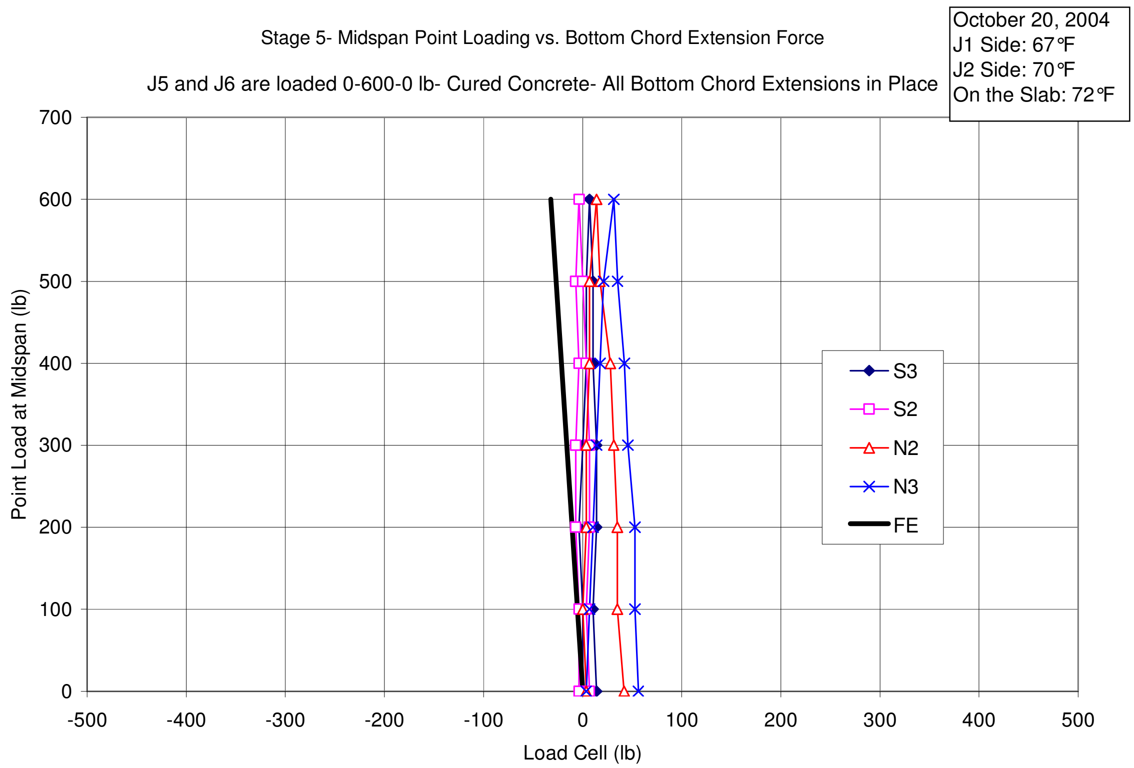


Figure C.147

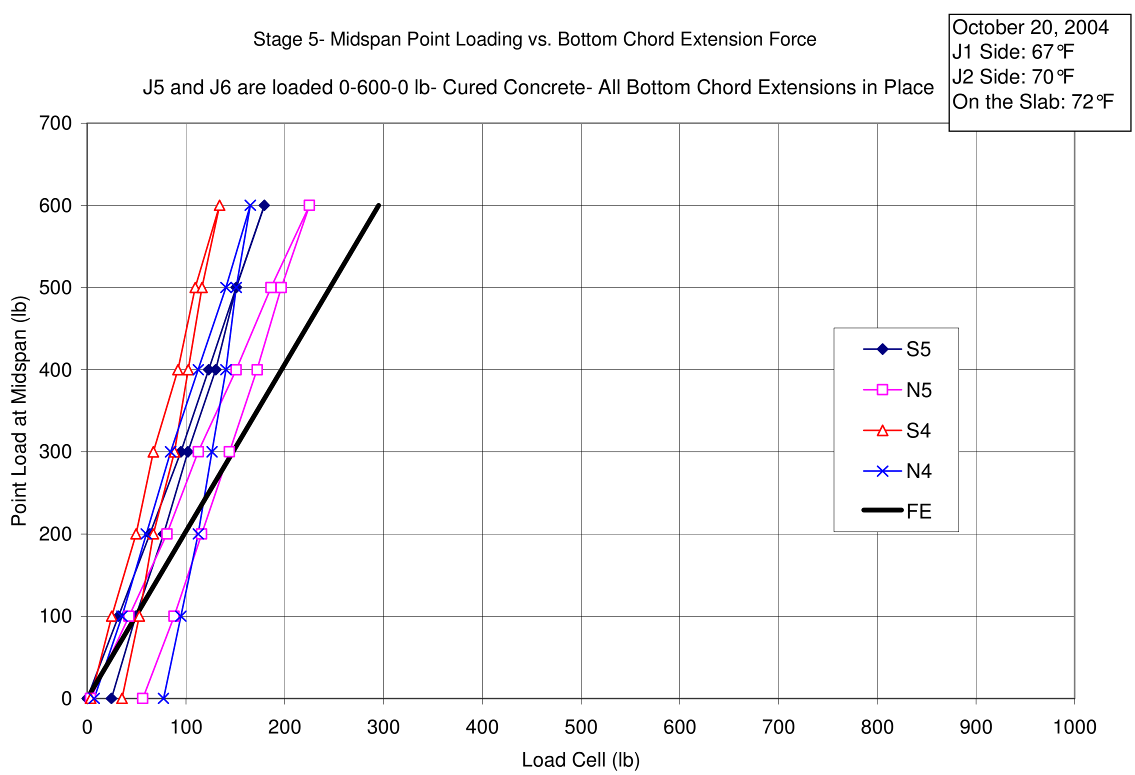


Figure C.148

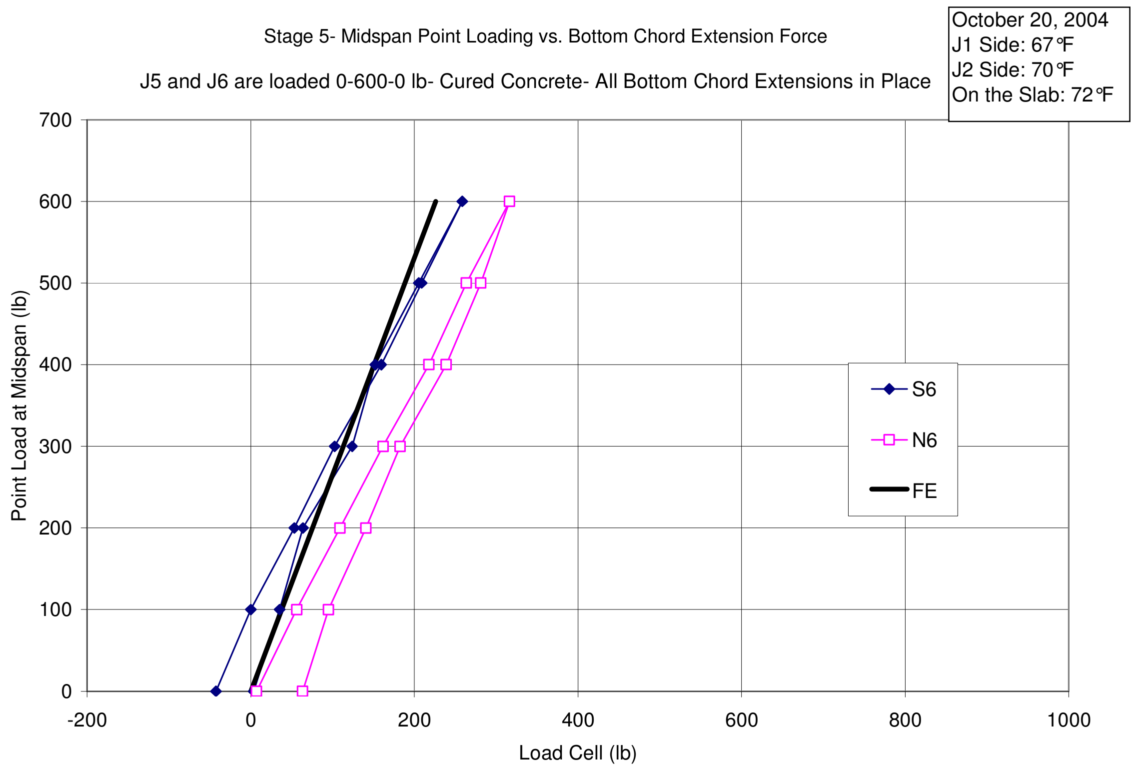


Figure C.149

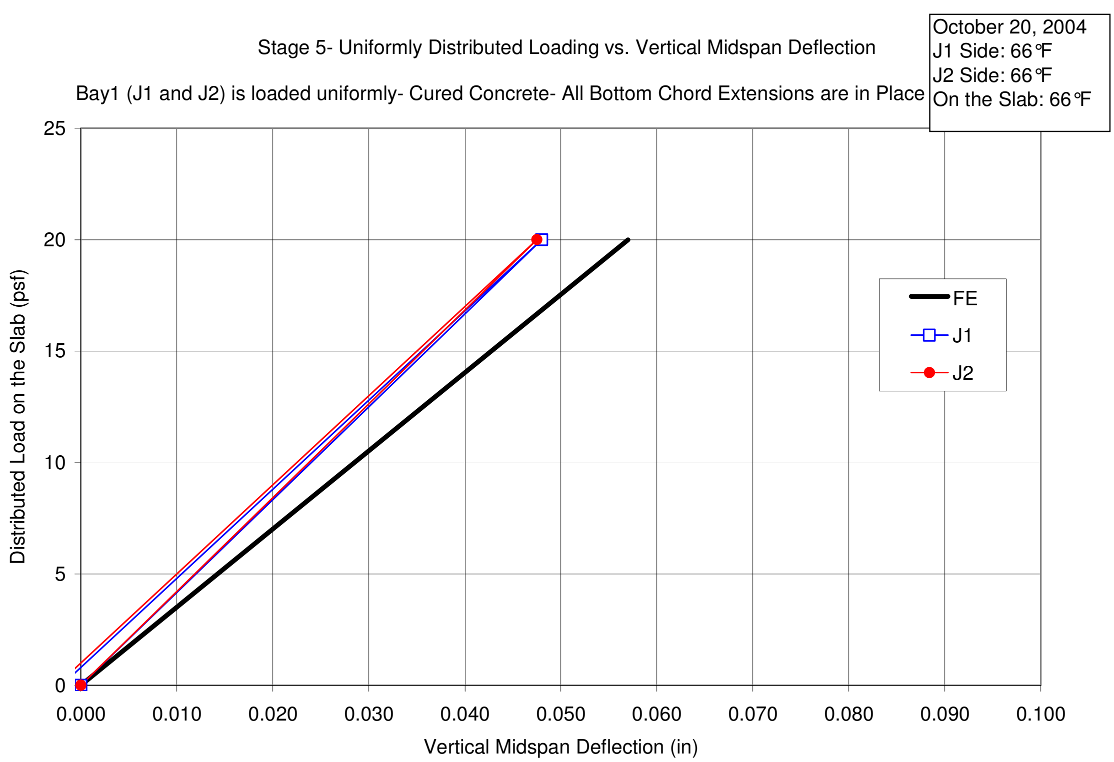


Figure C.150

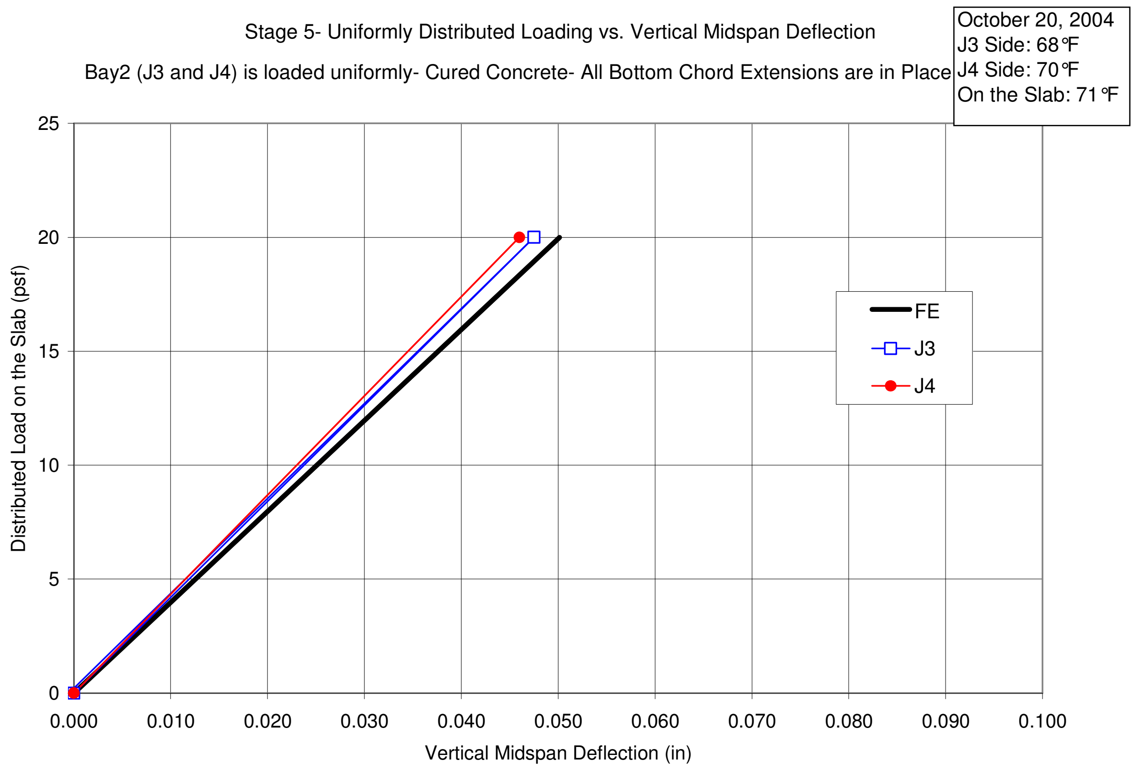


Figure C.151

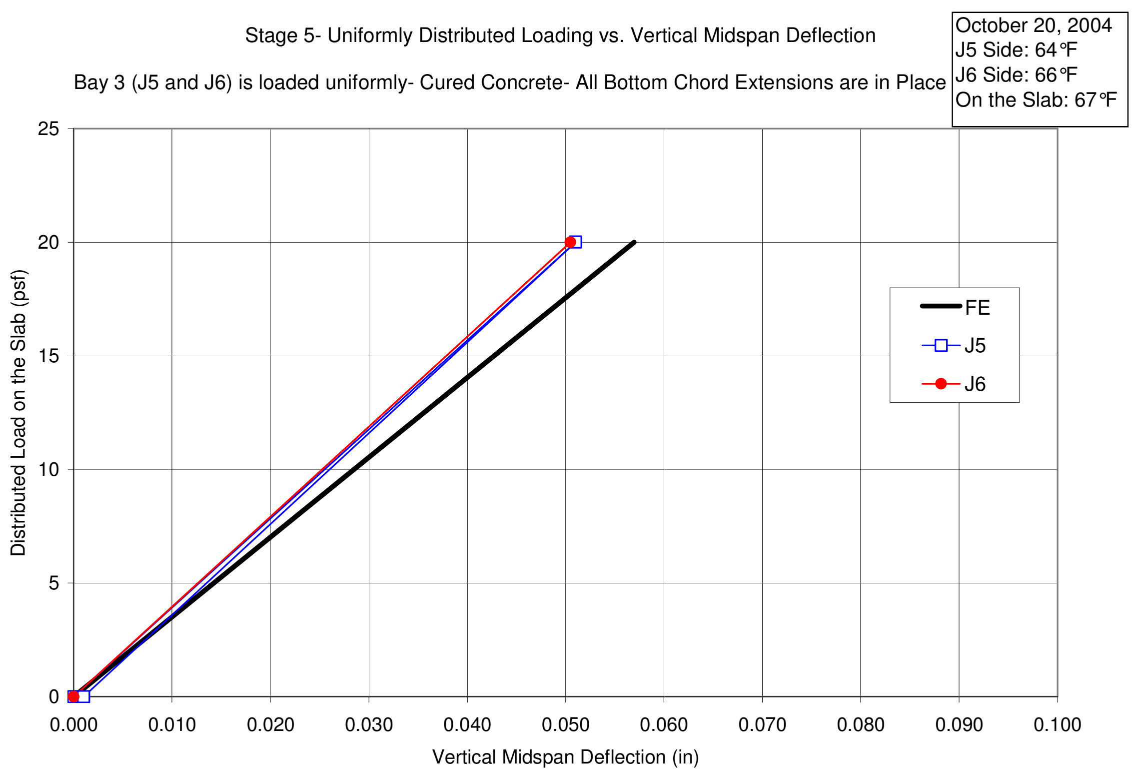


Figure C.152

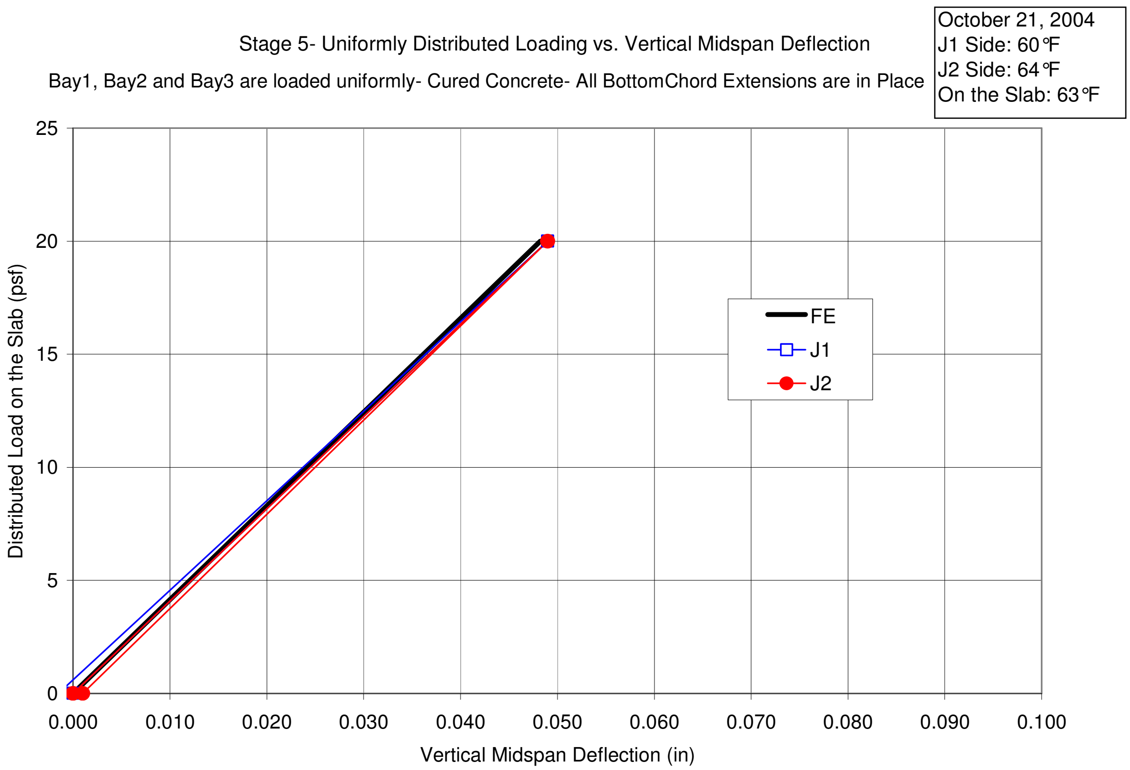


Figure C.153

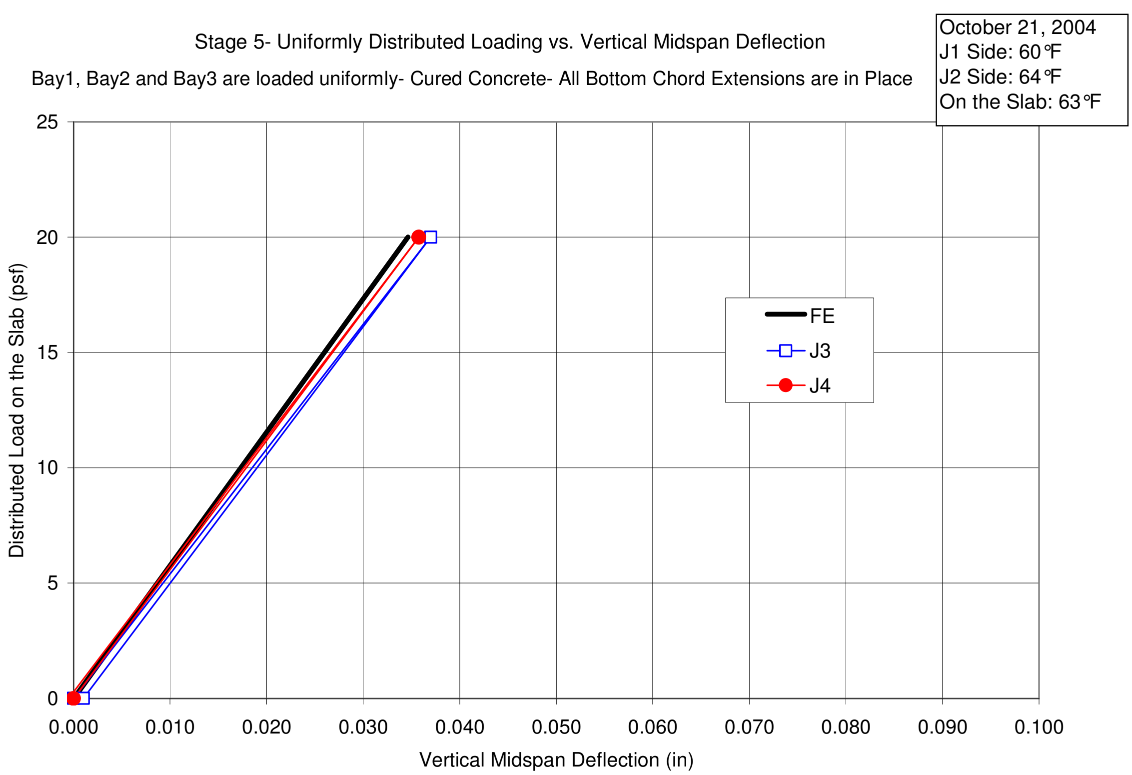


Figure C.154

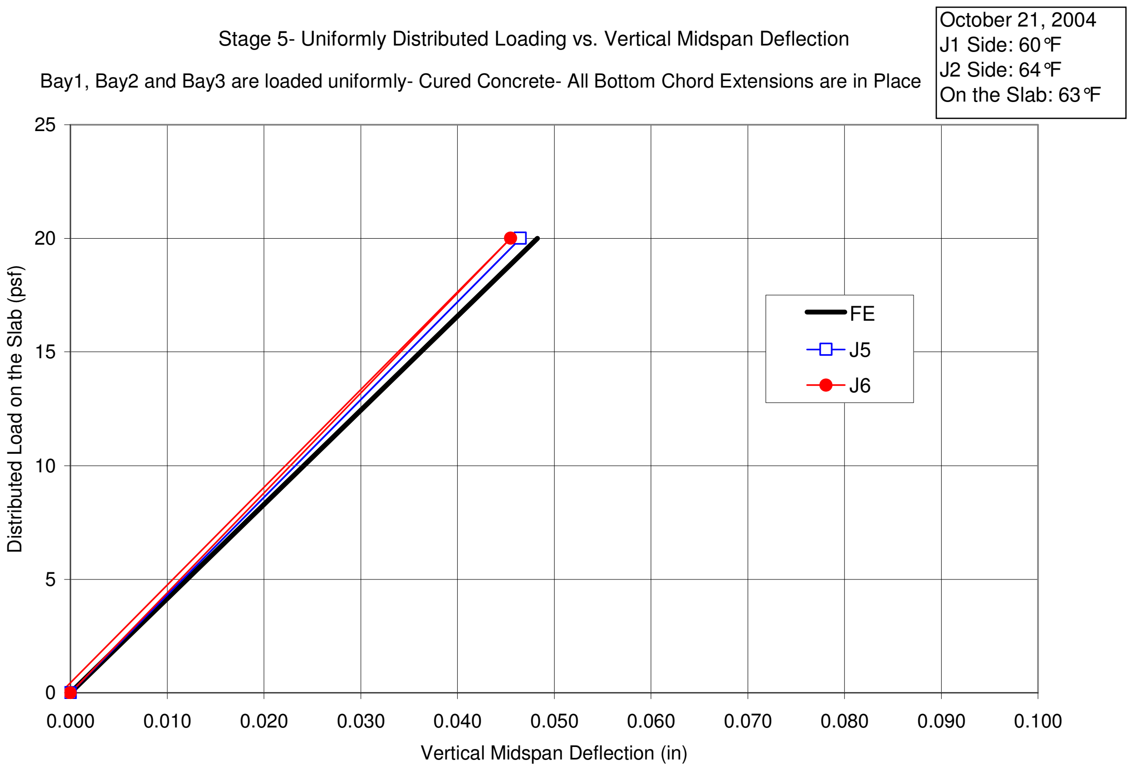


Figure C.155

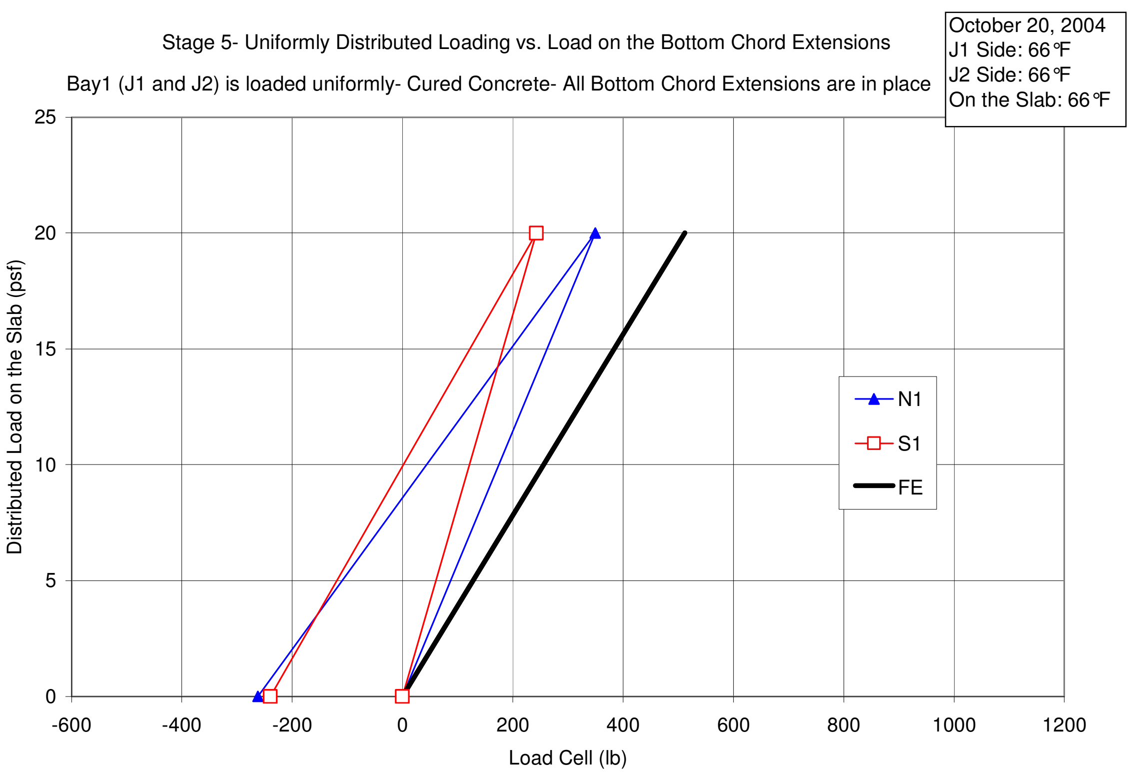


Figure C.156

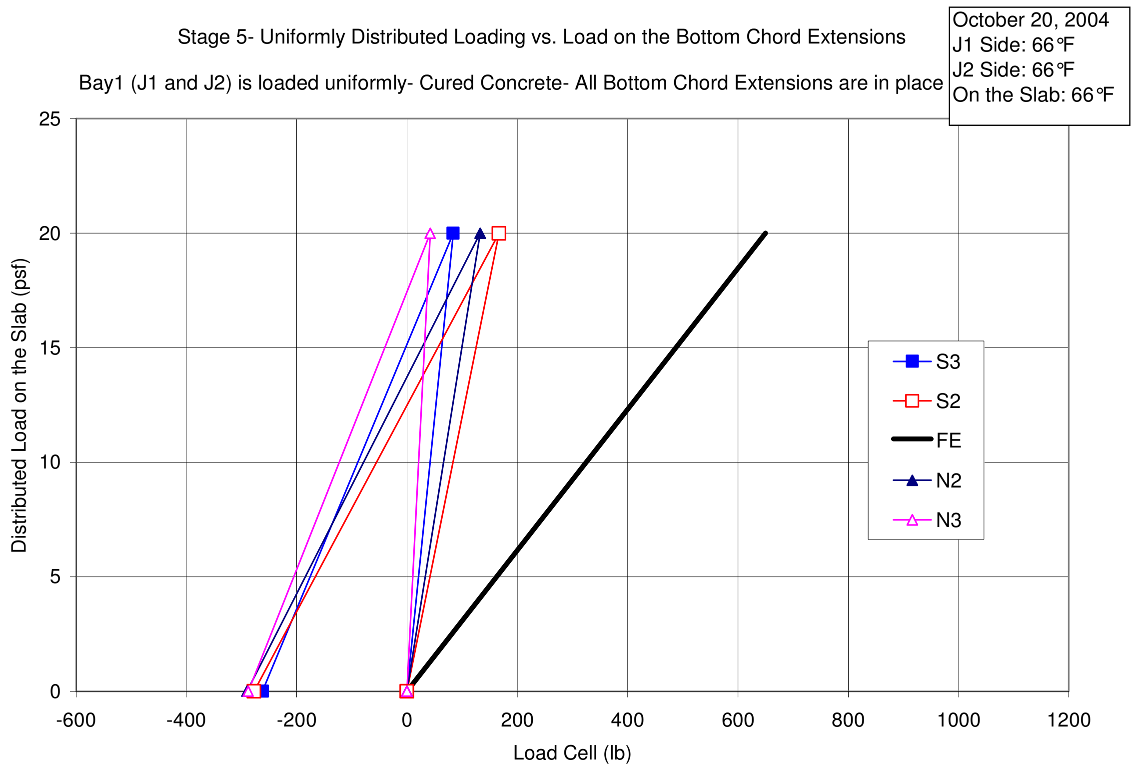


Figure C.157

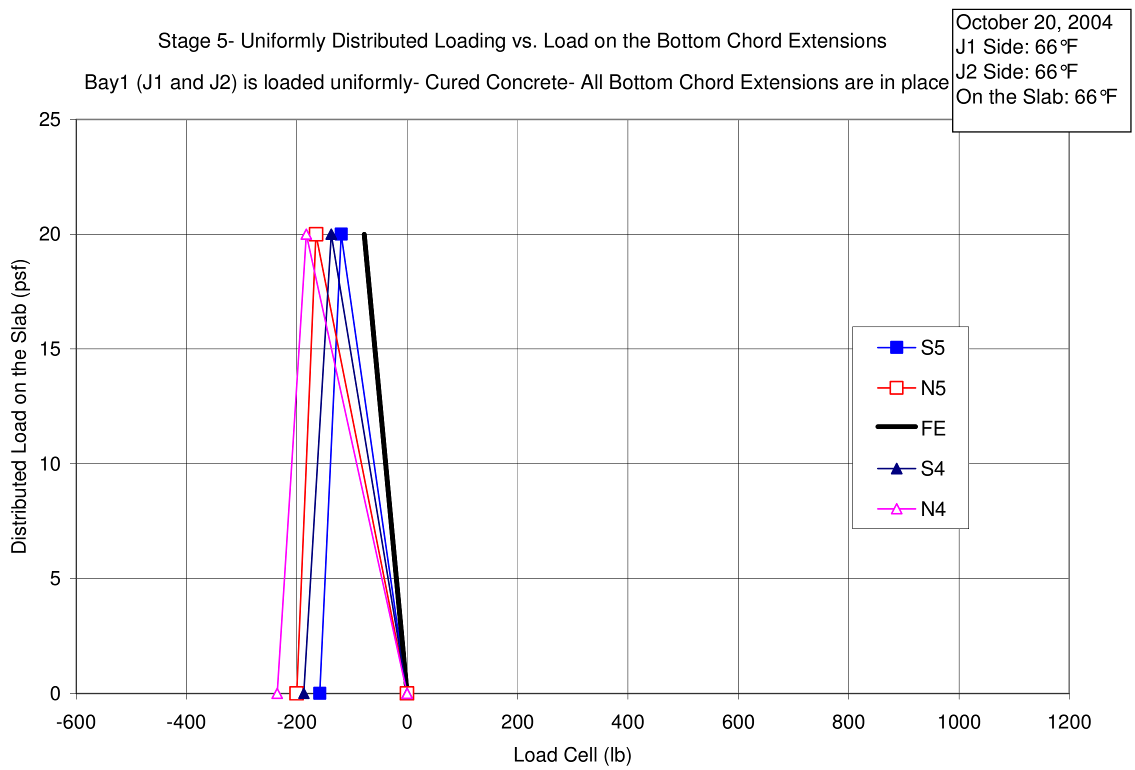


Figure C.158

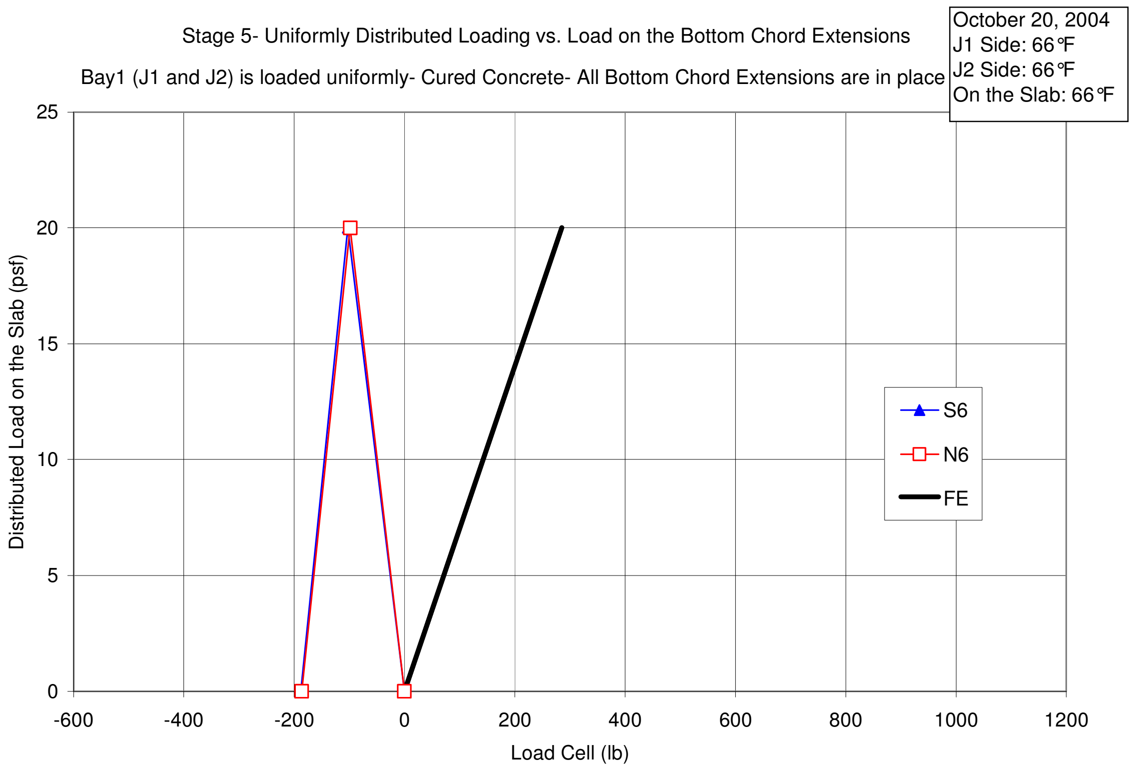


Figure C.159

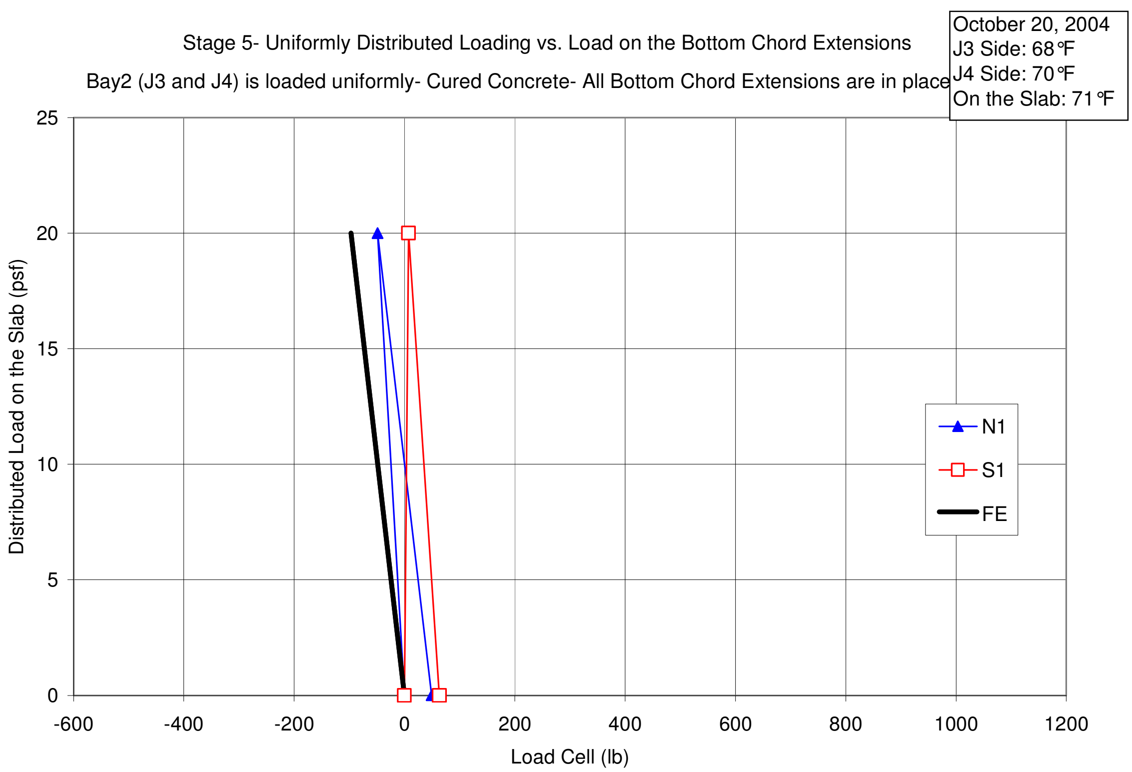


Figure C.160

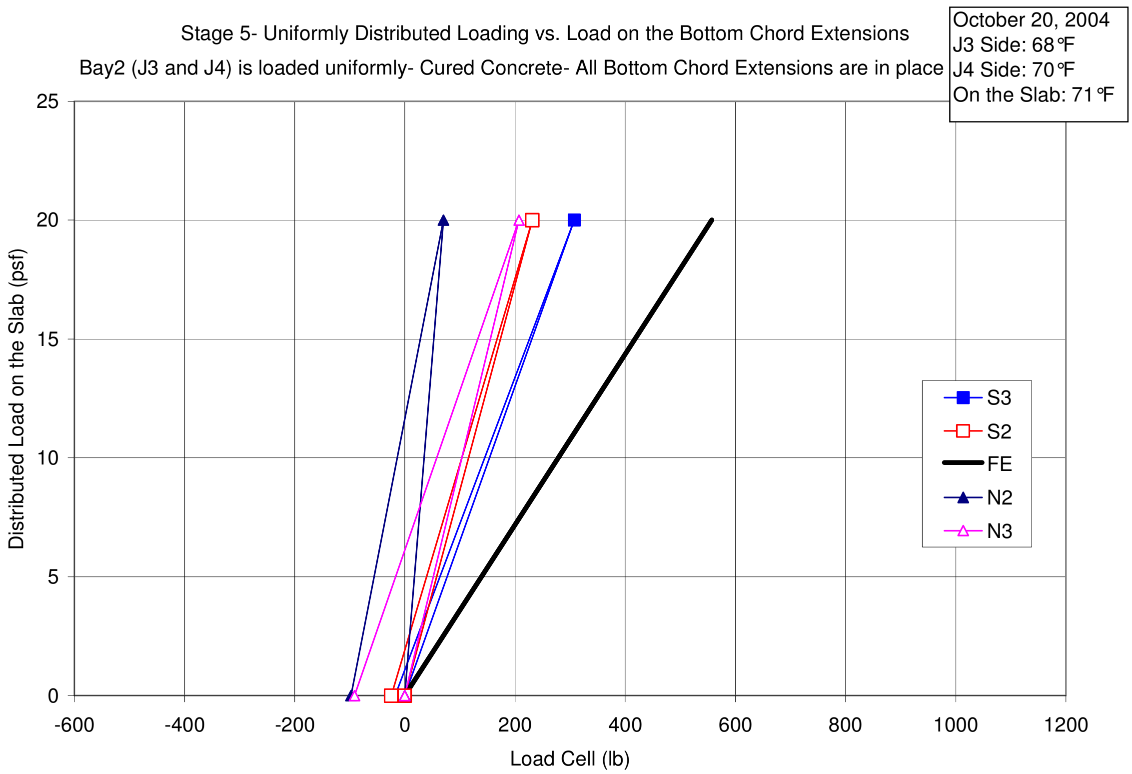
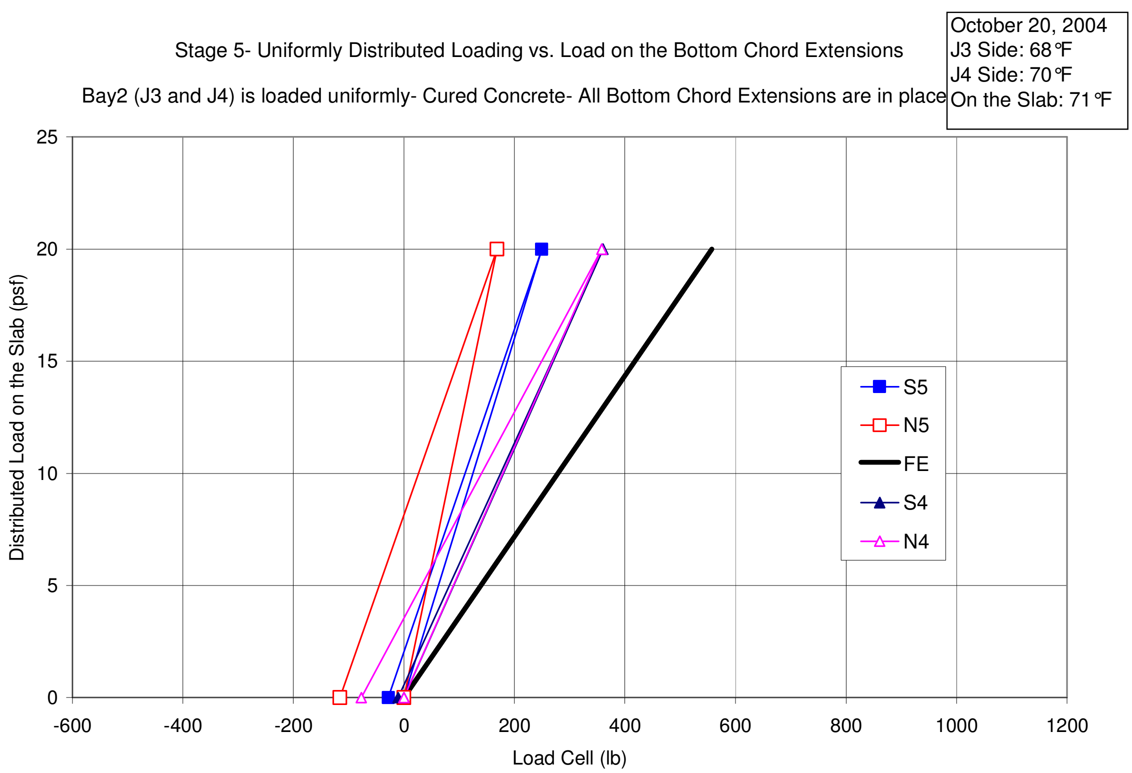


Figure C.161



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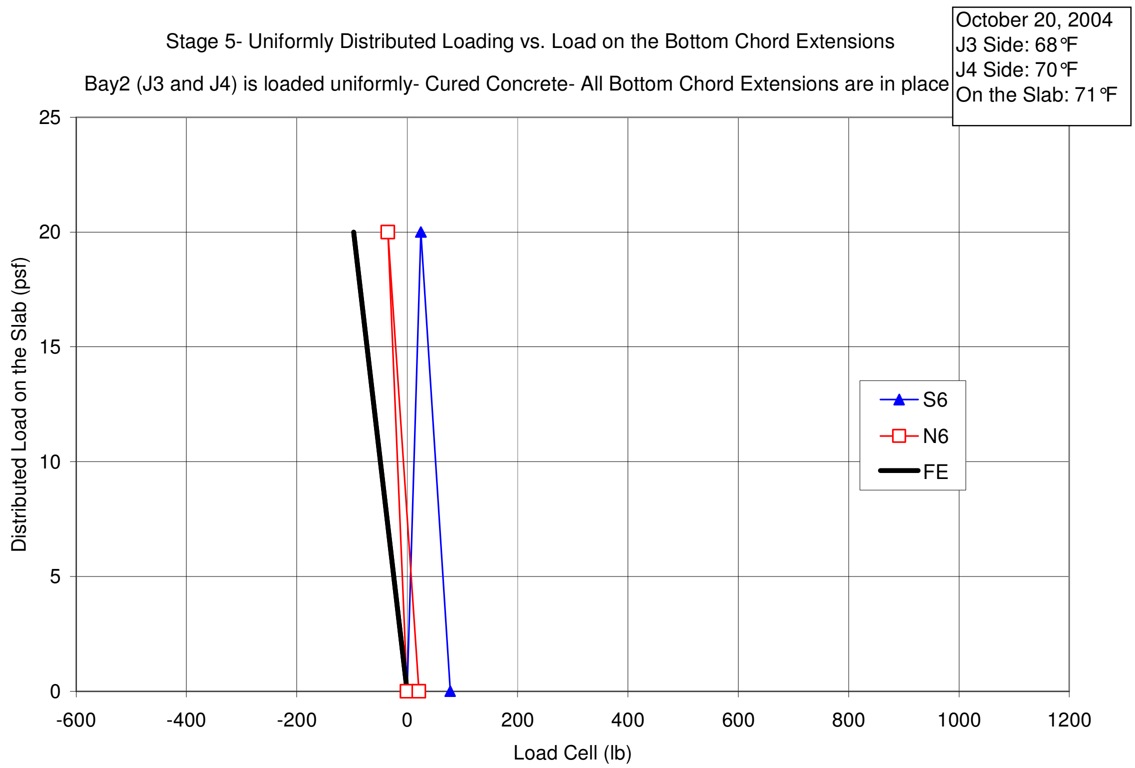


Figure C.163

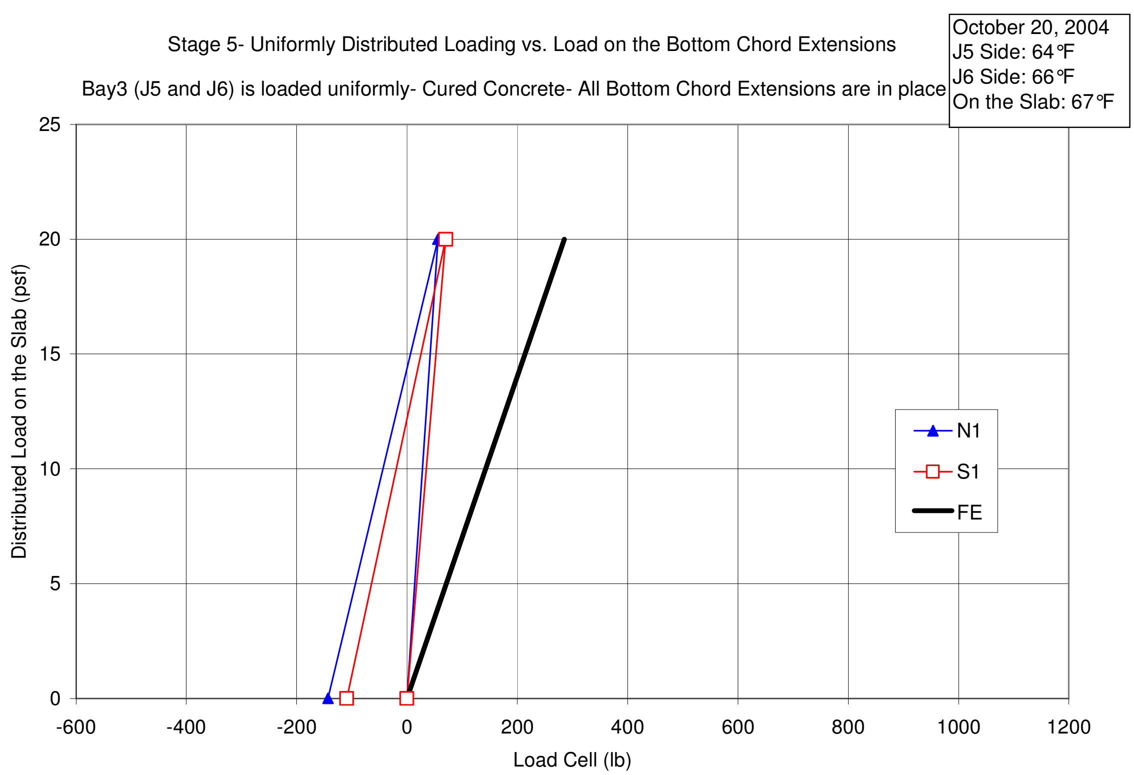
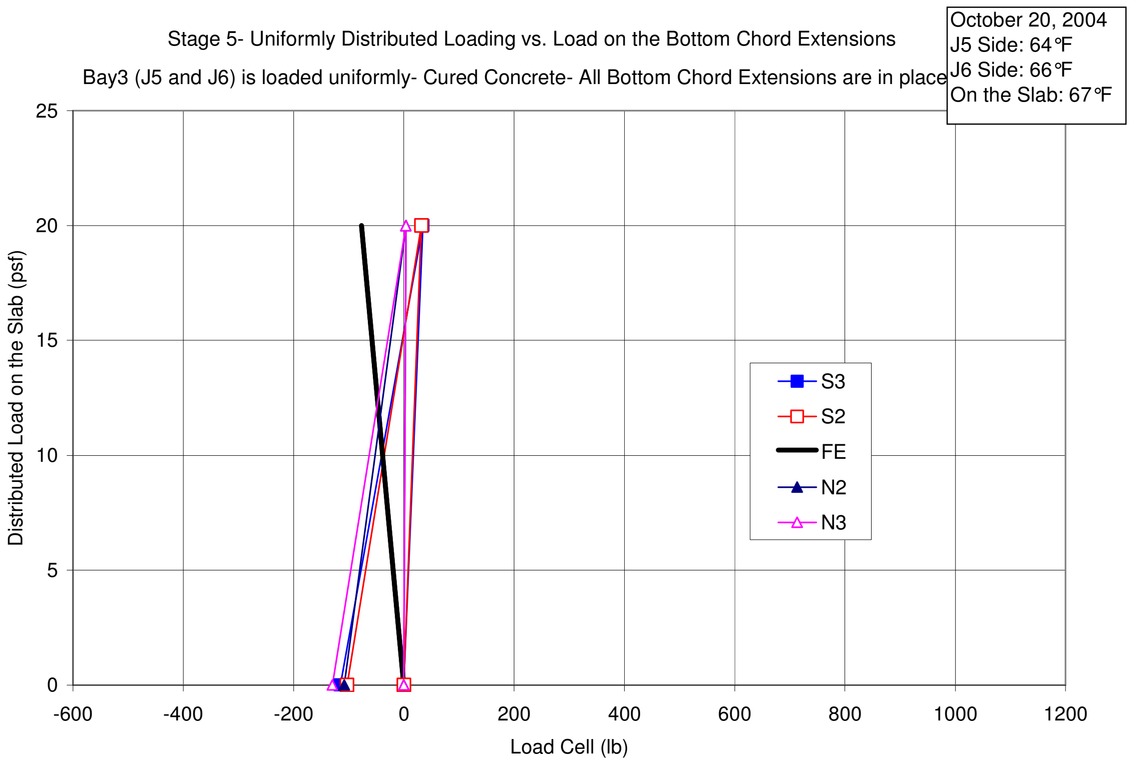


Figure C.164



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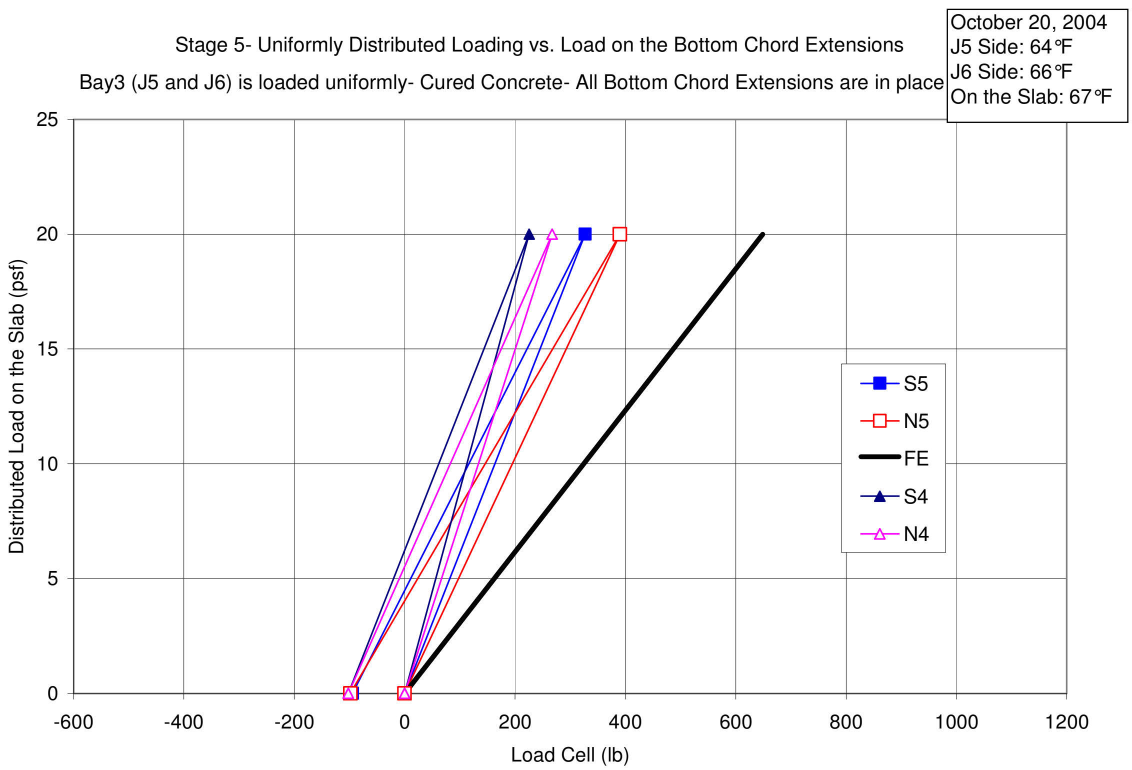
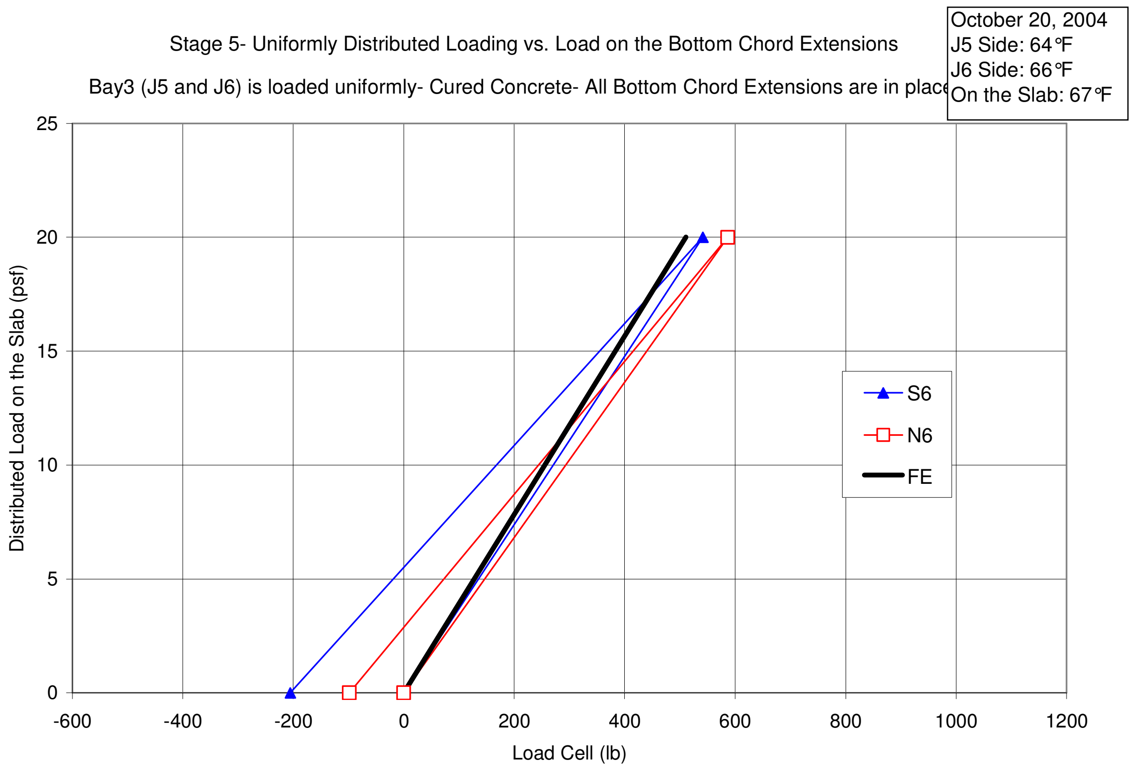


Figure C.166



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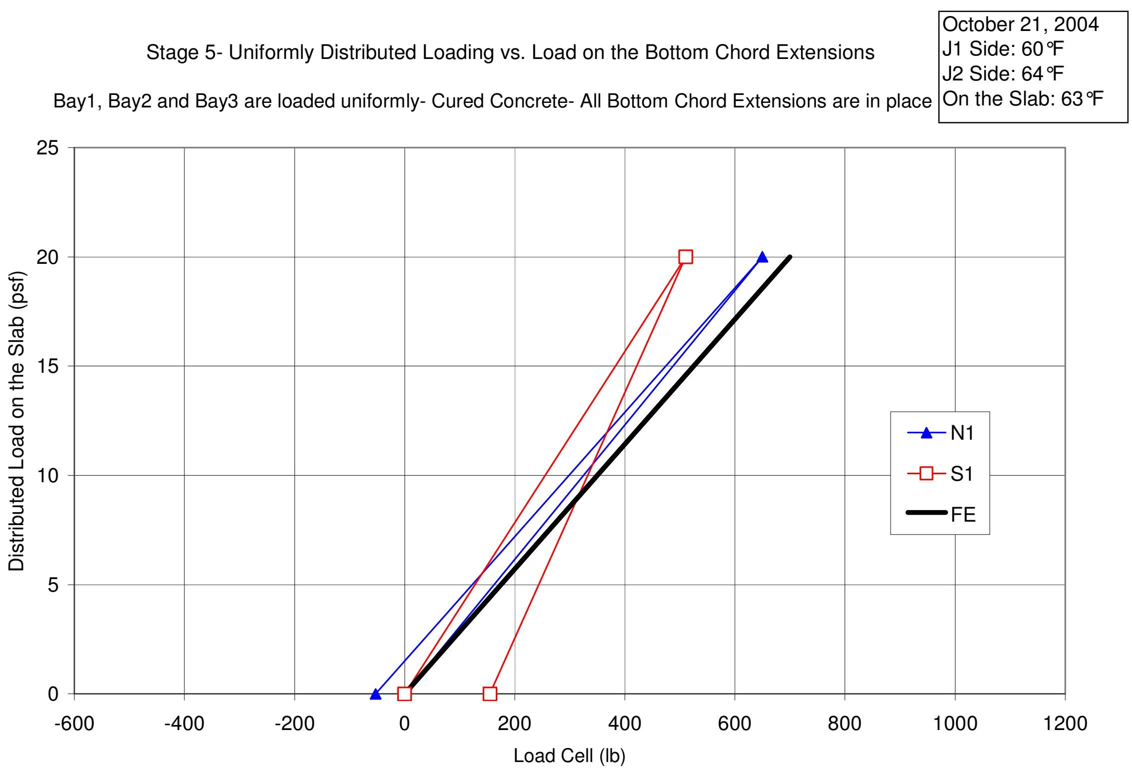

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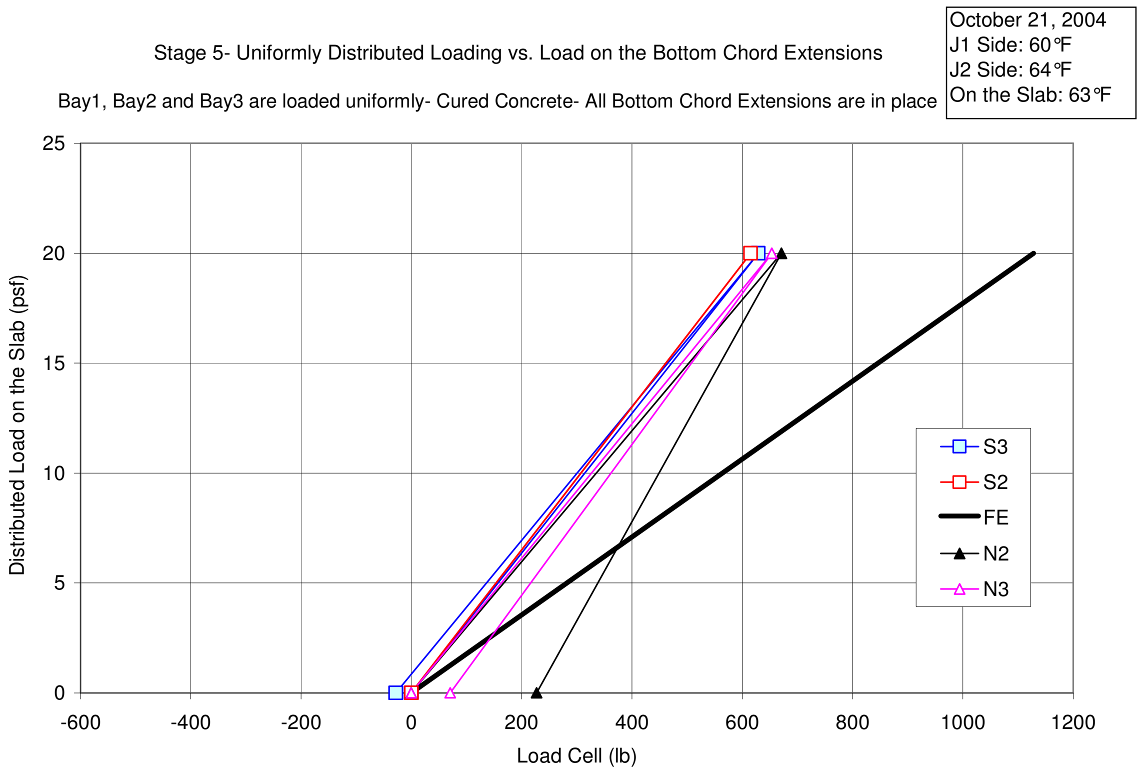

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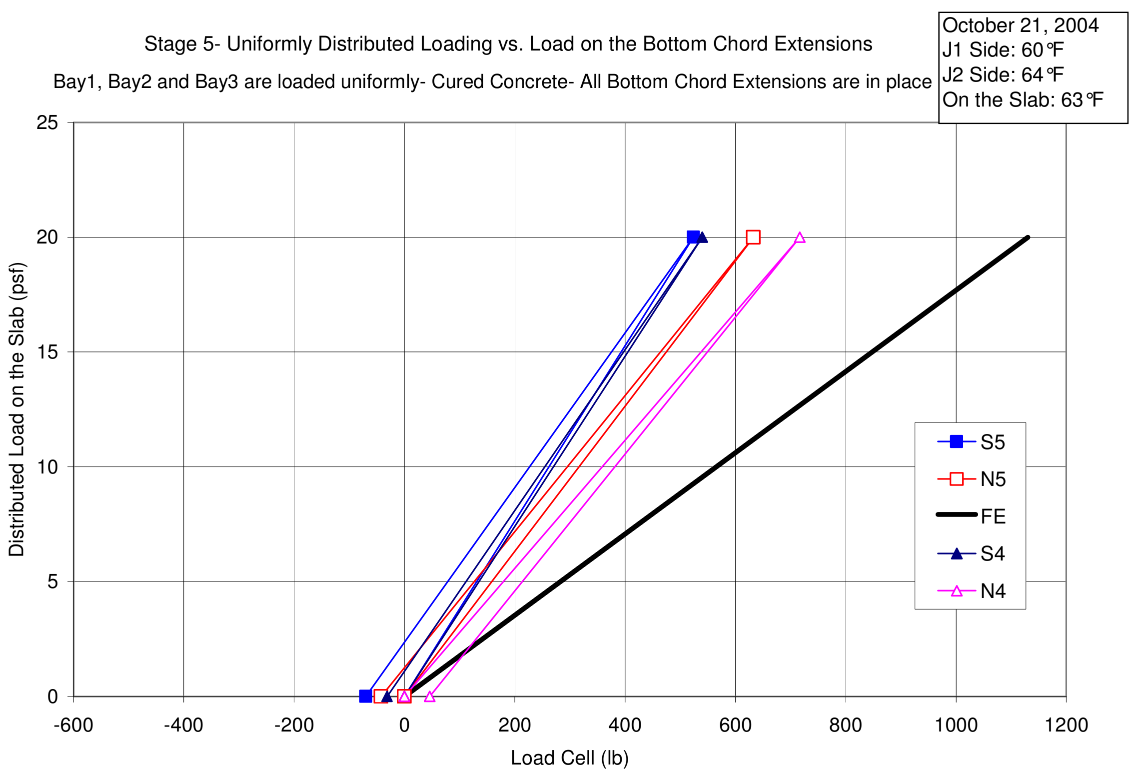


Figure C.170

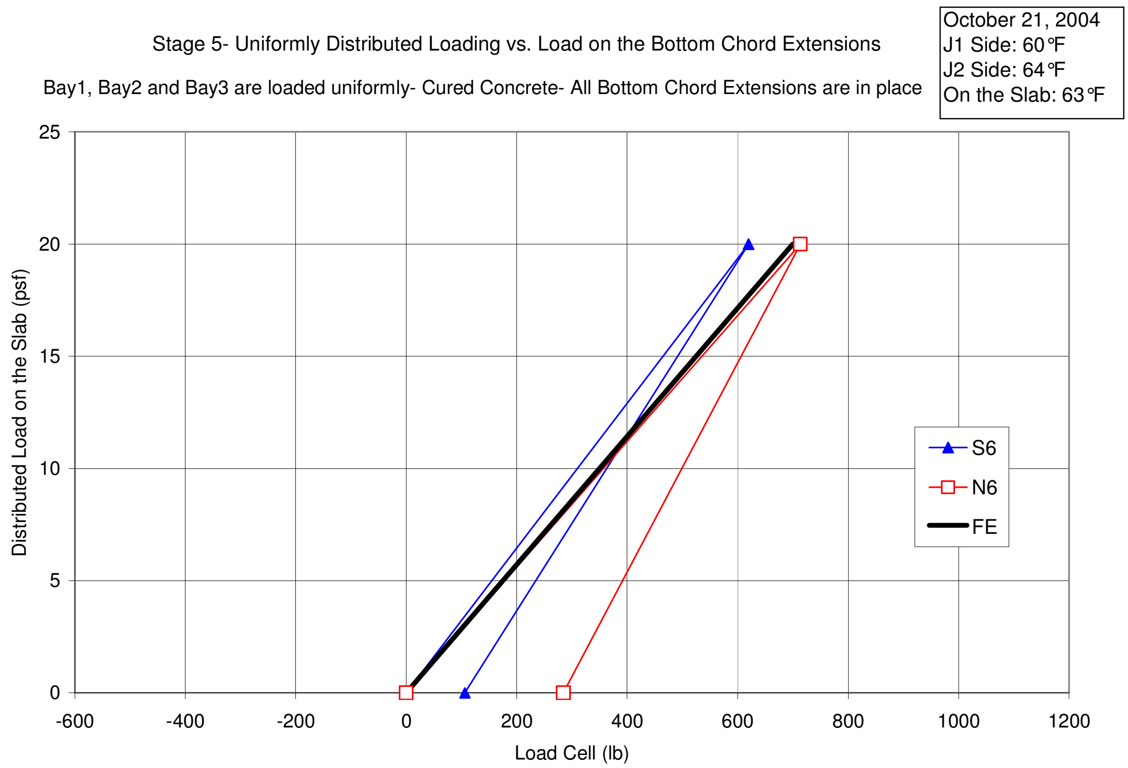


Figure C.171

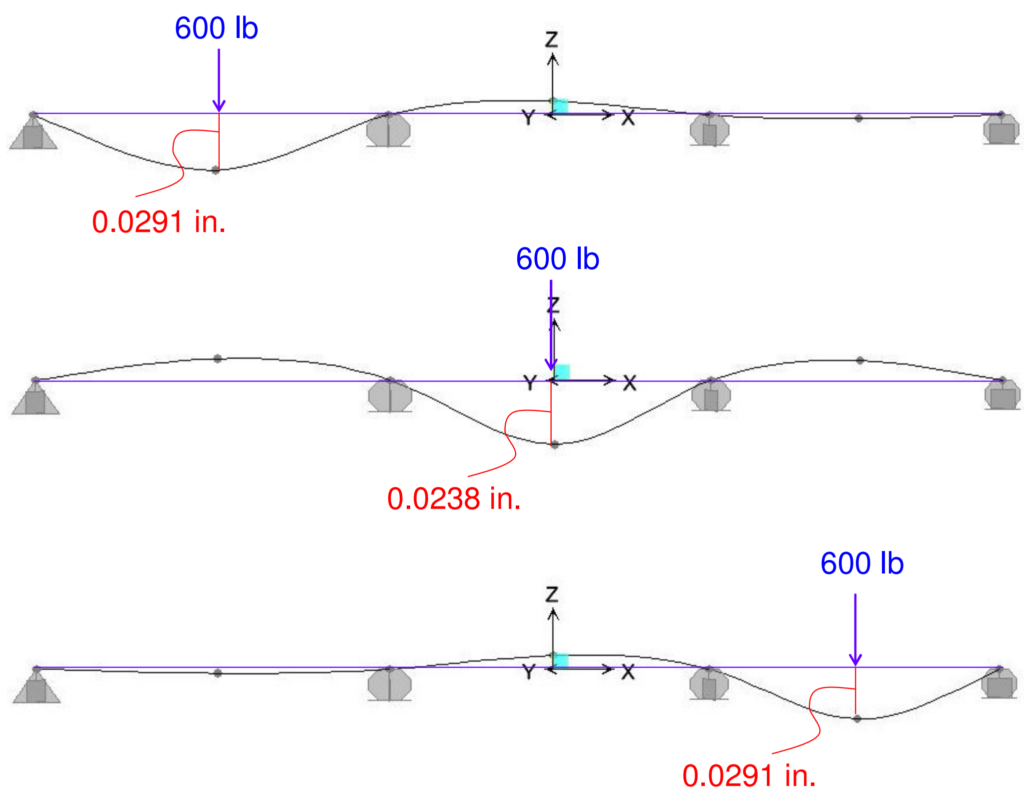


Figure C.172

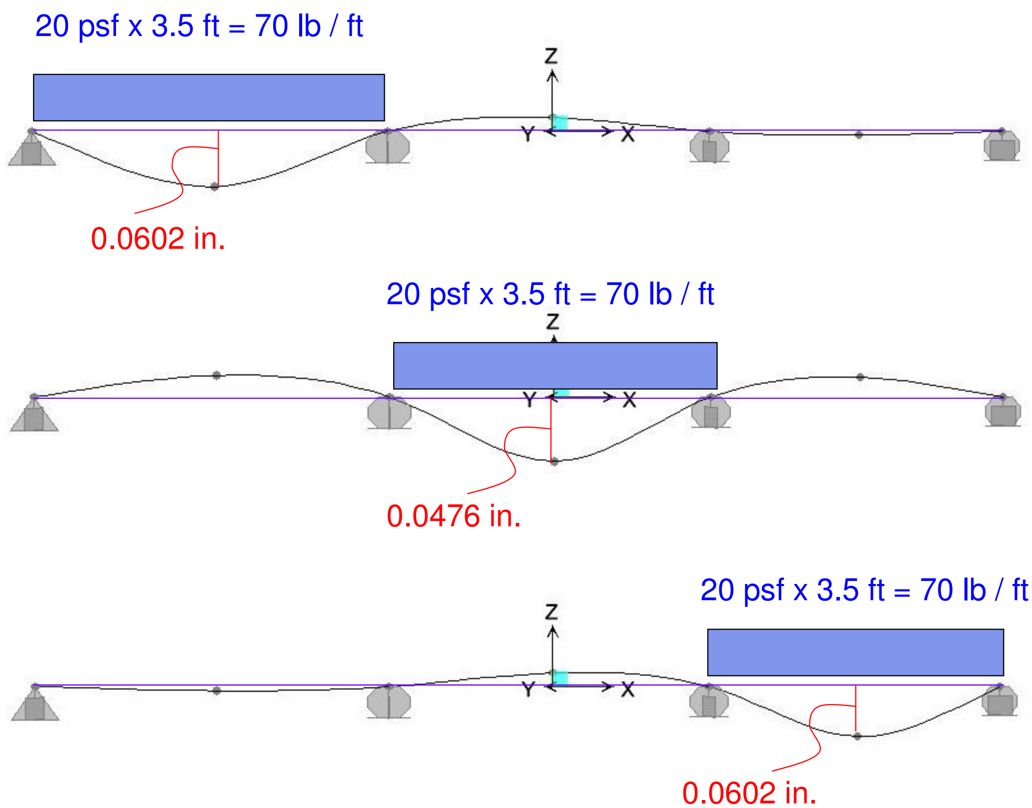


Figure C.173

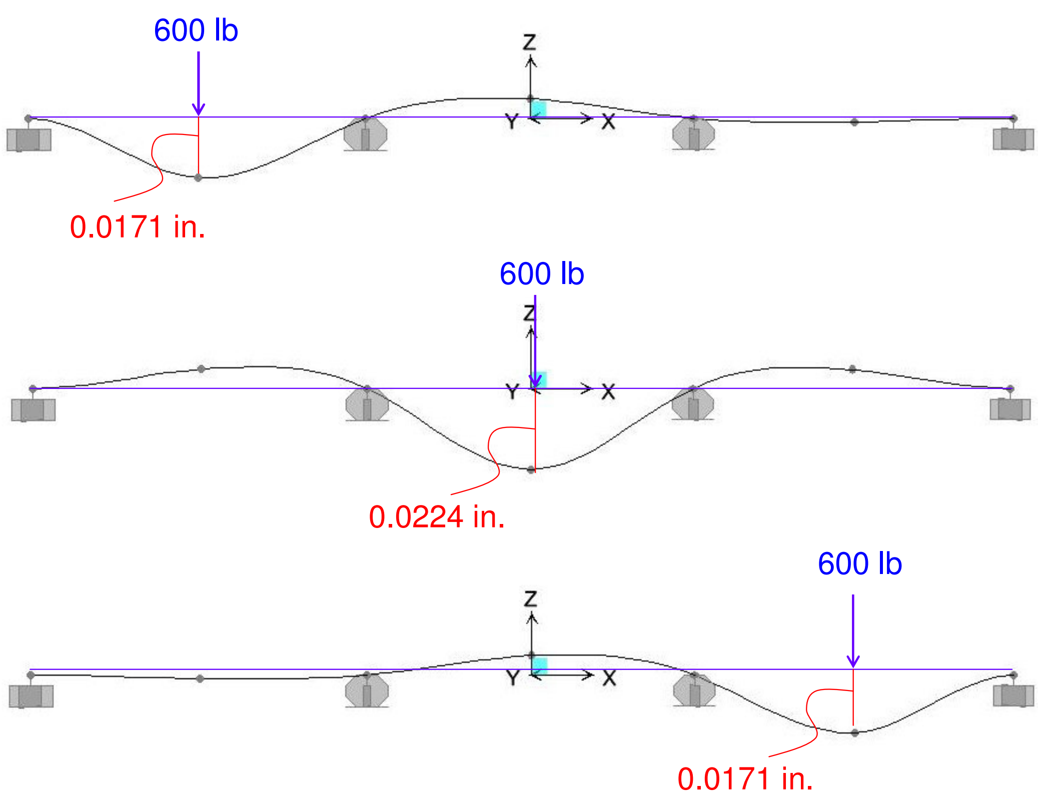
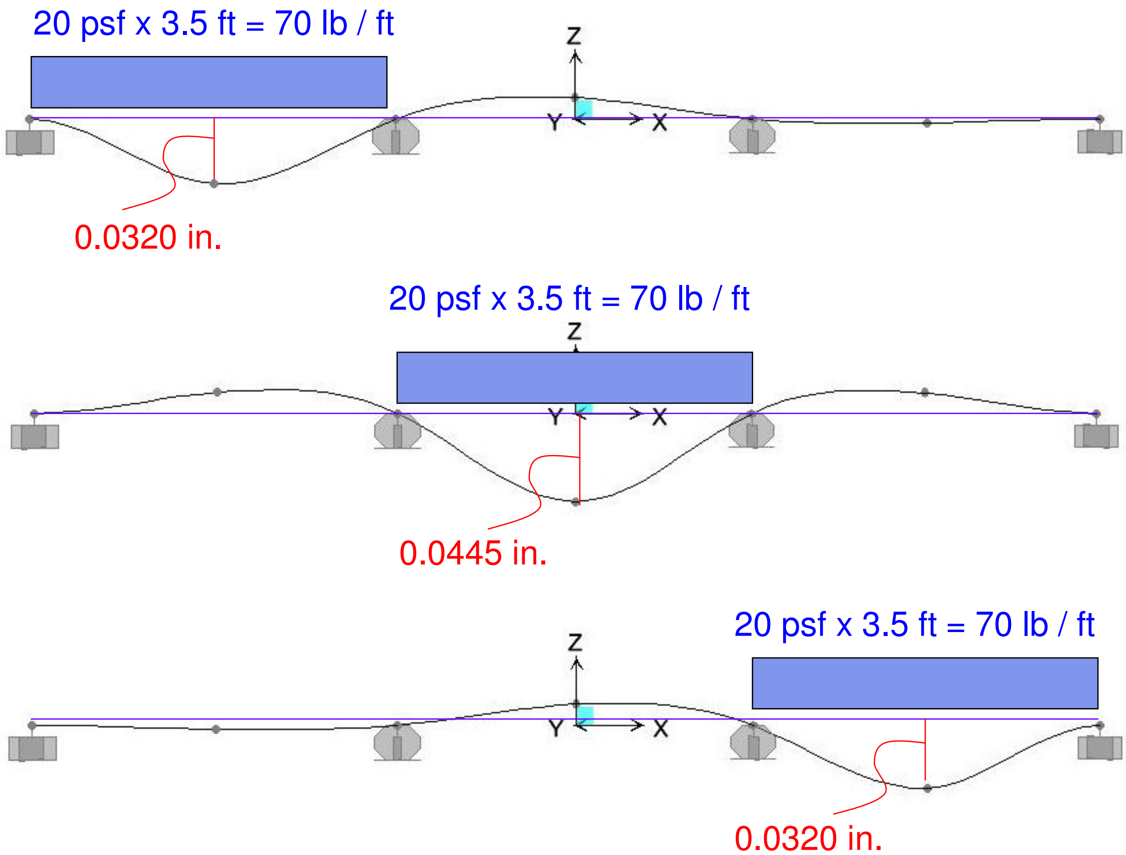


Figure C.174



20 psf x 3.5 ft = 70 lb / ft
Z
Y
X
0.0320 in.
20 psf x 3.5 ft = 70 lb / ft
Z
Y
X
0.0445 in.
20 psf x 3.5 ft = 70 lb / ft
Z
Y
X
0.0320 in.

Figure C.175