Norton & Schmidt

Consulting Engineers, LLC
Established 1967
Kansas City ● Atlanta

November 24, 2014

Mr. Jim Unruh
Colliers International
e/m: jim.unruh@colliers.com

Ms. Naomi Menefee
Colliers International
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RE: THE GOODWILL BUILDING **JOB #2014-1969**
1817 CAMPBELL
KANSAS CITY, MISSOURI

Per the signed proposal and per your request, Norton & Schmidt Consulting Engineers reviewed the above referenced building for the purposes of determining the live load capacity of each of the roof and floor levels, to determine the areas of possible structural concern found, to determine possible methods to resolve any low live load rated areas, and to make additional repair recommendations as necessary. Following is a summary of the findings and opinions for your review.

It should be noted that this examination did not attempt to check for possible termite damage, water damage, or for structural components that are concealed from view by finish or stored materials. When making visual observations of a building, it is required that certain assumptions be made regarding the existing conditions. Because these assumptions may not be verifiable without expending added sums of money, or destroying adequate or serviceable portions of the building, the owner of this report agrees that we will be held harmless, indemnified and defended by you from and against all claims, loss, liabilities, or expenses (including legal fees) arising out of the services provided by this report.

OBSERVATIONS

An examination of the roof and floor framing systems revealed the roof joists to be 2x8's at 16" on center spanning in an east/west direction with the 8x12 timber beams spanning in a north/south direction. The floor joists at each of the first, second, third and fourth floors were found to be 3x12 floor joists at 24" on center. The lumber was assumed to be old growth lumber with a high allowable bending stress value and a high modulus of elasticity. Our assumption is that the wood is equivalent to Douglas Fir #1 or Douglas Fir Select Structural. Our assumption for the code required loading of the building was based on the ASCE 7-10, and the IBC.

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THE GOODWILL BUILDING **JOB #2014-1969**
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KANSAS CITY, MISSOURI

The roof joists were found to be capable of supporting the Code required minimum live load of 20psf with some deflection. This is based on a calculated total load deflection and to the fact that the roof is deflecting and ponding water exists in several areas on the roof. The 8x12 wood beams were found to be capable of supporting a total load of 43psf, which leads to a live load of approximately 25psf allowable. Therefore, it is my opinion that the roof framing members are marginally adequate to meet the minimum Code requirements. However, before the roof is re-roofed in the future, it is my opinion that all existing layers of roof covering be removed to limit the weight on the roof and reduce the stress and deflection on the members.

An examination of each of the floor levels revealed the floors to be framed with 3x12 floor joists at 24" on center. These 3x12 floor joists were checked and found to be capable of supporting approximately 65psf live load with the dead load set at 12psf. It is our assumption that the floor joists in this location are capable of supporting the 65psf. The general Code required loading for office buildings is 50psf, plus a partition load of 15psf. Therefore, the floors appear to have been built and designed to support an approximate 65psf live load. However, the floor joists at the fourth floor are not the limiting factor. The 8x12 wood beams at the fourth floor were found to be capable of supporting only a 55psf live load. This allowable live load is greater than the 50psf minimum live load required by Code for office loading without considering the required partition load. Therefore, it is our opinion that the fourth floor will satisfactorily support a live load of 55psf for the building in its current condition.

An examination of the floor frame at the second and third floor areas revealed the 3x12 floor joists to be capable of supporting the 65psf live load noted. In this case, the 10x14 wood beams in each location are capable of supporting a total load of 90psf or a live load of approximately 78psf. Since the floor joists are the limiting factor, it is our opinion that the floor system for the second and third floors is capable of supporting a 65psf live load. This appears to be an acceptable Code required load and no additional repairs appear to be necessary for office-type loading. However, should you desire to have a load rating greater than 65psf live load, additional bracing or beefing-up of the floor joists would be necessary.

A check of the first floor frame revealed the floor joists to be capable of supporting 65psf live load as noted above. The timber beams with the additional columns installed appear to be capable of supporting a load greater than 125psf. Therefore, overall, the first floor loading is capable of supporting the most load but would still need to be limited to 65psf through the main floor joist span areas.

In general, it appears that the floors are designed and adequately built to support a 65psf live load at the first, second and third floors, with a 55psf live load at the fourth floor, and a 20psf live load at the roof. Should you desire to increase the capacity of any of these floor loads, please feel free to contact our office. The fourth floor capacity could be increased to 65psf in lieu of the 55psf by installing a C8x11.5 steel channel bolted to the existing wood beams with two (2) ½" diameter bolts at 12" on center and two extra bolts at each end. However, any additional

modifications beyond that would appear to require extensive modifications or strengthening of each of the existing floor joists. To increase the capacity of any of the other floors, the floor joists would need to be addressed which would require additional joists or bracing to reduce the overall span. This appears to be an expensive improvement due to the number of members involved. This does not appear to be necessary for the building to be considered useable and structurally sound for a building in its current condition and for its current use.

The calculations and summary of the allowable live loads for this building are shown on the enclosed attachments. Should you have further questions regarding this matter, please feel free to contact our office.

Sincerely,

Warren D. Schwabauer, Jr., P.E.
Principal
Charter Member of NABIE
Kansas P.E. #10709; Missouri P.E. #E-22664
Norton & Schmidt Consulting Engineers
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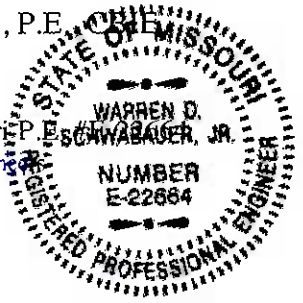

Brandon Schwabauer, MS, PE, SE
Project Engineer
Kansas PE #23833
Norton & Schmidt Consulting Engineers
311 East 11th Avenue
North Kansas City, Missouri 64116

ENCLOSURES: calculations, sketches, billing invoice

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Calculation Summary

Loading – ASCE 7-10

Floor Dead Load:	12 psf
Floor Live Load:	
Partition load	15 psf
Office space w/o partitions	50 psf
reduced	46 psf
Office space with partitions	65 psf
reduced	59 psf
Roof Dead Load	18 psf
Roof Live Load	20 psf

Assumptions:

Weight of paper per cubic foot = 75pcf
Old growth lumber – high bending design values.
Douglas Fir #1 and Douglas Fir Select Structural

Capacities:

Roof

Code Loading (D+Lr) 38 psf

	Span	Capacity	Applied	
Beams - 8x12	16'-0"	43 psf	38 psf	Ok
Joists - 2x8's at 16"oc	15'-6"	38 psf	38 psf	Ok
Decking - 2x decking	2'-0"	> 150 psf	38 psf	Ok
Columns - 8x8	12'-10"	30.5 kips	10.4 kips	Ok

Governing capacity: **20 psf Live Load (Roof Joists)**

4th Floor

Code Loading (D+Lr) 71 psf (LL reduced, with partitions)

	Span	Capacity	Applied	
Beams - 8x12	14'-4"	67 psf	71 psf	NG
Joists - 3x12's at 24"oc	16'-0"	77 psf	71 psf	Ok
Decking - 2x decking	2'-0"	> 150 psf	38 psf	Ok
Columns - 8x8	12'-10"	30.5K	29.7 kips	Ok

Governing capacity: **55 psf Live Load (Floor Beams)**

3rd Floor

Code Loading (D+Lr) 71 psf (LL reduced, with partitions)

	Span	Capacity	Applied	
Beams - 10x14	14'-6"	90 psf	71 psf	Ok
Joists - 3x12's at 24"oc	16'-0"	77 psf	71 psf	Ok
Decking - 2x decking	2'-0"	> 150 psf	38 psf	Ok
Columns - 10x10	12'-10"	55.3 kips	49.0 kips	Ok

Governing capacity: **65 psf Live Load (Floor Joists)**

2nd Floor

Code Loading (D+Lr) 71 psf (LL reduced, with partitions)

	Span	Capacity	Applied	
Beams - 10x14	14'-6"	90 psf	71 psf	Ok
Joists - 3x12's at 24"oc	16'-0"	77 psf	71 psf	Ok
Decking - 2x decking	2'-0"	> 150 psf	38 psf	Ok
Columns - 12x12	12'-10"	82.7 kips	68.4 kips	Ok

Governing capacity: **65 psf Live Load (Floor Joists)**

1st Floor

Code Loading (D+Lr) 71 psf (LL reduced, with partitions)

	Span	Capacity	Applied	
Beams - 12x14	8'-0"	>125 psf	71 psf	Ok
Joists - 3x12's at 24"oc	16'-0"	77 psf	71 psf	Ok
Decking - 2x decking	2'-0"	> 150 psf	38 psf	Ok
Columns - 14x14	12'-10"	120.6 kips	87.7 kips	Ok

Governing capacity: **65 psf Live Load (Floor Joists)**

Footings

We were not able to verify size. Therefore, we can not make a determination on the adequacy of the footings.

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Project Goodwill Building
Job No. 2014-1969
Calculated by _____ Date _____
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Floor Live Load

L_o = 50 psf (offices)
15 psf (partitions)
} L_o = 65 psf (offices w/ partitions)

$$L = L_o\left(0.25 + \frac{15}{\sqrt{K_{LL}A_T}}\right) \quad \text{(Eq 4-1)}$$

$$L = 65\,psf\left(0.25 + \frac{15}{\sqrt{(2)(16\times16)}}\right) = 59\,psf \quad \text{(offices w/ partitions @ interior beams)}$$

$$L = 50\,psf\left(0.25 + \frac{15}{\sqrt{(2)(16\times16)}}\right) = 46\,psf \quad \text{(office space w/o partitions @ interior beams)}$$

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Floor Dead Load

	Load (psf)
3/4" Hardwood Flooring	2.5 psf
2x Sub Floor Decking	5.0 psf
Joists (3x12 @ 24"oc)	3psf
Miscellaneous Allowance	1.5 psf
	12 psf

Roof Dead Load

Bituminous, gravel covered membraine	5.5 psf
2x Sub Floor Decking	5.0 psf
Joists (2x8 @ 16"oc)	6.0 psf
Miscellaneous Allowance	1.5 psf
	18 psf

Column Capacities					
Member Properties	Size	8x8	10x10	12x12	14x14
	b=	7.5 in	9.5 in	11.5 in	13.5 in
	d=	7.5 in	9.5 in	11.5 in	13.5 in
	le=	154.0 in	154.0 in	154.0 in	154.0 in
Adjustment Factors	Fc	700 psi	700 psi	700 psi	700 psi
	Cd	1.00	1.00	1.00	1.00
	Cm	1.00	1.00	1.00	1.00
	Ct	1.00	1.00	1.00	1.00
	Ci	1.00	1.00	1.00	1.00
	CF=	1.00	1.00	1.00	1.00
	Fc*=	700 psi	700 psi	700 psi	700 psi
Column Stability Factor	E'min=	470,000 psi	470,000 psi	470,000 psi	470,000 psi
	FcE=	916 psi	1,470 psi	2,154 psi	2,969 psi
	c=	0.80	0.80	0.80	0.80
	Cp=	0.78	0.88	0.92	0.95
	Fc'=	543 psi	613 psi	645 psi	662 psi
Capacity	Fcallow=	30,517 lb	55,279 lb	85,288 lb	120,650 lb

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Compression Perpendicular to Grain

$F_{c\perp}' = F_{c\perp} C_D C_M C_t' C_i' C_b$

$F_{c\perp} = 625$ psi

$C_D = 1.0$

$C_b = 1.0$

$F_{c\perp}' = 625$ psi

$P_{allow} = F_{c\perp}' A = F_{c\perp}' bd$

	8x8	10x10	12x12	14x14
P_{allow}	35.2^k	56.4^k	82.7^k	113.9^k

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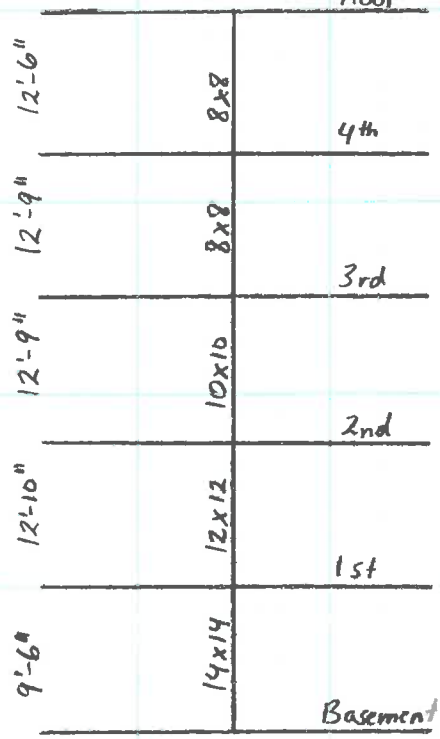
Column Check – 17'x17' Trib Area



	Applied	Allowable
Roof		
4th	$P = 11.6^k$	$P_{allow} = 30.5^k$
3rd	$P = 30.3^k$	$P_{allow} = 30.5^k$
2nd	$P = 49.1^k$	$P_{allow} = 55.3^k$
1st	$P = 67.9^k$	$P_{allow} = 85.3^k$ $= 82.7^k$ (crushing governs)
Basement	$P = 86.7^k$	$P_{allow} = 120.6^k$

Norton & Schmidt	Project	Goodwill Building	Wood Beam Design		
	Location	Kansas City, MO	Made by	Date	Job No
	Client	Goodwill	BSS		2014-1969
	Description	Roof Joists	Checked	Revision	Page No

Analysis

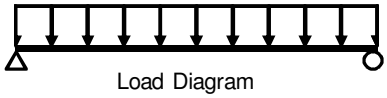
Simply supported beam

Span (ft)	15.50
Lu (ft)	0.00

LOADING	Type	Load	Position	Length
		lb or plf	ft	ft
UDL	D	23.94	-	-
UDL	L	26.60	-	-
Point load				-
Point load				-
Point load				-
Partial UDL				
Partial UDL				

Design Status		capacity ratio
Shear Stress	**PASS**	0.30
Bending Stress	**PASS**	0.58
Deflection	**PASS**	0.94
(1) 2x8 is adequate.		

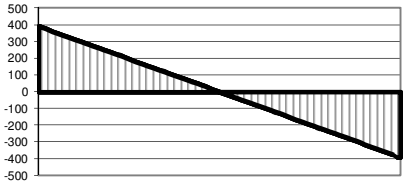
Load Combination: Auto Select



Load Diagram

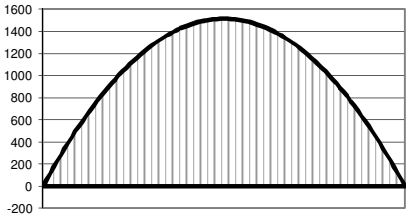
Member		
Number:	1	
Size:	2x8	
Species:	Douglas Fir-Larch	
Grade:	Select Structural	
Density:	30	pcf

(1) 2x8 Properties		
Classification=	Dimension Lumber	
W=	2.27	plf
b=	1.50	in
d=	7.25	in^2
A=	10.88	in^4
Ix=	47.63	in^4
Iy=	2.04	in
Sx=	13.14	in^3
Fb=	1500	psi
Ft=	1000	psi
Fv=	180	psi
Fc,p=	625	psi
Fc=	1700	psi
E=	1900000	psi
Emin=	690000	psi



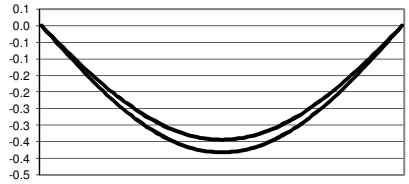
Shear Force Diagram

Adjustment Factors		
C_D=	1.00	1.15
C_M=	Dry	
C_t=	1.00	
C_L=	1.00	
C_V=	1.00	
C_F=	1.00	1.2
C_{fu}=	1.00	
C_C=	1.00	
C_i=	1.00	
C_r=	1.00	1.15



Bending Moment Diagram

Wet Service Factor, C_M						
Fb	Ft	Fv	Fc,p	Fc	E	Emin
1.00	1.00	1.00	1.00	1.00	1.00	1.00



Deflection Diagram

Adjustment ASD Values		
F'b=	2381	psi
F'v=	180	psi
E'=	1900000	psi

RESULTS					
M max	V max	fb	fv	Max. deflection (in)	
				Imposed only	Dead load
lb-ft	lbs	psi	psi	in	in
1517.8	391.70	1386.10	54.03	0.382	0.344

Deflection Limits		Allowable in	Actual in	Design Status	Creep Factor	
span/deflection ratios					1.5	1
Imposed Loads	360	0.517	0.382	**PASS**		
Dead Loads			0.344			
Total Loads	240	0.775	0.726	**PASS**		

Norton & Schmidt	Project	Goodwill Building	Wood Beam Design		
	Location	Kansas City, MO	Made by	Date	Job No
	Client	Goodwill	BSS		2014-1969
	Description	Roof Beams	Checked	Revision	Page No

Analysis

Span (ft)	16.00
Lu (ft)	0.00

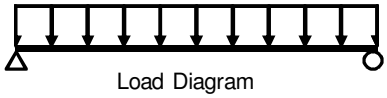
	DL (psf)	LL (psf)
Loads	18.00	25.00
Trib. Width	15.50 ft	

Simply supported beam

Design Status		capacity ratio
Shear Stress	**PASS**	0.55
Bending Stress	**PASS**	1.00
Deflection	**PASS**	0.98
(1) 8x12 is adequate.		

Load Combination: Auto Select

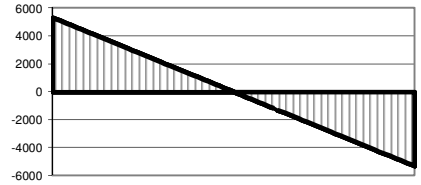
LOADING	Type	Load	Position	Length
		lb or plf	ft	ft
UDL	D	279.00	-	-
UDL	L	387.50	-	-
Point load				-
Point load				-
Point load				-
Partial UDL				
Partial UDL				



Load Diagram

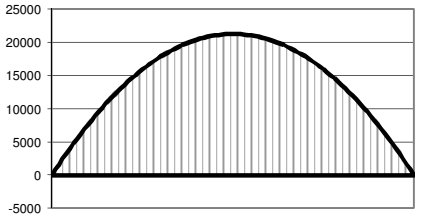
Member	
Number:	1
Size:	8x12
Species:	Douglas Fir-Larch
Grade:	No.1
Density:	30 pcf

(1) 8x12 Properties		
Classification=	Beams and Stringers	
W=	17.97	plf
b=	7.50	in
d=	11.50	in^2
A=	86.25	in^4
Ix=	950.55	in^4
Iy=	404.30	in
Sx=	165.31	in^3
Fb=	1350	psi
Ft=	675	psi
Fv=	170	psi
Fc,p=	625	psi
Fc=	925	psi
E=	1600000	psi
Emin=	580000	psi



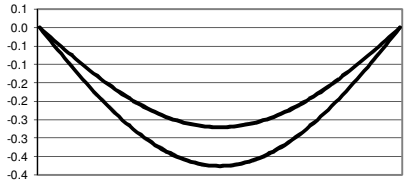
Shear Force Diagram

Adjustment Factors		
C_D=	1.00	1.15
C_M=	Dry	
C_t=	1.00	
C_L=	1.00	
C_V=	0.99	1
C_F=	1.00	
C_{fu}=	1.00	
C_C=	1.00	
C_i=	1.00	
C_r=	1.00	



Bending Moment Diagram

Wet Service Factor, C_M						
Fb	Ft	Fv	Fc,p	Fc	E	Emin
1.00	1.00	1.00	1.00	1.00	1.00	1.00



Deflection Diagram

Adjustment ASD Values		
F'b=	1553	psi
F'v=	170	psi
E'=	1600000	psi

RESULTS					
M max	V max	fb	fv	Max. deflection (in)	
				Imposed only	Dead load
lb-ft	lbs	psi	psi	in	in
21328.6	5332.14	1548.24	92.73	0.376	0.271

Deflection Limits		Allowable in	Actual in	Design Status	Creep Factor	
span/deflection ratios					1.5	1.5
Imposed Loads	360	0.533	0.376	**PASS**		
Dead Loads			0.271			
Total Loads	240	0.800	0.782	**PASS**		

Norton & Schmidt	Project	Goodwill Building	Wood Beam Design		
	Location	Kansas City, MO	Made by	Date	Job No
	Client	Goodwill	BSS		2014-1969
	Description	Floor Joists	Checked	Revision	Page No

Analysis

Span (ft)	16.00
Lu (ft)	0.00

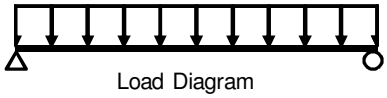
	DL (psf)	LL (psf)
Loads	12.00	65.00
Trib. Width	2.00 ft	

Simply supported beam

Design Status		capacity ratio
Shear Stress	**PASS**	0.37
Bending Stress	**PASS**	0.98
Deflection	**PASS**	0.71
(1) 3x12 is adequate.		

Load Combination: Auto Select

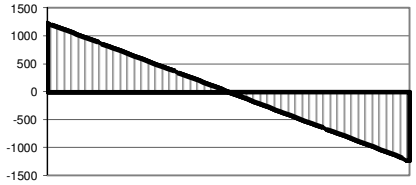
LOADING	Type	Load	Position	Length
		lb or plf	ft	ft
UDL	D	24.00	-	-
UDL	L	130.00	-	-
Point load				-
Point load				-
Point load				-
Partial UDL				
Partial UDL				



Load Diagram

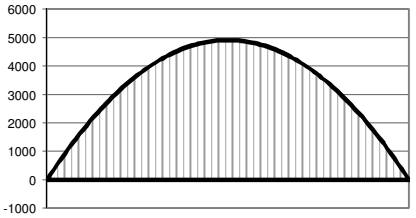
Member	
Number:	1
Size:	3x12
Species:	Douglas Fir-Larch
Grade:	No.1
Density:	30 pcf

(1) 3x12 Properties		
Classification=	Dimension Lumber	
W=	5.86	plf
b=	2.50	in
d=	11.25	in^2
A=	28.13	in^4
Ix=	296.63	in^4
Iy=	14.65	in
Sx=	52.73	in^3
Fb=	1000	psi
Ft=	675	psi
Fv=	180	psi
Fc,p=	625	psi
Fc=	1500	psi
E=	1700000	psi
Emin=	620000	psi



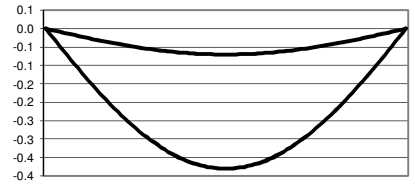
Shear Force Diagram

Adjustment Factors		
C_D=	1.00	
C_M=	Dry	
C_t=	1.00	
C_L=	1.00	
C_V=	1.00	
C_F=	1.00	
C_{fu}=	1.00	
C_C=	1.00	
C_i=	1.00	
C_r=	1.00	1.15



Bending Moment Diagram

Wet Service Factor, C_M						
Fb	Ft	Fv	Fc,p	Fc	E	Emin
1.00	1.00	1.00	1.00	1.00	1.00	1.00



Deflection Diagram

Adjustment ASD Values		
F'b=	1150	psi
F'v=	180	psi
E'=	1700000	psi

RESULTS					
M max	V max	fb	fv	Max. deflection (in)	
				Imposed only	Dead load
lb-ft	lbs	psi	psi	in	in
4928.2	1232.05	1121.44	65.71	0.380	0.070

Deflection Limits		Allowable in	Actual in	Design Status	Creep Factor	
span/deflection ratios					1.5	1.5
Imposed Loads	360	0.533	0.380	**PASS**		
Dead Loads			0.070			
Total Loads	240	0.800	0.486	**PASS**		

Norton & Schmidt	Project	Goodwill Building	Wood Beam Design		
	Location	Kansas City, MO	Made by	Date	Job No
	Client	Goodwill	BSS		2014-1969
	Description	Floor Beams - 8x12	Checked	Revision	Page No

Analysis

Span (ft)	14.15
Lu (ft)	0.00

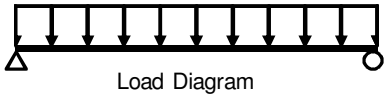
	DL (psf)	LL (psf)
Loads	12.00	55.00
Trib. Width	15.35 ft	

Simply supported beam

Design Status		capacity ratio
Shear Stress	**PASS**	0.74
Bending Stress	**PASS**	0.98
Deflection	**PASS**	1.00
(1) 8x12 is adequate.		

Load Combination: Auto Select

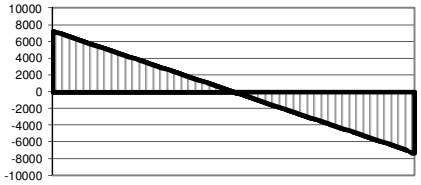
LOADING	Type	Load	Position	Length
		lb or plf	ft	ft
UDL	D	184.20	-	-
UDL	L	844.25	-	-
Point load				-
Point load				-
Point load				-
Partial UDL				
Partial UDL				



Load Diagram

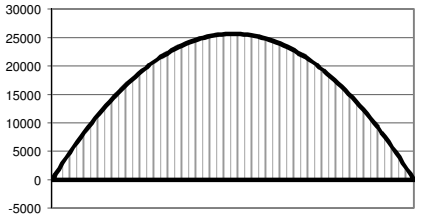
Member	
Number:	1
Size:	8x12
Species:	Douglas Fir-Larch
Grade:	Dense Select Structural
Density:	30 pcf

(1) 8x12 Properties		
Classification=	Beams and Stringers	
W=	17.97	plf
b=	7.50	in
d=	11.50	in
A=	86.25	in^2
Ix=	950.55	in^4
Iy=	404.30	in^4
Sx=	165.31	in^3
Fb=	1900	psi
Ft=	1100	psi
Fv=	170	psi
Fc,p=	730	psi
Fc=	1300	psi
E=	1700000	psi
Emin=	620000	psi



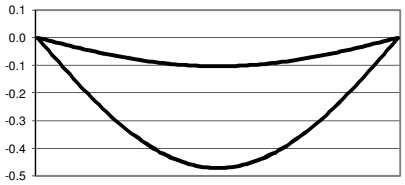
Shear Force Diagram

Adjustment Factors		
C_D=	1.00	
C_M=	Dry	
C_t=	1.00	
C_L=	1.00	
C_V=	1.00	1
C_F=	1.00	
C_{fu}=	1.00	
C_C=	1.00	
C_i=	1.00	
C_r=	1.00	



Bending Moment Diagram

Wet Service Factor, C_M						
Fb	Ft	Fv	Fc,p	Fc	E	Emin
1.00	1.00	1.00	1.00	1.00	1.00	1.00



Deflection Diagram

Adjustment ASD Values		
F'b=	1900	psi
F'v=	170	psi
E'=	1700000	psi

RESULTS					
M max	V max	fb	fv	Max. deflection (in)	
				Imposed only	Dead load
lb-ft	lbs	psi	psi	in	in
25740.3	7276.41	1868.48	126.55	0.471	0.103

Deflection Limits		Allowable in	Actual in	Design Status	Creep Factor	
span/deflection ratios					1.5	1.5
Imposed Loads	360	0.472	0.471	**PASS**		
Dead Loads			0.103			
Total Loads	240	0.708	0.626	**PASS**		

Norton & Schmidt	Project	Goodwill Building	Wood Beam Design		
	Location	Kansas City, MO	Made by	Date	Job No
	Client	Goodwill	BSS		2014-1969
	Description	Floor Beams - 10x14	Checked	Revision	Page No

Analysis

Span (ft)	14.50
Lu (ft)	0.00

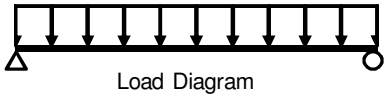
	DL (psf)	LL (psf)
Loads	15.00	75.00
Trib. Width	15.50 ft	

Simply supported beam

Design Status		capacity ratio
Shear Stress	**PASS**	0.70
Bending Stress	**PASS**	0.97
Deflection	**PASS**	0.77
(1) 10x14 is adequate.		

Load Combination: Auto Select

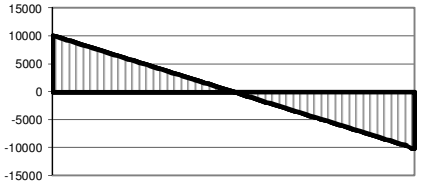
LOADING	Type	Load	Position	Length
		lb or plf	ft	ft
UDL	D	232.50	-	-
UDL	L	1162.50	-	-
Point load				-
Point load				-
Point load				-
Partial UDL				
Partial UDL				



Load Diagram

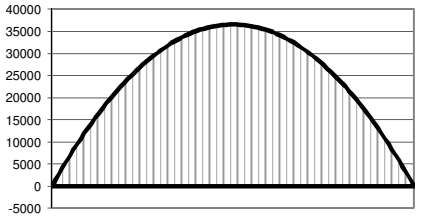
Member	
Number:	1
Size:	10x14
Species:	Douglas Fir-Larch
Grade:	Select Structural
Density:	30 pcf

(1) 10x14 Properties		
Classification=	Beams and Stringers	
W=	26.72	plf
b=	9.50	in
d=	13.50	in
A=	128.25	in^2
Ix=	1947.80	in^4
Iy=	964.55	in^4
Sx=	288.56	in^3
Fb=	1600	psi
Ft=	950	psi
Fv=	170	psi
Fc,p=	625	psi
Fc=	1100	psi
E=	1600000	psi
Emin=	580000	psi



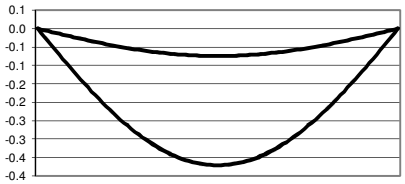
Shear Force Diagram

Adjustment Factors		
C_D=	1.00	
C_M=	Dry	
C_t=	1.00	
C_L=	1.00	
C_V=	0.96	1.00
C_F=	1.00	0.99
C_{fu}=	1.00	
C_C=	1.00	
C_i=	1.00	
C_r=	1.00	



Bending Moment Diagram

Wet Service Factor, C_M						
Fb	Ft	Fv	Fc,p	Fc	E	Emin
1.00	1.00	1.00	1.00	1.00	1.00	1.00



Deflection Diagram

Adjustment ASD Values		
F'b=	1579	psi
F'v=	170	psi
E'=	1600000	psi

RESULTS					
M max	V max	fb	fv	Max. deflection (in)	
				Imposed only	Dead load
lb-ft	lbs	psi	psi	in	in
36663.0	10113.94	1524.65	118.29	0.371	0.074

Deflection Limits		Allowable in	Actual in	Design Status	Creep Factor	
span/deflection ratios					1.5	1.5
Imposed Loads	360	0.483	0.371	**PASS**		
Dead Loads			0.074			
Total Loads	240	0.725	0.482	**PASS**		

Norton & Schmidt	Project	Goodwill Building	Wood Beam Design		
	Location	Kansas City, MO	Made by	Date	Job No
	Client	Goodwill	BSS		2014-1969
	Description	Floor Beams - 12x14	Checked	Revision	Page No

Analysis

Span (ft)	8.00
Lu (ft)	0.00

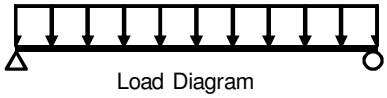
	DL (psf)	LL (psf)	
Loads	12.00	125.00	
Trib. Width	15.50		ft

Simply supported beam

Design Status		capacity ratio
Shear Stress	**PASS**	0.48
Bending Stress	**PASS**	0.49
Deflection	**PASS**	0.18
(1) 12x14 is adequate.		

Load Combination: Auto Select

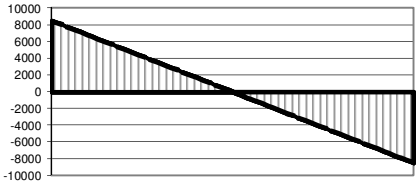
LOADING	Type	Load	Position	Length
		lb or plf	ft	ft
UDL	D	186.00	-	-
UDL	L	1937.50	-	-
Point load				-
Point load				-
Point load				-
Partial UDL				
Partial UDL				



Load Diagram

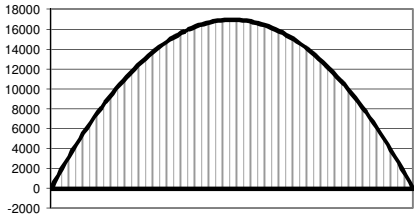
Member	
Number:	1
Size:	12x14
Species:	Douglas Fir-Larch
Grade:	No.1
Density:	30 pcf

(1) 12x14 Properties		
Classification=	Posts and Timbers	
W=	32.34	plf
b=	11.50	in
d=	13.50	in^2
A=	155.25	in^4
Ix=	2357.86	in^4
Iy=	1710.98	in
Sx=	349.31	in^3
Fb=	1200	psi
Ft=	825	psi
Fv=	170	psi
Fc,p=	625	psi
Fc=	1000	psi
E=	1600000	psi
Emin=	580000	psi



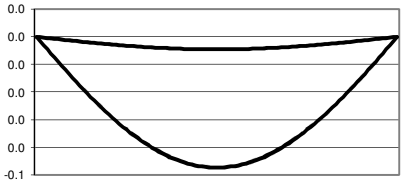
Shear Force Diagram

Adjustment Factors		
C_D=	1.00	
C_M=	Dry	
C_t=	1.00	
C_L=	1.00	
C_V=	1.00	1.00
C_F=	1.00	0.99
C_{fu}=	1.00	
C_C=	1.00	
C_i=	1.00	
C_r=	1.00	



Bending Moment Diagram

Wet Service Factor, C_M						
Fb	Ft	Fv	Fc,p	Fc	E	Emin
1.00	1.00	1.00	1.00	1.00	1.00	1.00



Deflection Diagram

Adjustment ASD Values		
F'b=	1184	psi
F'v=	170	psi
E'=	1600000	psi

RESULTS					
M max	V max	fb	fv	Max. deflection (in)	
				Imposed only	Dead load
lb-ft	lbs	psi	psi	in	in
16988.3	8494.13	583.60	82.07	0.047	0.005

Deflection Limits		Allowable in	Actual in	Design Status	Creep Factor	
span/deflection ratios					1.5	1.5
Imposed Loads	360	0.267	0.047	**PASS**		
Dead Loads			0.005			
Total Loads	240	0.400	0.054	**PASS**		

Norton & Schmidt	Project	Goodwill Building	Wood Beam Design		
	Location	Kansas City, MO	Made by	Date	Job No
	Client	Goodwill	BSS		2014-1969
	Description	Floor Decking	Checked	Revision	Page No

Analysis

Span (ft)	2.00
Lu (ft)	0.00

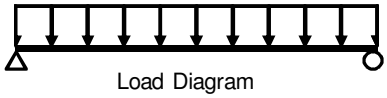
	DL (psf)	LL (psf)
Loads	20.00	125.00
Trib. Width	0.60 ft	

Simply supported beam

Design Status		capacity ratio
Shear Stress	**PASS**	0.07
Bending Stress	**PASS**	0.10
Deflection	**PASS**	0.13
(1) 8x2 is adequate.		

Load Combination: Auto Select

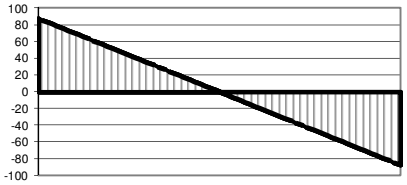
LOADING	Type	Load	Position	Length
		lb or plf	ft	ft
UDL	D	12.08	-	-
UDL	L	75.52	-	-
Point load				-
Point load				-
Point load				-
Partial UDL				
Partial UDL				



Load Diagram

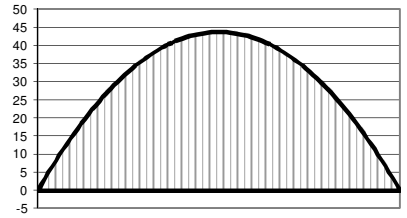
Member	
Number:	1
Size:	8x2
Species:	Douglas Fir-Larch
Grade:	No.1
Density:	30 pcf

(1) 8x2 Properties		
Classification=	Posts and Timbers	
W=	2.27	plf
b=	7.25	in
d=	1.50	in^2
A=	10.88	in^4
Ix=	2.04	in^4
Iy=	47.63	in
Sx=	2.72	in^3
Fb=	1200	psi
Ft=	825	psi
Fv=	170	psi
Fc,p=	625	psi
Fc=	1000	psi
E=	1600000	psi
Emin=	580000	psi



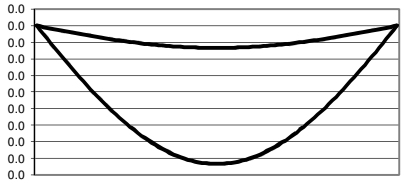
Shear Force Diagram

Adjustment Factors		
C_D=	1.00	
C_M=	Dry	
C_t=	1.00	
C_L=	1.00	
C_V=	1.00	1.00
C_F=	1.00	1.20
C_{fu}=	1.00	1.15
C_C=	1.00	
C_i=	1.00	
C_r=	1.00	1.15



Bending Moment Diagram

Wet Service Factor, C_M						
Fb	Ft	Fv	Fc,p	Fc	E	Emin
1.00	1.00	1.00	1.00	1.00	1.00	1.00



Deflection Diagram

Adjustment ASD Values		
F'b=	1904	psi
F'v=	170	psi
E'=	1600000	psi

RESULTS					
M max	V max	fb	fv	Max. deflection (in)	
				Imposed only	Dead load
lb-ft	lbs	psi	psi	in	in
43.8	87.61	193.34	12.08	0.008	0.001

Deflection Limits		Allowable in	Actual in	Design Status	Creep Factor	
span/deflection ratios					1.5	1.5
Imposed Loads	360	0.067	0.008	**PASS**		
Dead Loads			0.001			
Total Loads	240	0.100	0.010	**PASS**		

Norton & Schmidt	Project	Goodwill Building	Wood Beam Design		
	Location	Kansas City, MO	Made by	Date	Job No
	Client	Goodwill	BSS		2014-1969
	Description	Framing Around Elevator	Checked	Revision	Page No

Analysis

Span (ft)	15.50
Lu (ft)	0.00

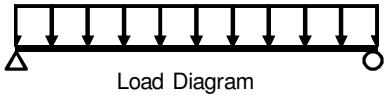
	DL (psf)	LL (psf)
Loads	12.00	59.00
Trib. Width	8.00 ft	

Simply supported beam

Design Status		capacity ratio
Shear Stress	**PASS**	0.43
Bending Stress	**PASS**	0.86
Deflection	**PASS**	0.70
(3) 3x12 is adequate.		

Load Combination: Auto Select

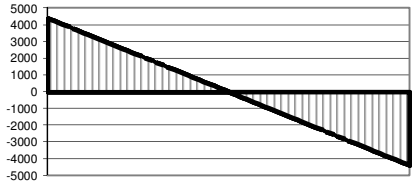
LOADING	Type	Load	Position	Length
		lb or plf	ft	ft
UDL	D	96.00	-	-
UDL	L	472.00	-	-
Point load				-
Point load				-
Point load				-
Partial UDL				
Partial UDL				



Load Diagram

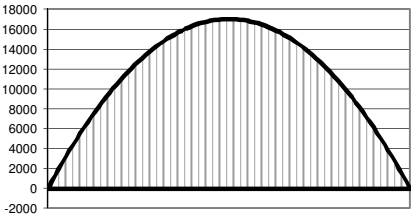
Member	
Number:	3
Size:	3x12
Species:	Douglas Fir-Larch
Grade:	Select Structural
Density:	30 pcf

(3) 3x12 Properties		
Classification=	Dimension Lumber	
W=	52.73	plf
b=	7.50	in
d=	11.25	in
A=	84.38	in^2
Ix=	889.89	in^4
Iy=	43.95	in^4
Sx=	158.20	in
Fb=	1500	in^3
Ft=	1000	psi
Fv=	180	psi
Fc,p=	625	psi
Fc=	1700	psi
E=	1900000	psi
Emin=	690000	psi



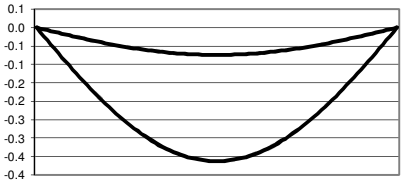
Shear Force Diagram

Adjustment Factors		
C_D=	1.00	
C_M=	Dry	
C_t=	1.00	
C_L=	1.00	
C_V=	1.00	1.00
C_F=	1.00	1.01
C_{fu}=	1.00	
C_C=	1.00	
C_i=	1.00	
C_r=	1.00	



Bending Moment Diagram

Wet Service Factor, C_M						
Fb	Ft	Fv	Fc,p	Fc	E	Emin
1.00	1.00	1.00	1.00	1.00	1.00	1.00



Deflection Diagram

Adjustment ASD Values		
F'b=	1511	psi
F'v=	180	psi
E'=	1900000	psi

RESULTS					
M max	V max	fb	fv	Max. deflection (in)	
				Imposed only	Dead load
lb-ft	lbs	psi	psi	in	in
17059.3	4402.41	1293.98	78.27	0.363	0.074

Deflection Limits		Allowable in	Actual in	Design Status	Creep Factor	
span/deflection ratios					1.5	1.5
Imposed Loads	360	0.517	0.363	**PASS**		
Dead Loads			0.074			
Total Loads	240	0.775	0.474	**PASS**		

Norton & Schmidt	Project	Goodwill Building	Wood Beam Design		
	Location	Kansas City, MO	Made by	Date	Job No
	Client	Goodwill	BSS		2014-1969
	Description	Framing Around Elevator	Checked	Revision	Page No

Analysis

Span (ft)	14.50
Lu (ft)	0.00

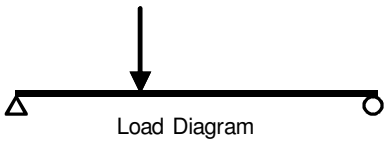
	DL (psf)	LL (psf)
Loads	12.00	59.00
Trib. Width	8.00 ft	

Simply supported beam

Design Status		capacity ratio
Shear Stress	**PASS**	0.28
Bending Stress	**PASS**	0.72
Deflection	**PASS**	0.43
(3) 3x12 is adequate.		

Load Combination: Auto Select

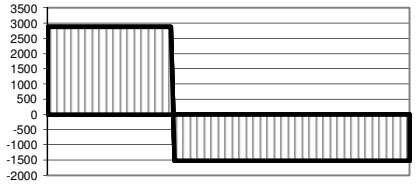
LOADING	Type	Load	Position	Length
		lb or plf	ft	ft
UDL			-	-
UDL			-	-
Point load	D	750.00	5.000	-
Point load	L	3650.00	5.000	-
Point load				-
Partial UDL				
Partial UDL				



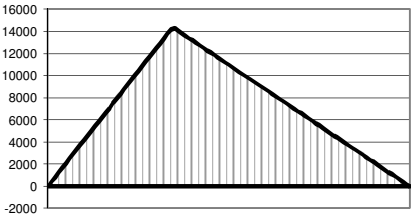
Load Diagram

Member	
Number:	3
Size:	3x12
Species:	Douglas Fir-Larch
Grade:	Select Structural
Density:	30 pcf

(3) 3x12 Properties		
Classification=	Dimension Lumber	
W=	52.73	plf
b=	7.50	in
d=	11.25	in^2
A=	84.38	in^4
Ix=	889.89	in^4
Iy=	43.95	in
Sx=	158.20	in^3
Fb=	1500	psi
Ft=	1000	psi
Fv=	180	psi
Fc,p=	625	psi
Fc=	1700	psi
E=	1900000	psi
Emin=	690000	psi

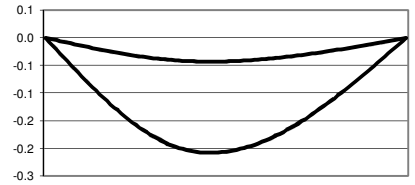


Shear Force Diagram



Bending Moment Diagram

Adjustment Factors		
C_D=	1.00	
C_M=	Dry	
C_t=	1.00	
C_L=	1.00	
C_V=	1.00	1.00
C_F=	1.00	1.01
C_{fu}=	1.00	
C_C=	1.00	
C_i=	1.00	
C_r=	1.00	



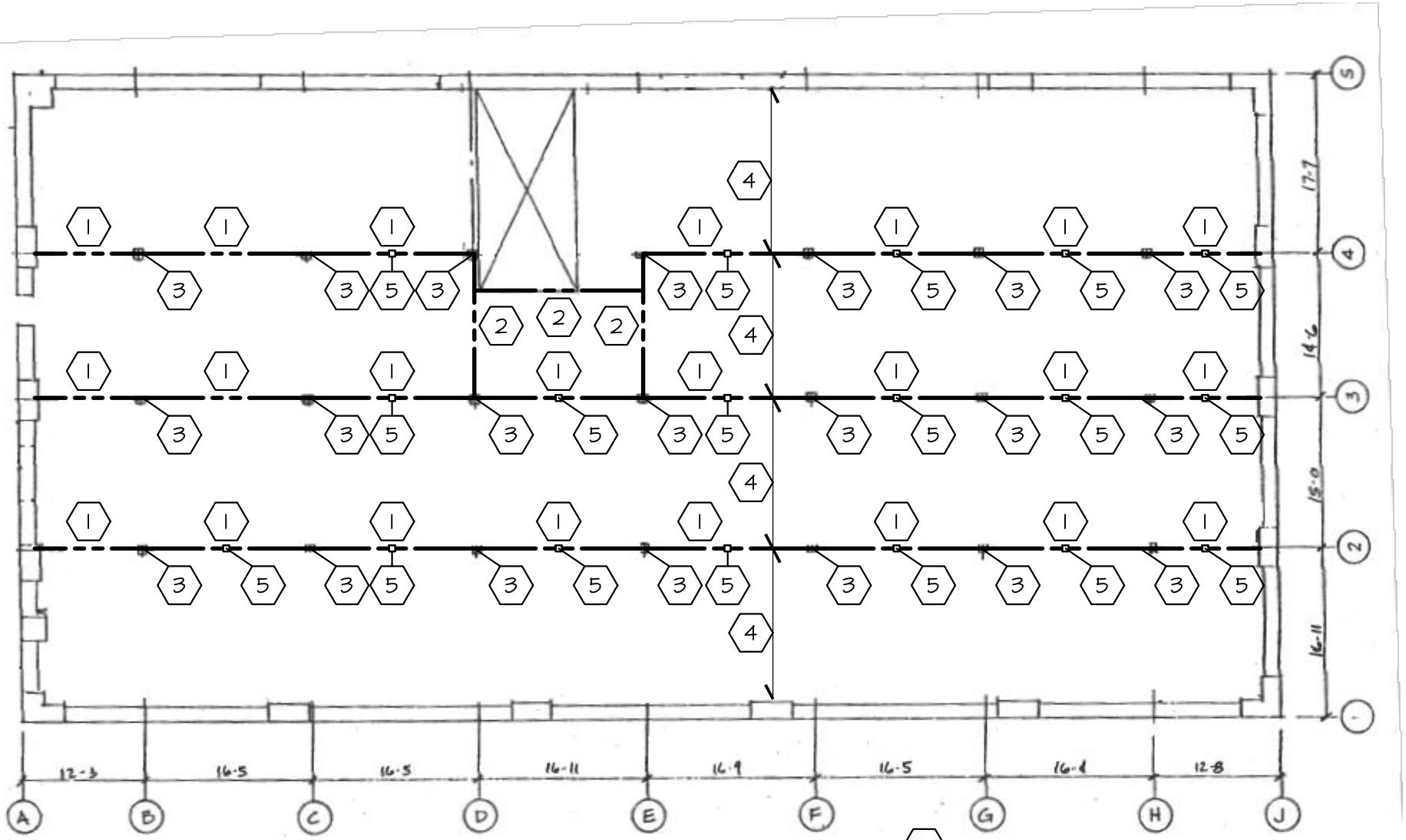
Deflection Diagram

Wet Service Factor, C_M						
Fb	Ft	Fv	Fc,p	Fc	E	Emin
1.00	1.00	1.00	1.00	1.00	1.00	1.00

Adjustment ASD Values		
F'b=	1511	psi
F'v=	180	psi
E'=	1900000	psi

RESULTS					
M max	V max	fb	fv	Max. deflection (in)	
				Imposed only	Dead load
lb-ft	lbs	psi	psi	in	in
14301.3	2883.14	1084.78	51.26	0.208	0.043

Deflection Limits		Allowable in	Actual in	Design Status	Creep Factor	
span/deflection ratios					1.5	1.5
Imposed Loads	360	0.483	0.208	**PASS**		
Dead Loads			0.043			
Total Loads	240	0.725	0.273	**PASS**		



1 12X14 WOOD BEAM

2 (3) 3X12 WOOD BEAM

3 14X14 WOOD COLUMN

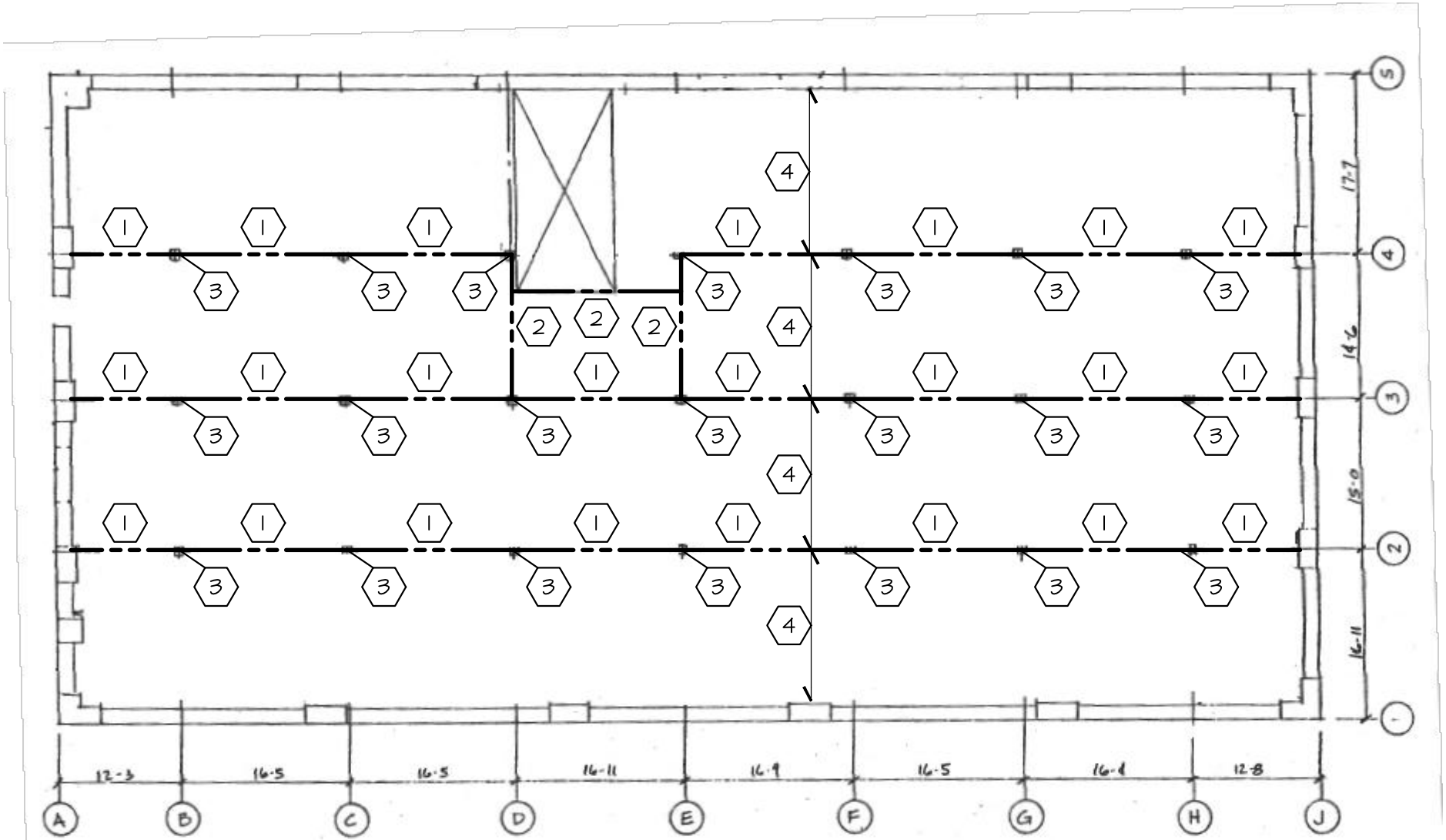
4 3X12 FLOOR JOISTS AT 24"oc

5 8X8 WOOD COLUMN

NORTH

1 1ST FLOOR FRAMING PLAN

SCALE: NTS



1 10X14 WOOD BEAM

2 (3) 3X12 WOOD BEAM

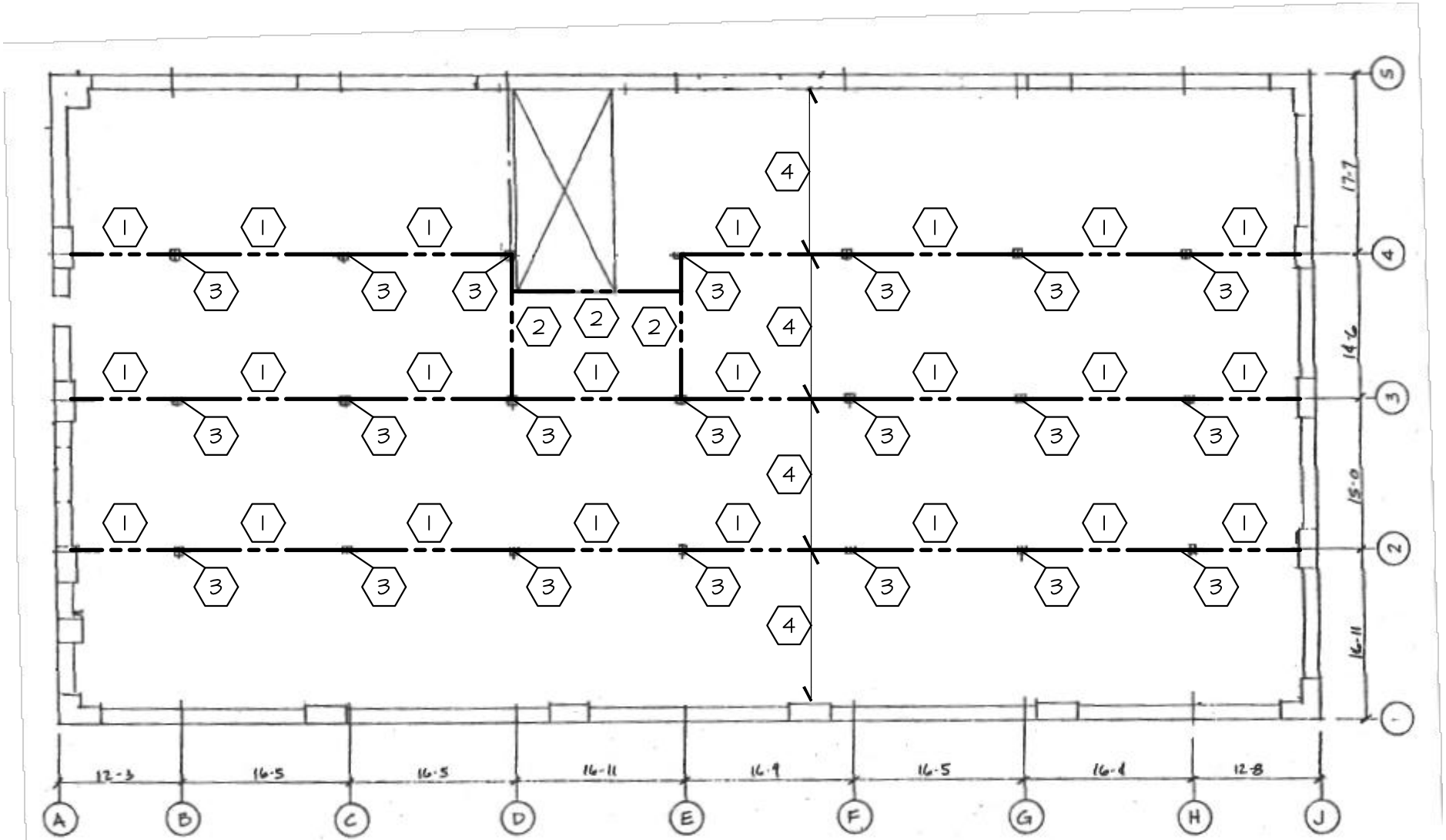
3 12X12 WOOD COLUMN

4 3X12 FLOOR JOISTS AT 24"oc

NORTH

2 2ND FLOOR FRAMING PLAN

SCALE: NTS



1 10X14 WOOD BEAM

2 (3) 3X12 WOOD BEAM

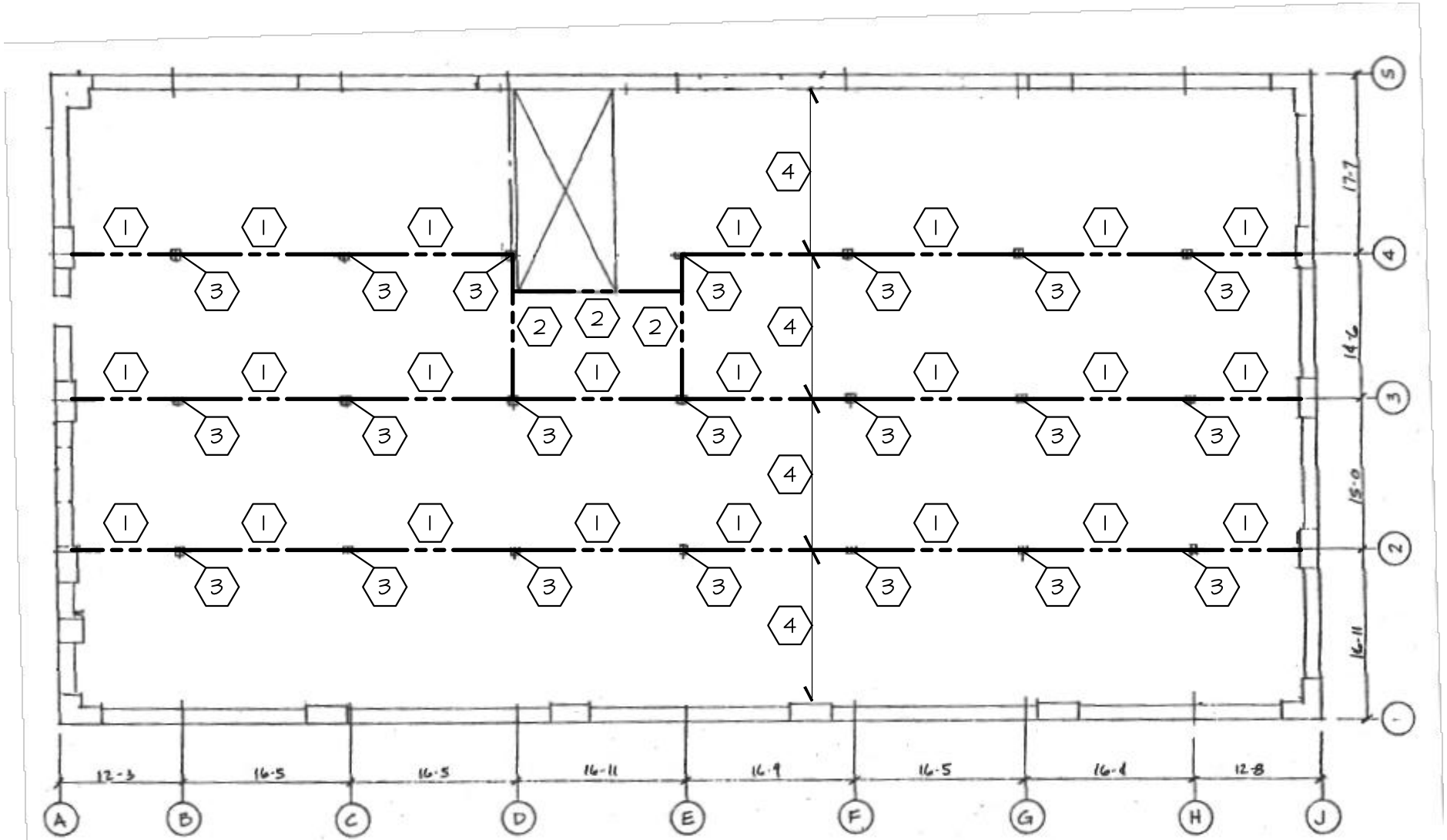
3 10X10 WOOD COLUMN

4 3X12 FLOOR JOISTS AT 24"oc

NORTH

3 3RD FLOOR FRAMING PLAN

SCALE: NTS



1 8X12 WOOD BEAM

2 (3) 3X12 WOOD BEAM

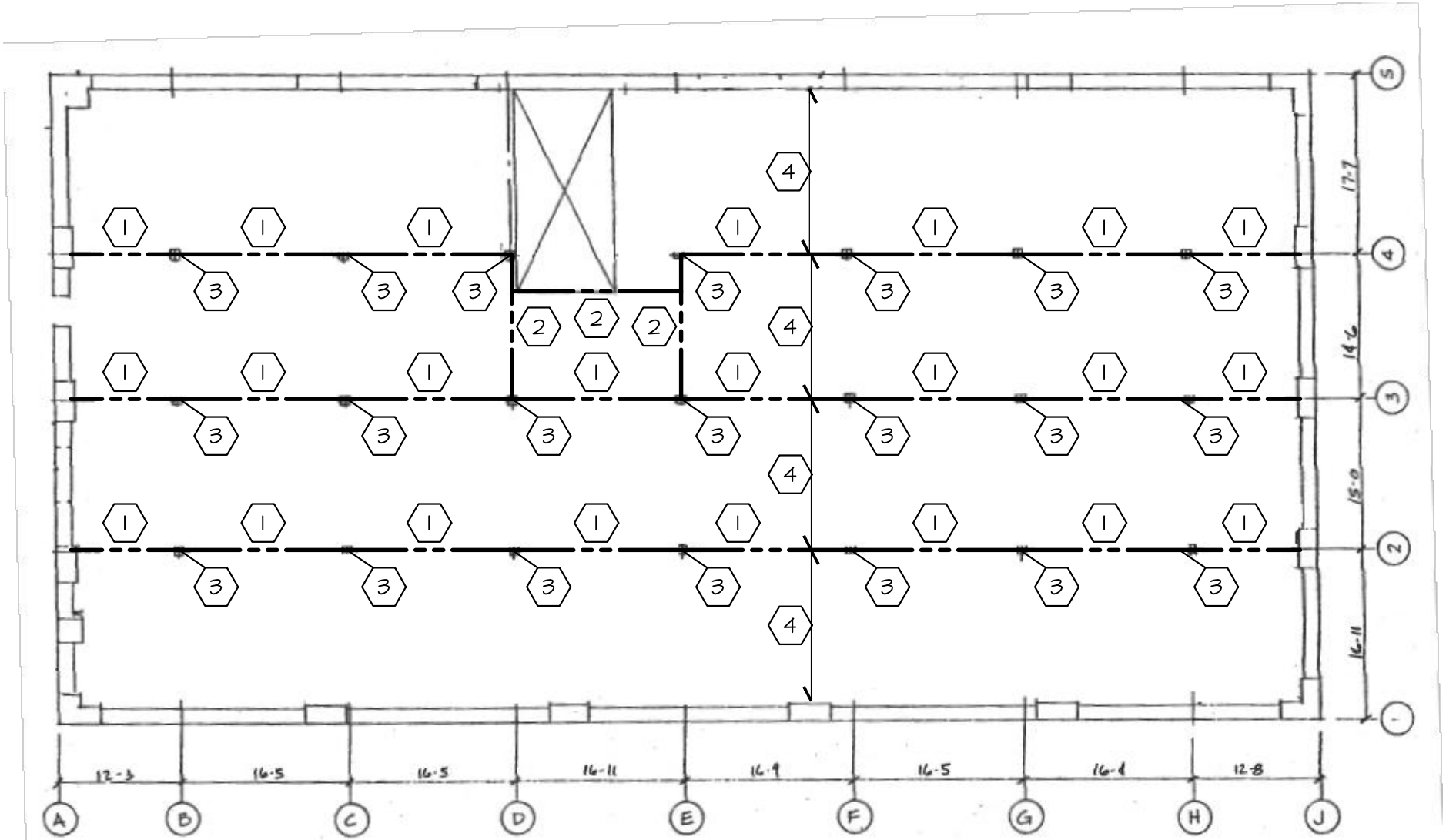
3 8X8 WOOD COLUMN

4 3X12 FLOOR JOISTS AT 24"oc

NORTH

4 4TH FLOOR FRAMING PLAN

SCALE: NTS



1 8X12 WOOD BEAM

2 (3) 3X12 WOOD BEAM

3 8X8 WOOD COLUMN

4 2X8 ROOF JOISTS AT 16"oc

NORTH

5 ROOF FRAMING PLAN

SCALE: NTS

Norton & Schmidt

Consulting Engineers, LLC
Established 1967
Kansas City ● Atlanta

November 24, 2014

BILLING INVOICE

Mr. Jim Unruh
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Ms. Naomi Menefee
Colliers International
e/m: naomi.menefee@colliers.com

RE: THE GOODWILL BUILDING **JOB #2014-1969**
1817 CAMPBELL
KANSAS CITY, MISSOURI

Agreed Fee:	$5,000.00
ACCOUNT BALANCE:	$5,000.00

Please remit on or before December 24, 2014, and refer to the above referenced job number.

Thank you,

Warren D. Schwabauer, Jr., P.E., CBIE
Principal
Charter Member of NABIE
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lw