

# *TGRWA*

## *Structural Engineers*

**407 South Dearborn, Suite 900  
Chicago, Illinois**

# *TGRWA*

*Structural Engineers*

***Structural Materials,  
Components and Systems***

***November 13, 2006***

***Tylk Gustafson Reckers Wilson Andrews, LLC  
Chicago, Illinois***

# Building Materials

- **Structural Steel**

- Rolled Sections
- Open Web Members
- Metal Deck

- **Reinforced Concrete**

- Conventional Cast-In-Place Concrete
- Post-Tensioned Concrete
- Hollow Core Precast Concrete Slabs
- Precast Concrete Wall Panels

- **Masonry**

- Concrete Masonry Units (CMU)
- Clay Masonry (Brick Masonry)
- Glass Block

- **Timber**

- Sawn (Dimensional)
- Glu-Lam
- Engineered Wood Products

- **Light Gauge Framing**

- **Glass**

# Building Materials

The choice of building materials is dependent upon:

- Architectural Aesthetics
- Building Layout / Form
- Building Use
- Building Codes
- Construction Schedule
- Economy
- Material Properties
- Project Scale
- Project Location

## Building Materials and Components

Selected building materials and components must be integrated to form a complete, unified structural system to resist the loads imposed on the structure.

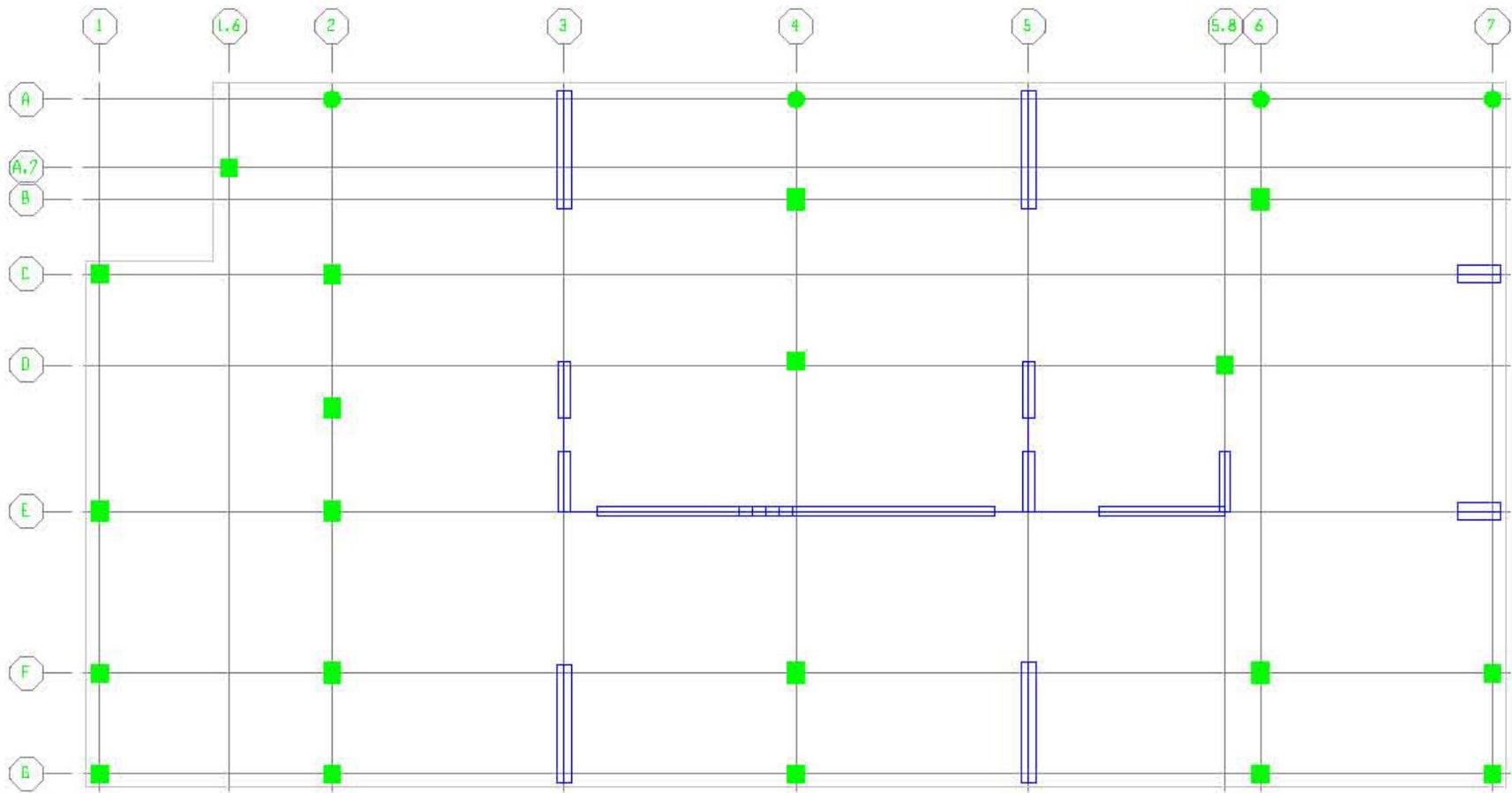


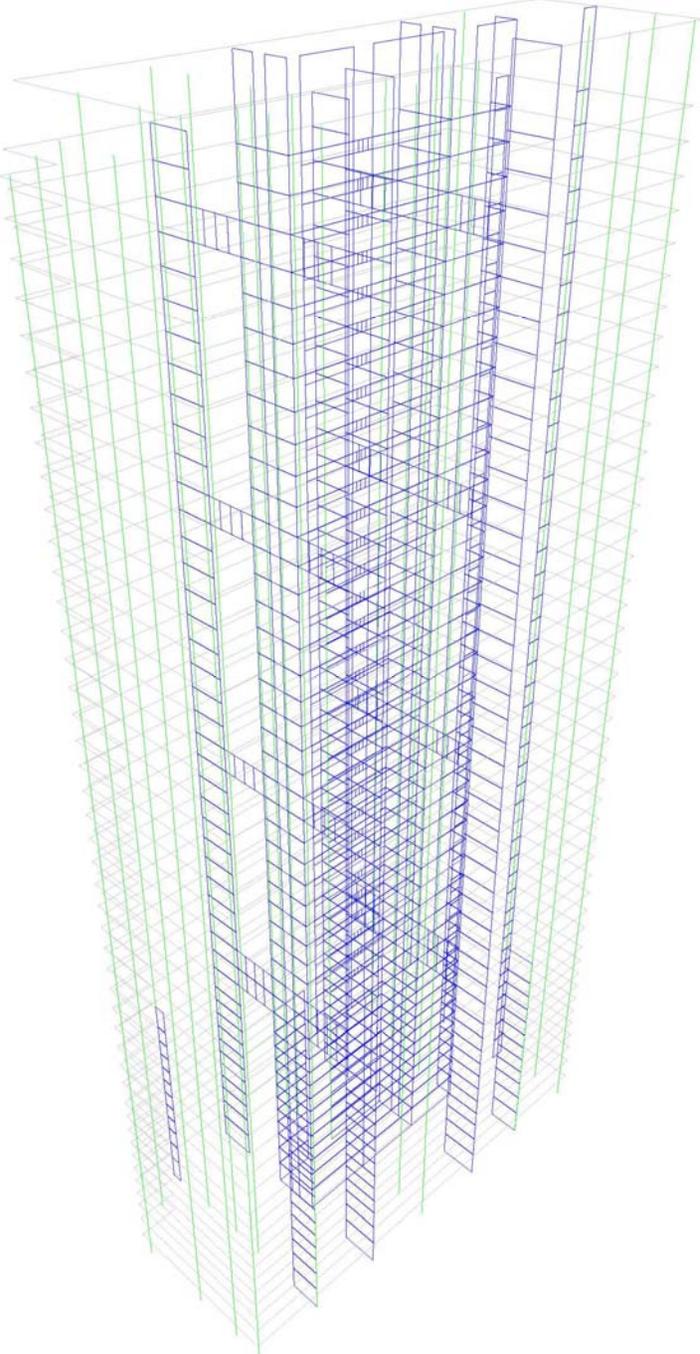
## Examples of Unified Structural Systems With Various Building Materials

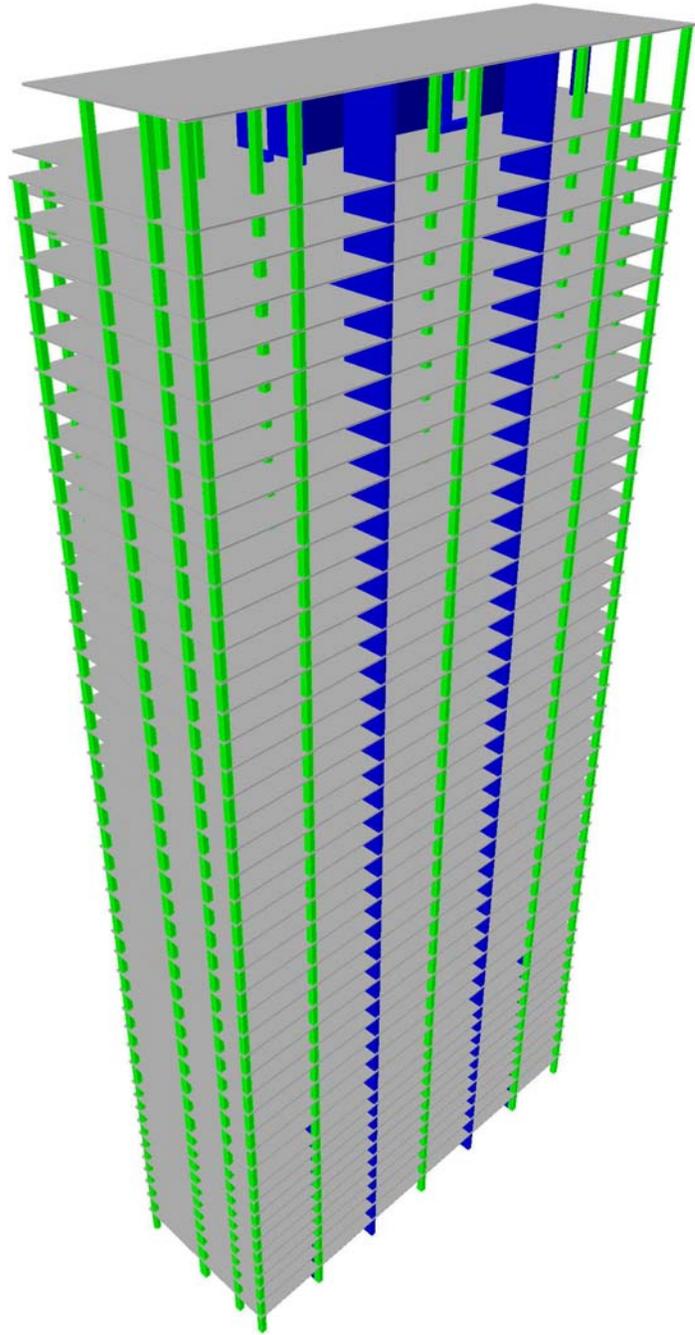
- *Metal Roof Deck supported by Open Web Bar Joists. Structural Steel Girders and Columns support the Open Web Bar Joists. CMU Masonry Infill Walls transfer wind loads.*
- *Precast Concrete Plank Floor supported by Structural Steel Girders with CMU Masonry Shear Walls.*
- *Metal Plate Connected Timber Roof Trusses supported by CMU Masonry Bearing Walls.*
- *Concrete Filled Metal Floor Deck supported on Light Gage Metal Floor Joists. Light Gage Metal Stud Walls support floor framing and also function as Shear Walls.*



PERKINS  
+ WILL







# Structural Steel

## Rolled Sections

Wide Flange Sections

Hollow Structural Sections

Square

Rectangular

Round

Trusses

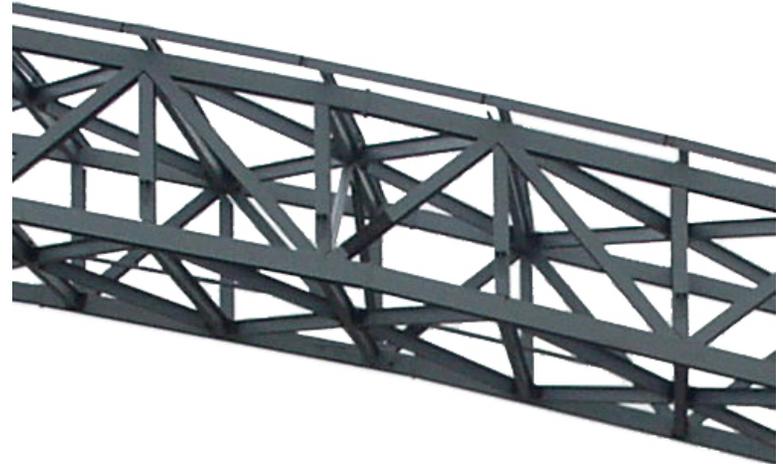
Plate Girders

## Open Web Members

Bar Joists

Long Span Bar Joists

Joist Girders



# Structural Steel

*Bryant School  
Harvey, Illinois*

Primary Structural System

- Structural Steel Framing
- Open Web Bar Joists
- Steel Composite Metal Floor and Roof Deck

Exterior Wall System

- Exterior Clay Masonry with Lightgauge Backup











# Structural Steel

## *Stephens Convention Center Rosemont, Illinois*

### Primary Structural System

- Structural Steel Framing
- Open Web Bar Joists
- Steel Composite Metal Floor and Roof Deck

### Exterior Wall System

- Exterior Precast Concrete Wall Panels













# Structural Steel

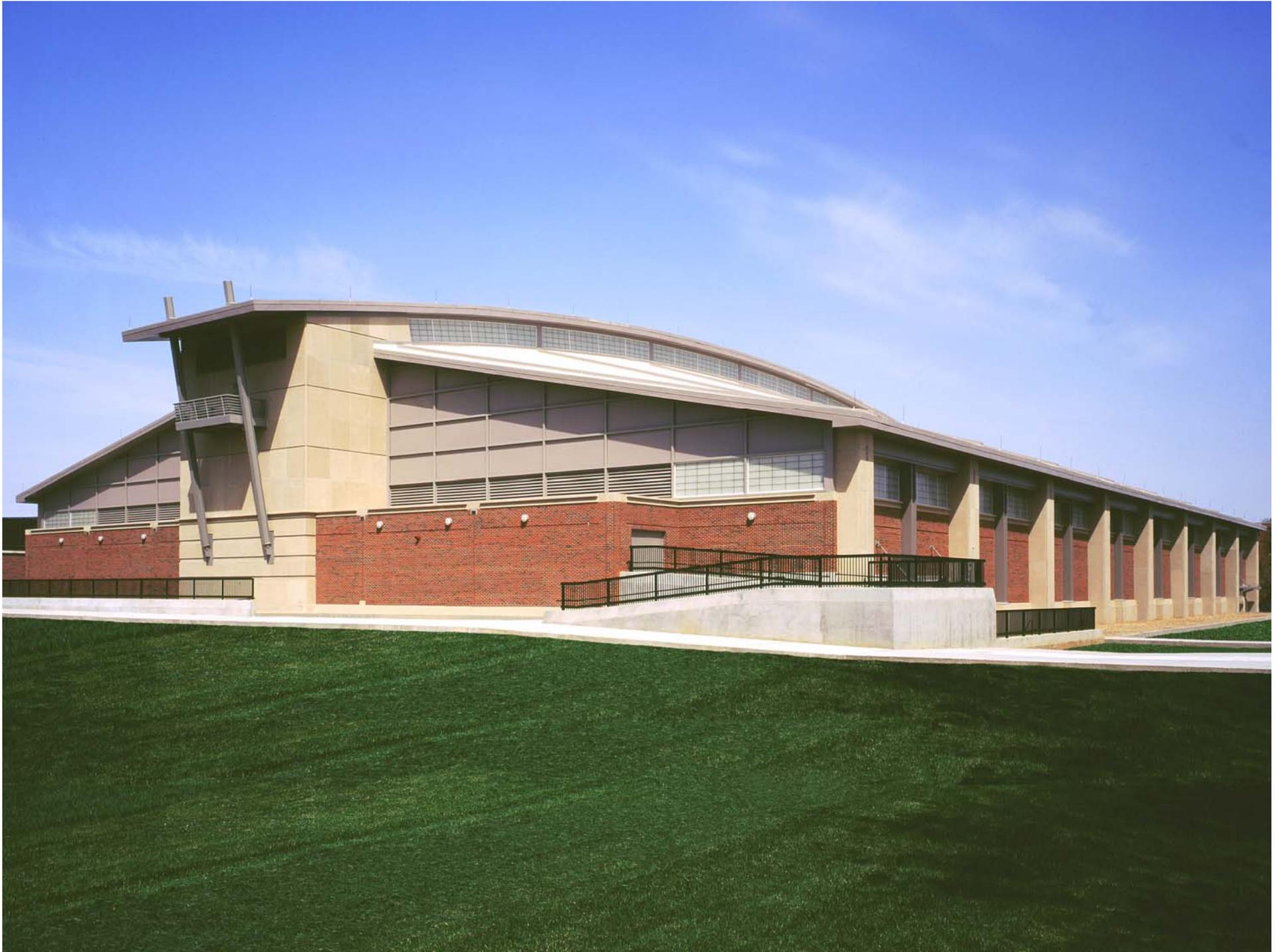
## *Indoor Football Practice Facility Champaign, Illinois*

### Primary Structural System

- Reinforced Concrete Buttresses
- Steel box Truss
- Open Web Bar Joists

### Exterior Wall System

- Exterior Clay Masonry with CMU Backup







# STANDARD LOAD TABLE

## OPEN WEB STEEL JOISTS, K-SERIES

Based on a Maximum Allowable Tensile Stress of 30 ksi

Adopted by the Steel Joist Institute November 4, 1985; Revised to May 2, 1994 - Effective September 1, 1994

The black figures in the following table give the TOTAL safe uniformly distributed load-carrying capacities, in pounds per linear foot, of K-Series Steel Joists. The weight of DEAD loads, including the joists, must be deducted to determine the LIVE load-carrying capacities of the joists. The load table may be used for parallel chord joists installed to a maximum slope of 1/2 inch per foot.

The figures shown in RED in this load table are the LIVE loads per linear foot of joist which will produce an approximate deflection of 1/360 of the span. LIVE loads which will produce a deflection of 1/240 of the span may be obtained by multiplying the figures in RED by 1.5. In no case shall the TOTAL load capacity of the joists be exceeded.

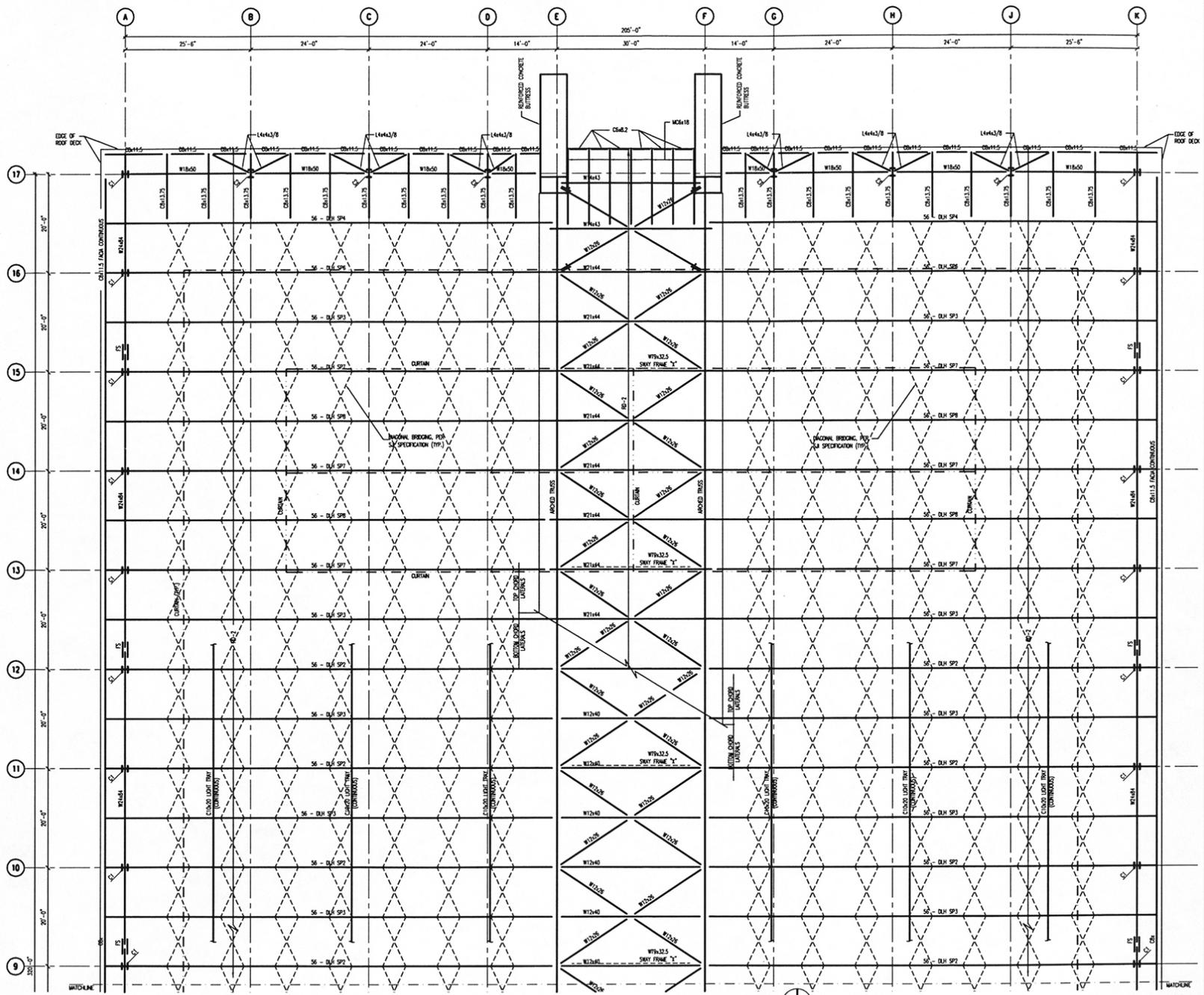
The approximate joist weights per linear foot shown in these tables do not include accessories.

The approximate moment of inertia of the joist, in inches<sup>4</sup> is;  $I_j = 26.767(W_{LL})(L^3)(10^{-6})$ , where  $W_{LL}$  = RED figure in the Load Table and  $L$  = (Span - .33) in feet.

For the proper handling of concentrated and/or varying loads, see Section 5.5 in the Recommended Code of Standard Practice.

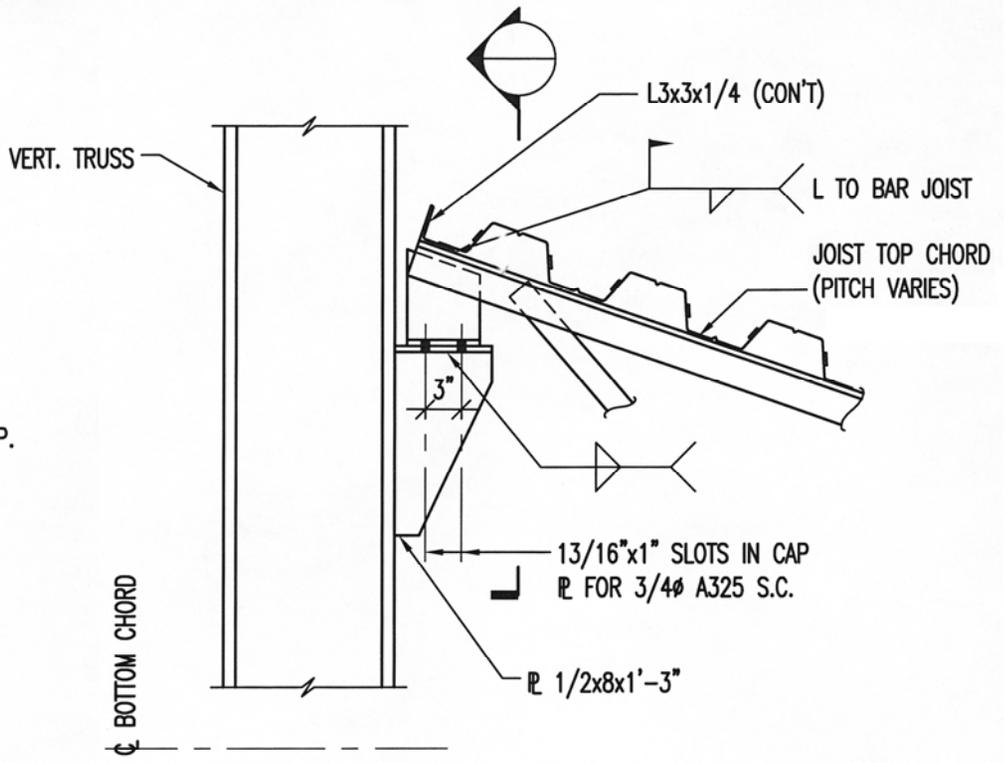
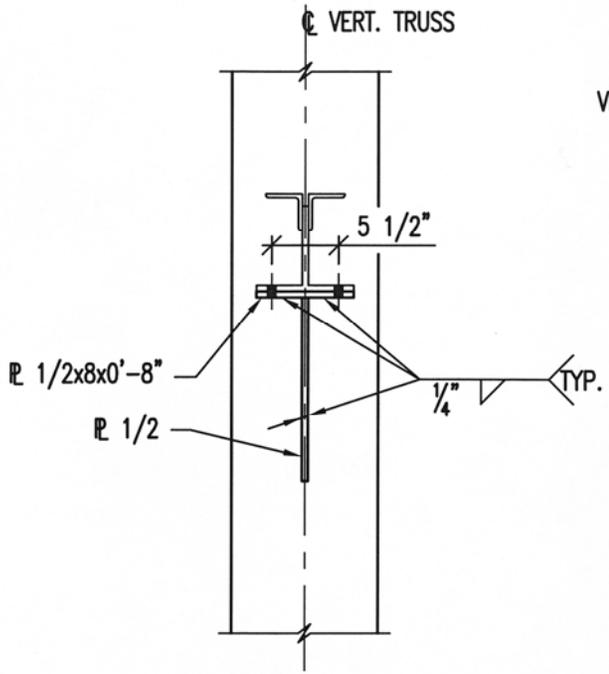
Where the joist span occurs in the shaded area of the table, the row of bridging nearest the mid span shall be diagonal bridging with bolted connections at chords and midspan.

Joist Designation	8K1	10K1	12K1	12K3	12K5	14K1	14K3	14K4	14K6	16K2	16K3	16K4	16K5	16K6	16K7	16K9
Depth (In.)	8	10	12	12	12	14	14	14	14	16	16	16	16	16	16	16
Approx. Wt. (lbs./ft)	5.1	5	5	5.7	7.1	5.2	6	6.7	7.7	5.5	6.3	7	7.5	8.1	8.6	10
Span (ft.) ↓																
8	550 550															
9	550 550															
10	550 480	550 550														
11	532 377	550 542														
12	444 288	550 455	550 550	550 550	550 550											
13	377 225	479 363	550 510	550 510	550 510											
14	324 179	412 289	500 425	550 463	550 463	550 550	550 550	550 550	550 550							
15	281 145	358 234	434 344	543 428	550 434	511 475	550 507	550 507	550 507							
16	246 119	313 192	380 282	476 351	550 396	448 390	550 467	550 467	550 467	550 550						
17		227 159	336 234	420 291	550 366	395 324	495 404	550 443	550 443	512 488	550 526	550 526	550 526	550 526	550 526	550 526
18		246 134	299 197	374 245	507 317	352 272	441 339	530 397	550 408	456 409	508 456	550 490	550 490	550 490	550 490	550 490
19		221 113	268 167	335 207	454 269	315 230	395 287	475 336	550 383	408 347	455 386	547 452	550 455	550 455	550 455	550 455



A S1.7 FIELD ROOF FRAMING PLAN - BASE (NORTH)  
 1/8" = 1'-0"





	LONG-SPAN JOIST CONNECTION TO SPINE TRUSS

	LONG-SPAN JOIST CONNECTION TO SPINE TRUSS









# Precast / Prestressed Concrete

*Mt. Carmel High School  
Chicago, IL*

Primary Structural System

- Precast Concrete Wall Panels
- Precast Concrete Hollow Core Slab
- Reinforced CMU Walls
- Structural Steel Framing
- Open Web Bar Joists

Exterior Wall System

- Exterior Face Brick
- Glass Curtainwall









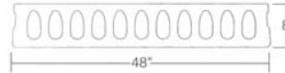








## 4.4 Standard load tables 8" thick .75" strand cover



4.0  
Standard  
Spancrete

Issued 10/94

No Structural Topping Dead Load Weight of Slab = 63 psf							
Code	FIRE RATINGS (Hours)						
	Restrained			Unrestrained			
Rational Design	—			—			
SBC/UBC	2*			3/4			
UL	2			3/4			
DILHR 51.045 Table 2	See 2.2			See 2.2			
SECTION PROPERTIES							
A = 258 in. <sup>2</sup>	Y <sub>t</sub> = 4.02 in.			b = 19.6 in.			
I = 1806 in. <sup>4</sup>	Y <sub>b</sub> = 3.98 in.			W <sub>t</sub> = 63 psf			
φ M <sub>n</sub> ft-k/ft	11.05	14.97	19.73	25.52	32.86	36.48	
Series	75D- 8506	75D- 8606	75D- 8706	75D- 8806	75D- 8908	75D- 8712	
Span in Feet	ALLOWABLE SUPERIMPOSED LOAD IN POUNDS PER SQUARE FOOT						
12	309	437	593				
13	256	365	498				
14	213	307	422				
15	179	261	361				
16	151	223	311	417			
17	128	192	269	364			
18	109	165	235	319			
19	92	143	205	281			
20	78	124	180	248	335		
21	66	108	159	221	299		
22	56	94	140	196	268	303	
23	46	81	124	175	240	273	
24	38	70	109	157	217	246	
25		61	97	140	196	223	
26		52	85	126	177	202	
27		45	76	113	160	183	
28			67	101	145	166	
29			59	91	132	150	
30			51	82	120	136	
31				73	109	124	
32				65	99	113	
33				58	90	103	
34				52	82	94	
35					74	86	
36					68	78	
37					61	71	
38					55	65	
39					50	59	
40						54	

2 Inch Bonded Structural Topping Dead Load Weight of Slab With Topping = 88 psf							
Code	FIRE RATINGS (Hours)						
	Restrained			Unrestrained			
Rational Design	—			—			
SBC/UBC	3			3/4			
UL	2			3/4			
DILHR 51.045 Table 2	See 2.2			See 2.2			
SECTION PROPERTIES							
A = 343 in. <sup>2</sup>	Y <sub>t</sub> = 4.78 in.			b = 19.6 in.			
I = 3443 in. <sup>4</sup>	Y <sub>b</sub> = 5.22 in.			W <sub>t</sub> = 88 psf			
φ M <sub>n</sub> ft-k/ft	14.18	19.24	25.42	32.97	42.53	47.24	
Series	75D- 8506T	75D- 8606T	75D- 8706T	75D- 8806T	75D- 8908T	75D- 8712T	
Span in Feet	ALLOWABLE SUPERIMPOSED LOAD IN POUNDS PER SQUARE FOOT						
15	224	330	459				
16	188	281	395	468			
17	158	241	342	436			
18	134	207	297	406			
19	112	178	259	357			
20	94	154	227	315	360		
21		133	199	279	339		
22		115	175	248	320	322	
23		99	154	221	303	304	
24			135	197	275	289	
25			119	176	248	274	
26			105	157	224	256	
27				140	201	229	
28				125	180	204	
29				112	160	182	
30				99	142	163	
31					126	146	
32					112	130	
33					98	116	
34					86	103	
35						91	
36						80	
37						70	

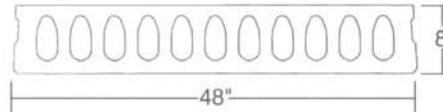
\*In areas where the heat transmission requirements of ASTM E-119 may be reduced to 1/2 the hourly rating (Wis. ILHR 51.042) these units qualify for a 3 hour rating.

1\* - 1 1/2\* Camber 1 1/2\* or More Camber



## 4.4 Standard load tables 8" thick .75" strand cover

**4.0**  
Standard  
Spancrete



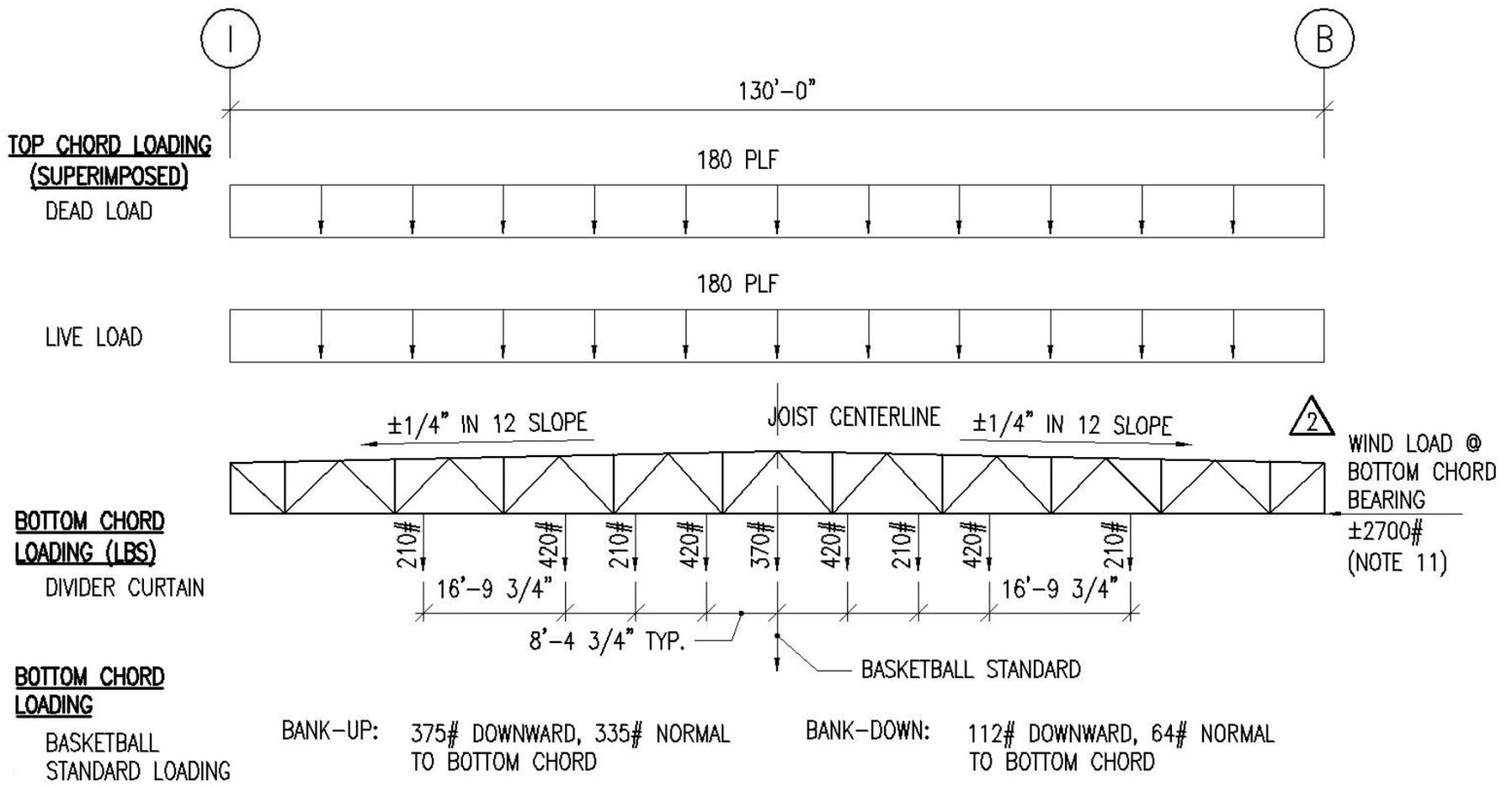
Issued 10/94

No Structural Topping Dead Load Weight of Slab = 63 psf							
Code	FIRE RATINGS (Hours)			SECTION PROPERTIES			
	Restrained	Unrestrained					
Rational Design	—	—					
SBC/UBC	2*	—					
UL	2	3/4					
DILHR 51.045 Table 2	See 2.2	See 2.2					
A = 258 in. <sup>2</sup>		Y <sub>t</sub> = 4.02 in.		b = 19.6 in.			
I = 1806 in. <sup>4</sup>		Y <sub>b</sub> = 3.98 in.		Wt = 63 psf			
φ M <sub>n</sub> ft-k/ft	11.05	14.97	19.73	25.52	32.86	36.48	
Series	.75D-8506	.75D-8606	.75D-8706	.75D-8806	.75D-8808	.75D-8712	
Span in Feet	ALLOWABLE SUPERIMPOSED LOAD IN POUNDS PER SQUARE FOOT						
12	309	437	593				
13	256	365	498				
14	213	307	422				
15	179	261	361				
16	151	223	311	417			
17	128	192	269	364			
18	109	165	235	319			
19	92	143	205	281			
20	78	124	180	248	335		
21	66	108	159	221	299		
22	56	94	140	196	268	303	
23	46	81	124	175	240	273	
24	38	70	109	157	217	246	
25		61	97	140	196	223	

2 Inch Bonded Structural Topping Dead Load Weight of Slab With Topping = 88 psf							
Code	FIRE RATINGS (Hours)			SECTION PROPERTIES			
	Restrained	Unrestrained					
Rational Design	—	—					
SBC/UBC	3	—					
UL	2	3/4					
DILHR 51.045 Table 2	See 2.2	See 2.2					
A = 343 in. <sup>2</sup>		Y <sub>t</sub> = 4.78 in.		b = 19.6 in.			
I = 3443 in. <sup>4</sup>		Y <sub>b</sub> = 5.22 in.		Wt = 88 psf			
φ M <sub>n</sub> ft-k/ft	14.18	19.24	25.42	32.97	42.53	47.24	
Series	.75D-8506T	.75D-8606T	.75D-8706T	.75D-8806T	.75D-8808T	.75D-8712T	
Span in Feet	ALLOWABLE SUPERIMPOSED LOAD IN POUNDS PER SQUARE FOOT						
15	224	330	459				
16	188	281	395	468			
17	158	241	342	436			
18	134	207	297	406			
19	112	178	259	357			
20	94	154	227	315	360		
21		133	199	279	339		
22		115	175	248	320	322	
23		99	154	221	303	304	
24			135	197	275	289	
25			119	176	248	274	
26			105	157	224	256	
27				140	201	229	
28				125	180	204	







8 JOIST SP8 LOADING DIAGRAM



# Masonry

## ***Concrete Masonry Units (CMU)***

- Load Bearing Walls
- Load Bearing Piers
- Exterior Wall Infill
- Interior Partitions
- Exterior Retaining Walls

## ***Clay Masonry (Brick)***

- Load Bearing Walls and Piers
- Exterior Wall Infill (Face Brick)



# Masonry

***747 North LaSalle  
Chicago, Illinois***

Primary Structural System

- Load Bearing CMU
- Composite Metal Deck / Framing
- CMU Shear Walls

Exterior Wall System

- Architectural Split Face CMU and Glass Curtain Walls



**BIG BOWL**

**FRESH ASIAN COOKING**

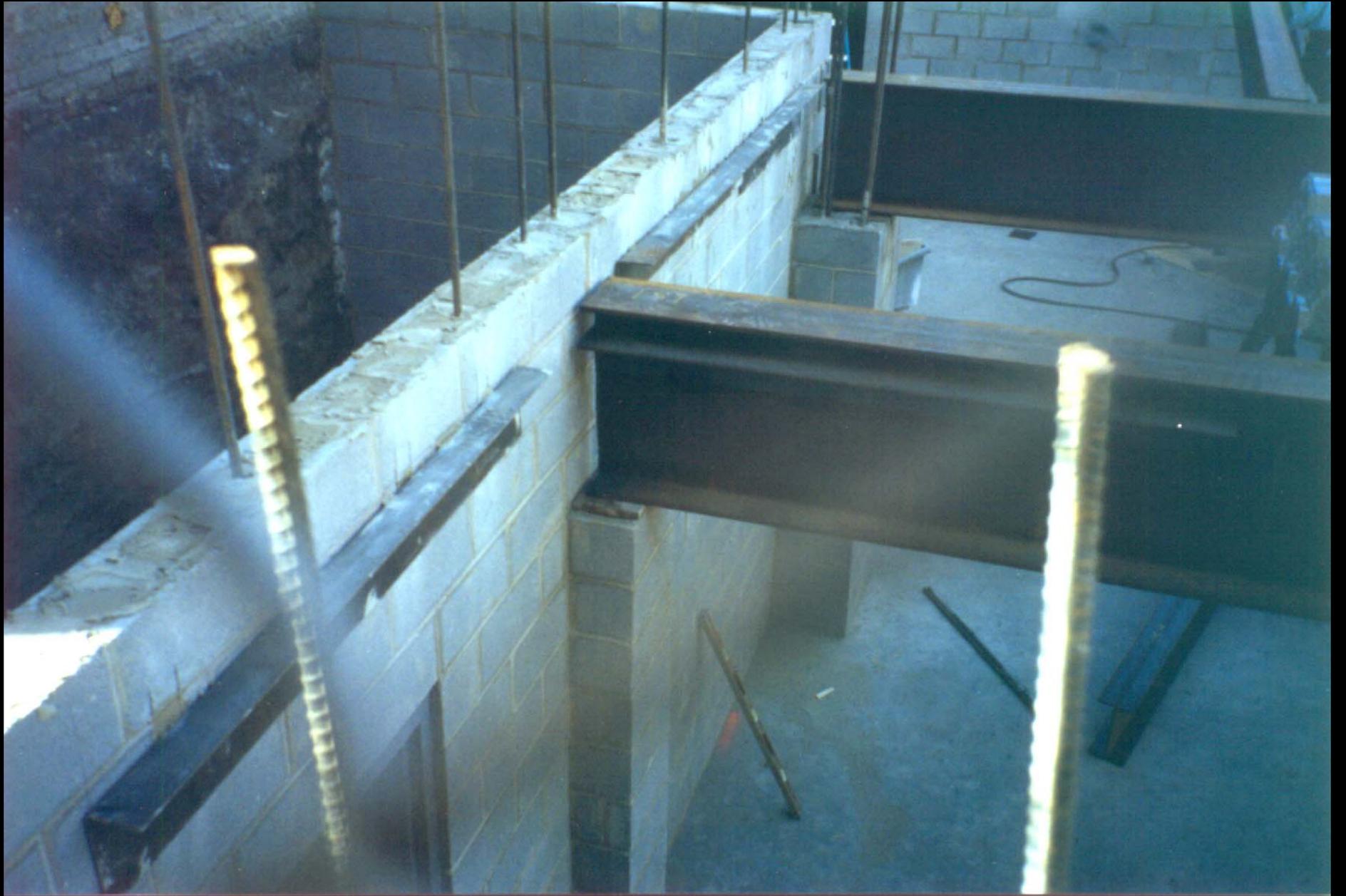
STATE & CEDAR  
ERIE & LASALLE  
LINCOLNSHIRE

**ERREX**  
ERREX BUILDING MATERIALS  
ERREX BUILDING MATERIALS  
ERREX BUILDING MATERIALS  
ERREX BUILDING MATERIALS

















# Timber

## Sawn Lumber

Load Bearing Stud Walls

Floor & Roof Joists

Trusses

## Glu-Lam

Beams, Girders, Columns  
(Exposed Timber)

## *Engineered Wood Products (Trus Joist)*

Microlam, Paralam,  
Timberstrand

Openweb Members

TJI Joists (Wood I Joists)



# Timber

## *Sawn Lumber*

Load Bearing Stud Walls

Floor & Roof Joists

Trusses

## *Glu-Lam*

Beams, Girders, Columns  
(Exposed Timber)

## **Engineered Wood Products**

Microlam, Paralam,  
Timberstrand

Openweb Members

TJI Joists (Wood I Joists)



# Timber

## *Cunningham Children's Home Urbana, Illinois*

### Primary Structural System

- Exterior Load Bearing Masonry Walls
- Interior Load Bearing Masonry Walls and Metal Stud Walls
- Prefabricated Metal Plate Wood Truss Roof Framing



**TABLE 4A — BASE DESIGN VALUES FOR VISUALLY GRADED DIMENSION LUMBER**  
**(All species except Southern Pine — see Table 4B)**

(Tabulated design values are for normal load duration and dry service conditions.  
 See NDS 2.3 for a comprehensive description of design value adjustment factors.)

**USE WITH TABLE 4A ADJUSTMENT FACTORS**

Species and commercial grade	Size classification	Design values in pounds per square inch (psi)						Grading Rules Agency
		Bending $F_b$	Tension parallel to grain $F_t$	Shear parallel to grain $F_v$	Compression perpendicular to grain $F_{c\perp}$	Compression parallel to grain $F_c$	Modulus of Elasticity $E$	
<b>DOUGLAS FIR-LARCH</b>								
Select Structural	2"-4"thick	1450	1000	95	625	1700	1,900,000	WCLIB WWPA
No.1 & Btr		1150	775	95	625	1500	1,800,000	
No.1	2"& wider	1000	675	95	625	1450	1,700,000	
No.2		875	575	95	625	1300	1,600,000	
No.3		500	325	95	625	750	1,400,000	
Stud		675	450	95	625	825	1,400,000	
Construction	2"-4"thick	1000	650	95	625	1600	1,500,000	
Standard	2"-4" wide	550	375	95	625	1350	1,400,000	
Utility		275	175	95	625	875	1,300,000	
<b>DOUGLAS FIR-LARCH (NORTH)</b>								
Select Structural	2"-4"thick	1300	800	95	625	1900	1,900,000	NLGA
No.1/No.2	2"& wider	825	500	95	625	1350	1,600,000	
No.3		475	300	95	625	775	1,400,000	
Stud	650	375	95	625	850	1,400,000		
Construction	2"-4"thick	950	575	95	625	1750	1,500,000	
Standard	2"-4" wide	525	325	95	625	1400	1,400,000	
Utility		250	150	95	625	925	1,300,000	
<b>DOUGLAS FIR-SOUTH</b>								
Select Structural	2"-4"thick	1300	875	90	520	1550	1,400,000	WWPA
No.1		900	600	90	520	1400	1,300,000	
No.2	2"& wider	825	525	90	520	1300	1,200,000	
No.3		475	300	90	520	750	1,100,000	
Stud		650	425	90	520	825	1,100,000	
Construction		2"-4"thick	925	600	90	520	1550	
Standard	2"-4" wide	525	350	90	520	1300	1,100,000	
Utility		250	150	90	520	875	1,000,000	
<b>EASTERN HEMLOCK-TAMARACK</b>								
Select Structural	2"-4"thick	1250	575	85	555	1200	1,200,000	NELMA NSLB
No.1		775	350	85	555	1000	1,100,000	
No.2	2"& wider	575	275	85	555	825	1,100,000	
No.3		350	150	85	555	475	900,000	
Stud		450	200	85	555	525	900,000	
Construction		2"-4"thick	675	300	85	555	1050	
Standard	2"-4" wide	375	175	85	555	850	900,000	
Utility		175	75	85	555	550	800,000	
<b>EASTERN SOFTWOODS</b>								
Select Structural	2"-4"thick	1250	575	70	335	1200	1,200,000	NELMA NSLB
No.1		775	350	70	335	1000	1,100,000	
No.2	2"& wider	575	275	70	335	825	1,100,000	
No.3		350	150	70	335	475	900,000	
Stud		450	200	70	335	525	900,000	
Construction		2"-4"thick	675	300	70	335	1050	
Standard	2"-4" wide	375	175	70	335	850	900,000	
Utility		175	75	70	335	550	800,000	
<b>EASTERN WHITE PINE</b>								
Select Structural	2"-4"thick	1250	575	70	350	1200	1,200,000	NELMA NSLB
No.1		775	350	70	350	1000	1,100,000	
No.2	2"& wider	575	275	70	350	825	1,100,000	
No.3		350	150	70	350	475	900,000	
Stud		450	200	70	350	525	900,000	
Construction		2"-4"thick	675	300	70	350	1050	
Standard	2"-4" wide	375	175	70	350	850	900,000	
Utility		175	75	70	350	550	800,000	
<b>HEM-FIR</b>								
Select Structural	2"-4"thick	1400	900	75	405	1500	1,600,000	WCLIB WWPA
No.1 & Btr		1050	700	75	405	1350	1,500,000	
No.1	2"& wider	950	600	75	405	1300	1,500,000	
No.2		850	500	75	405	1250	1,300,000	
No.3		500	300	75	405	725	1,200,000	
Stud		675	400	75	405	800	1,200,000	
Construction	2"-4"thick	975	575	75	405	1500	1,300,000	
Standard	2"-4" wide	550	325	75	405	1300	1,200,000	
Utility		250	150	75	405	850	1,100,000	

**TABLE 4A — BASE DESIGN VALUES FOR VISUALLY GRADED DIMENSION LUMBER**  
**(All species except Southern Pine — see Table 4B)**

(Tabulated design values are for normal load duration and dry service conditions.  
 See NDS 2.3 for a comprehensive description of design value adjustment factors.)

**USE WITH TABLE 4A ADJUSTMENT FACTORS**

Species and commercial grade	Size classification	Design values in pounds per square inch (psi)						Grading Rules Agency
		Bending $F_b$	Tension parallel to grain $F_t$	Shear parallel to grain $F_v$	Compression perpendicular to grain $F_{c\perp}$	Compression parallel to grain $F_c$	Modulus of Elasticity $E$	
<b>DOUGLAS FIR-LARCH</b>								
Select Structural		1450	1000	95	625	1700	1,900,000	WCLIB WWPA
No.1 & Btr	2"-4"thick	1150	775	95	625	1500	1,800,000	
No.1		1000	675	95	625	1450	1,700,000	
No.2	2"& wider	875	575	95	625	1300	1,600,000	
No.3		500	325	95	625	750	1,400,000	
Stud		675	450	95	625	825	1,400,000	
Construction	2"-4"thick	1000	650	95	625	1600	1,500,000	
Standard		550	375	95	625	1350	1,400,000	
Utility	2"-4" wide	275	175	95	625	875	1,300,000	
<b>DOUGLAS FIR-LARCH (NORTH)</b>								
Select Structural	2"-4"thick	1300	800	95	625	1900	1,900,000	NLGA
No.1/No.2		825	500	95	625	1350	1,600,000	
No.3	2"& wider	475	300	95	625	775	1,400,000	
Stud		650	375	95	625	850	1,400,000	
Construction	2"-4"thick	950	575	95	625	1750	1,500,000	
Standard		525	325	95	625	1400	1,400,000	
Utility	2"-4" wide	250	150	95	625	925	1,300,000	
<b>DOUGLAS FIR-SOUTH</b>								
Select Structural		1300	875	90	520	1550	1,400,000	WWPA
No.1	2"-4"thick	900	600	90	520	1400	1,300,000	
No.2		825	525	90	520	1300	1,200,000	
No.3	2"& wider	475	300	90	520	750	1,100,000	
Stud		650	425	90	520	825	1,100,000	
Construction	2"-4"thick	925	600	90	520	1550	1,200,000	
Standard		525	350	90	520	1300	1,100,000	
Utility	2"-4" wide	250	150	90	520	875	1,000,000	
<b>EASTERN HEMLOCK-TAMARACK</b>								
Select Structural		1250	575	85	555	1200	1,200,000	NELMA NSLB
No.1	2"-4"thick	775	350	85	555	1000	1,100,000	
No.2		575	275	85	555	825	1,100,000	
No.3	2"& wider	350	150	85	555	475	900,000	
Stud		450	200	85	555	525	900,000	

**TABLE 5A — DESIGN VALUES FOR STRUCTURAL GLUED LAMINATED SOFTWOOD TIMBER**  
 (Members stressed primarily in bending) <sup>1,2,3,4,12</sup>

(Tabulated design values are for normal load duration and dry service conditions. See NDS 2.3 for a comprehensive description of design value adjustment factors.)

**USE WITH TABLE 5A ADJUSTMENT FACTORS**

Combination Symbol <sup>4</sup>	Species Outer Laminations/ Core Laminations <sup>5</sup>	Design values in pounds per square inch (psi)													
		BENDING ABOUT X-X AXIS (Loaded Perpendicular to Wide Faces of Laminations)						BENDING ABOUT Y-Y AXIS (Loaded Parallel to Wide Faces of Laminations)					AXIALLY LOADED		
		Bending		Compression Perpendicular to Grain		Shear Parallel to Grain <sup>10</sup>	Modulus of Elasticity E <sub>xx</sub>	Bending F <sub>byy</sub>	Compression Perpendicular to Grain (Side Faces) F <sub>cLyy</sub>	Shear Parallel to Grain F <sub>vy</sub>	Shear Parallel to Grain (For Members With Multiple Piece Laminations Which are Not Edge Glued) <sup>13</sup> F <sub>vyy</sub>	Modulus of Elasticity E <sub>yy</sub>	Tension Parallel to Grain F <sub>t</sub>	Compression Parallel to Grain F <sub>c</sub>	Modulus of Elasticity E
		Tension Zone Stressed in Tension F <sub>bxx</sub>	Compression Zone Stressed in Tension <sup>6</sup> F <sub>bxx</sub>	Tension Face <sup>9,10</sup> F <sub>cLxx</sub>	Compression Face <sup>9,10</sup> F <sub>cLxx</sub>										
<b>E-RATED WESTERN SPECIES</b>															
16F-E1	WW/WW	1600	800	255 <sup>10</sup>	255 <sup>10</sup>	140	1,300,000	1050	255	125 <sup>14</sup>	65 <sup>14</sup>	1,200,000	725	925	1,200,000
16F-E2 <sup>11</sup>	HF/HF	1600	800	500 <sup>10</sup>	500 <sup>10</sup>	155	1,400,000	1250	375	135	70	1,300,000	825	1200	1,300,000
16F-E3	DF/DF	1600	800	650 <sup>10</sup>	650 <sup>10</sup>	165	1,600,000	1450	560	145	75	1,500,000	975	1600	1,500,000
16F-E4 <sup>7</sup>	DF/N3WW	1600	800	650 <sup>10</sup>	650 <sup>10</sup>	90 <sup>10</sup>	1,600,000	900	255	130 <sup>14</sup>	65 <sup>14</sup>	1,300,000	675	675	1,300,000
16F-E5 <sup>7</sup>	DF/N3DF	1600	800	650 <sup>10</sup>	650 <sup>10</sup>	90 <sup>10</sup>	1,600,000	1050	470	135	70	1,500,000	700	900	1,500,000
16F-E6 <sup>8</sup>	DF/DF	1600	1600	650 <sup>10</sup>	650 <sup>10</sup>	165	1,600,000	1500	560	145	75	1,500,000	1000	1600	1,500,000
16F-E7 <sup>9,11</sup>	HF/HF	1600	1600	500 <sup>10</sup>	500 <sup>10</sup>	155	1,400,000	1250	375	135	70	1,300,000	850	1150	1,300,000
20F-E1	WW/WW	2000	1000	255 <sup>10</sup>	255 <sup>10</sup>	140	1,600,000	1100	255	125 <sup>14</sup>	65 <sup>14</sup>	1,300,000	800	1050	1,300,000
20F-E2 <sup>11</sup>	HF/HF	2000	1000	500 <sup>10</sup>	500 <sup>10</sup>	155	1,600,000	1400	375	135	70	1,400,000	925	1550	1,400,000
20F-E3	DF/DF	2000	1000	650 <sup>10</sup>	650 <sup>10</sup>	165	1,700,000	1550	560	145	75	1,600,000	1050	1650	1,600,000
20F-E4 <sup>7</sup>	DF/N3WW	2000	1000	650	650 <sup>10</sup>	90 <sup>10</sup>	1,600,000	1100	255	130 <sup>14</sup>	65 <sup>14</sup>	1,400,000	800	700	1,400,000
20F-E5 <sup>7</sup>	DF/N3DF	2000	1000	650 <sup>10</sup>	650 <sup>10</sup>	90 <sup>10</sup>	1,700,000	1300	470	135	70	1,600,000	825	975	1,600,000
20F-E6 <sup>8</sup>	DF/DF	2000	2000	650 <sup>10</sup>	650 <sup>10</sup>	165	1,700,000	1600	560	145	75	1,600,000	1150	1650	1,600,000
20F-E7 <sup>9,11</sup>	HF/HF	2000	2000	500 <sup>10</sup>	500 <sup>10</sup>	155	1,600,000	1500	375	135	70	1,400,000	1050	1550	1,400,000
22F-E1	DF/DF	2200	1100	650	650 <sup>10</sup>	165	1,700,000	1550	560	145	75	1,600,000	1050	1600	1,600,000
22F-E2 <sup>11</sup>	HF/HF	2200	1100	500 <sup>10</sup>	500 <sup>10</sup>	155	1,600,000	1400	375	135	70	1,400,000	950	1400	1,400,000
22F-E3 <sup>7</sup>	DF/N3WW	2200	1100	650	650 <sup>10</sup>	90 <sup>10</sup>	1,700,000	1250	255	135 <sup>14</sup>	70 <sup>14</sup>	1,400,000	825	750	1,400,000
22F-E4 <sup>7</sup>	DF/N3DF	2200	1100	650	650 <sup>10</sup>	90 <sup>10</sup>	1,800,000	1350	470	135	70	1,600,000	950	950	1,600,000
22F-E5 <sup>8</sup>	DF/DF	2200	2200	650	650	165	1,700,000	1650	560	145	75	1,600,000	1100	1650	1,600,000
22F-E6 <sup>9,11</sup>	HF/HF	2200	2200	500 <sup>10</sup>	500 <sup>10</sup>	155	1,700,000	1550	375	135	70	1,500,000	1050	1500	1,500,000
24F-E1	DF/DF	2400	1200	650	650	165	1,800,000	1550	560	145	75	1,600,000	1100	1600	1,600,000
24F-E2 <sup>11</sup>	HF/HF	2400	1200	500 <sup>10</sup>	500 <sup>10</sup>	155	1,700,000	1450	375	135	70	1,500,000	1000	1400	1,500,000
24F-E3	DF/HF	2400	1200	650	500 <sup>10</sup>	155	1,800,000	1500	375	135	70	1,500,000	1050	1550	1,500,000
24F-E4	DF/DF	2400	1200	650	650	165	1,600,000	1650	560	145	75	1,700,000	1100	1700	1,700,000
24F-E5	DF/DF	2400	1200	650	650 <sup>10</sup>	165	1,800,000	1650	560	145	75	1,600,000	1100	1550	1,600,000
24F-E6 <sup>11</sup>	HF/WW	2400	1200	500 <sup>10</sup>	500 <sup>10</sup>	140	1,800,000	1250	255	130 <sup>14</sup>	65 <sup>14</sup>	1,400,000	925	1350	1,400,000
24F-E7 <sup>7</sup>	DF/N3WW	2400	1200	650	650	90 <sup>10</sup>	1,900,000	1400	255	135 <sup>14</sup>	70 <sup>14</sup>	1,600,000	975	875	1,600,000
24F-E8 <sup>7</sup>	DF/N3DF	2400	1200	650	650	90 <sup>10</sup>	1,900,000	1400	470	135	70	1,700,000	1000	1050	1,700,000
24F-E9 <sup>7,11</sup>	HF/N3HF	2400	1200	500 <sup>10</sup>	500 <sup>10</sup>	90 <sup>10</sup>	1,800,000	1350	375	135	70	1,600,000	950	825	1,600,000
24F-E10 <sup>8</sup>	DF/DF	2400	2400	650	650	165	1,900,000	1850	560	145	75	1,700,000	1300	1750	1,700,000
24F-E11 <sup>9,11</sup>	HF/HF	2400	2400	500 <sup>10</sup>	500 <sup>10</sup>	155	1,800,000	1600	375	135	70	1,500,000	1150	1550	1,500,000
24F-E12 <sup>8</sup>	DF/HF	2400	2400	650	650	155	1,900,000	1750	375	135	70	1,600,000	1200	1600	1,600,000
24F-E13 <sup>8</sup>	DF/DF	2400	2400	650	650	165	1,800,000	1950	560	145	70	1,700,000	1250	1700	1,700,000
24F-E14	DF/DF	2400	1200	650	650	165	1,800,000	1600	560	145	75	1,600,000	1050	1600	1,600,000
24F-E15	HF/HF	2400	1200	500	500	155	1,800,000	1500	375	135	70	1,500,000	1000	1550	1,500,000

**TABLE 8.2A-BOLT DESIGN VALUES (Z) for SINGLE SHEAR (two member) CONNECTIONS<sup>1,2</sup>  
for sawn lumber with both members of identical species**

MAIN MEMBER F <sub>m</sub> inches	SIDE MEMBER F <sub>m</sub> inches	BOLT DIAMETER D inches	G=0.67 RED OAK			G=0.55 MIXED MAPLE SOUTHERN PINE			G=0.50 DOUGLAS FIR- LARCH			G=0.49 DOUGLAS FIR- LARCH (N)			G=0.46 DOUGLAS FIR (S) HEM-FIR (N)		
			Z <sub>  </sub>	Z <sub>⊥</sub>	Z <sub>m⊥</sub>	Z <sub>  </sub>	Z <sub>⊥</sub>	Z <sub>m⊥</sub>	Z <sub>  </sub>	Z <sub>⊥</sub>	Z <sub>m⊥</sub>	Z <sub>  </sub>	Z <sub>⊥</sub>	Z <sub>m⊥</sub>	Z <sub>  </sub>	Z <sub>⊥</sub>	Z <sub>m⊥</sub>
			lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
1-1/2	1-1/2	1/2	650	420	420	530	330	330	480	300	300	470	290	290	440	270	270
		5/8	810	500	500	660	400	400	600	360	360	590	350	350	560	320	320
		3/4	970	580	580	800	460	460	720	420	420	710	400	400	670	380	380
		7/8	1130	660	660	930	520	520	850	470	470	830	460	460	780	420	420
		1	1290	740	740	1060	580	580	970	530	530	950	510	510	890	480	480
2-1/2	1-1/2	1/2	770	480	540	660	400	420	610	370	370	610	360	360	580	340	330
		5/8	1070	660	630	930	560	490	850	520	430	830	520	420	780	470	390
		3/4	1360	890	720	1120	660	560	1020	590	500	1000	560	480	940	520	450
		7/8	1590	960	800	1300	720	620	1190	630	550	1170	600	540	1090	550	500
		1	1820	1020	870	1490	770	680	1360	680	610	1330	650	590	1250	600	550
3	1-1/2	1/2	770	480	560	660	400	470	610	370	420	610	360	410	580	340	380
		5/8	1070	660	710	940	560	550	880	520	480	870	520	470	830	470	440
		3/4	1450	890	800	1270	660	620	1190	590	550	1170	560	530	1090	520	500
		7/8	1860	960	890	1520	720	690	1390	630	610	1360	600	590	1280	550	540
		1	2120	1020	970	1740	770	750	1590	680	670	1560	650	650	1460	600	600
3-1/2	1-1/2	1/2	770	480	560	660	400	470	610	370	430	610	360	420	580	340	400
		5/8	1070	660	760	940	560	620	880	520	540	870	520	530	830	470	490
		3/4	1450	890	900	1270	660	690	1200	590	610	1190	560	590	1140	520	550
		7/8	1890	960	990	1680	720	770	1590	630	680	1570	600	650	1470	550	600
		1	2410	1020	1080	2010	770	830	1830	680	740	1790	650	710	1680	600	660
	3-1/2	1/2	830	590	590	750	520	520	720	490	490	710	480	480	690	460	460
		5/8	1290	880	880	1170	780	780	1120	700	700	1110	690	690	1070	650	650
		3/4	1860	1190	1190	1690	960	960	1610	870	870	1600	850	850	1540	800	800
		7/8	2540	1410	1410	2170	1160	1160	1970	1060	1060	1940	1040	1040	1810	980	980
		1	3020	1670	1670	2480	1360	1360	2260	1230	1230	2210	1190	1190	2070	1110	1110
4-1/2	1-1/2	5/8	1070	660	760	940	560	640	880	520	590	870	520	590	830	470	560
		3/4	1450	890	990	1270	660	840	1200	590	750	1190	560	720	1140	520	670
		7/8	1890	960	1210	1680	720	930	1590	630	820	1570	600	790	1520	550	730
		1	2410	1020	1310	2150	770	1000	2050	680	890	2030	650	860	1930	600	800
		5/8	1290	880	880	1170	780	780	1120	700	730	1110	690	720	1070	650	690
	3-1/2	3/4	1860	1190	1240	1690	960	1090	1610	870	1000	1600	850	980	1540	800	910
		7/8	2540	1410	1630	2300	1160	1300	2190	1060	1160	2170	1040	1130	2060	980	1050
		1	3310	1670	1830	2870	1390	1440	2610	1290	1290	2560	1260	1250	2400	1210	1170
		5/8	1070	660	760	940	560	640	880	520	590	870	520	590	830	470	560
		3/4	1450	890	990	1270	660	850	1200	590	790	1190	560	780	1140	520	740
5-1/2	1-1/2	7/8	1890	960	1260	1680	720	1090	1590	630	980	1570	600	940	1520	550	860
		1	2410	1020	1560	2150	770	1190	2050	680	1060	2030	650	1010	1930	600	940
		5/8	1290	880	880	1170	780	780	1120	700	730	1110	690	720	1070	650	690
		3/4	1860	1190	1240	1690	960	1090	1610	870	1030	1600	850	1010	1540	800	970
		7/8	2540	1410	1640	2300	1160	1410	2190	1060	1260	2170	1040	1220	2060	980	1130
	3-1/2	1	3310	1670	1980	2870	1390	1550	2660	1290	1390	2630	1260	1340	2500	1210	1250
		5/8	1070	660	760	940	560	640	880	520	590	870	520	590	830	470	560
		3/4	1450	890	990	1270	660	850	1200	590	790	1190	560	780	1140	520	740
		7/8	1890	960	1260	1680	720	1090	1590	630	1010	1570	600	990	1520	550	950
		1	2410	1020	1560	2150	770	1350	2050	680	1270	2030	650	1240	1930	600	1190
7-1/2	3-1/2	5/8	1290	880	880	1170	780	780	1120	700	730	1110	690	720	1070	650	690
		3/4	1860	1190	1240	1690	960	1090	1610	870	1030	1600	850	1010	1540	800	970
		7/8	2540	1410	1640	2300	1160	1450	2190	1060	1360	2170	1040	1340	2060	980	1280
		1	3310	1670	2090	2870	1390	1830	2660	1290	1630	2630	1260	1570	2500	1210	1470

1. Tabulated lateral design values (Z) for bolted connections shall be multiplied by all applicable adjustment factors (see Table 7.3.1).
2. Tabulated lateral design values (Z) are for "full diameter" bolts (see Reference 3) with a bending yield strength (F<sub>y</sub>) of 45,000 psi.

**TABLE 8.2A-BOLT DESIGN VALUES (Z) for SINGLE SHEAR (two member) CONNECTIONS<sup>1,2</sup>  
for sawn lumber with both members of identical species**

THICKNESS		BOLT DIAMETER D inches	G=0.67 RED OAK			G=0.55 MIXED MAPLE SOUTHERN PINE			G=0.50 DOUGLAS FIR- LARCH			G=0.49 DOUGLAS FIR- LARCH (N)			G=0.46 DOUGLAS FIR (S) HEM-FIR (N)		
MAIN MEMBER t <sub>m</sub> inches	SIDE MEMBER t <sub>s</sub> inches		Z <sub>  </sub> lbs.	Z <sub>s⊥</sub> lbs.	Z <sub>m⊥</sub> lbs.	Z <sub>  </sub> lbs.	Z <sub>s⊥</sub> lbs.	Z <sub>m⊥</sub> lbs.	Z <sub>  </sub> lbs.	Z <sub>s⊥</sub> lbs.	Z <sub>m⊥</sub> lbs.	Z <sub>  </sub> lbs.	Z <sub>s⊥</sub> lbs.	Z <sub>m⊥</sub> lbs.	Z <sub>  </sub> lbs.	Z <sub>s⊥</sub> lbs.	Z <sub>m⊥</sub> lbs.
1-1/2	1-1/2	1/2	650	420	420	530	330	330	480	300	300	470	290	290	440	270	270
		5/8	810	500	500	660	400	400	600	360	360	590	350	350	560	320	320
		3/4	970	580	580	800	460	460	720	420	420	710	400	400	670	380	380
		7/8	1130	660	660	930	520	520	850	470	470	830	460	460	780	420	420
		1	1290	740	740	1060	580	580	970	530	530	950	510	510	890	480	480
2-1/2	1-1/2	1/2	770	480	540	660	400	420	610	370	370	610	360	360	580	340	330
		5/8	1070	660	630	930	560	490	850	520	430	830	520	420	780	470	390
		3/4	1360	890	720	1120	660	560	1020	590	500	1000	560	480	940	520	450
		7/8	1590	960	800	1300	720	620	1190	630	550	1170	600	540	1090	550	500
		1	1820	1020	870	1490	770	680	1360	680	610	1330	650	590	1250	600	550
3	1-1/2	1/2	770	480	560	660	400	470	610	370	420	610	360	410	580	340	380
		5/8	1070	660	710	940	560	550	880	520	480	870	520	470	830	470	440
		3/4	1450	890	800	1270	660	620	1190	590	550	1170	560	530	1090	520	500
		7/8	1860	960	890	1520	720	690	1390	630	610	1360	600	590	1280	550	540
		1	2120	1020	970	1740	770	750	1590	680	670	1560	650	650	1460	600	600
3-1/2	1-1/2	1/2	770	480	560	660	400	470	610	370	430	610	360	420	580	340	400
		5/8	1070	660	760	940	560	620	880	520	540	870	520	530	830	470	490
		3/4	1450	890	900	1270	660	690	1200	590	610	1190	560	590	1140	520	550
		7/8	1890	960	990	1680	720	770	1590	630	680	1570	600	650	1470	550	600
		1	2410	1020	1080	2010	770	830	1830	680	740	1790	650	710	1680	600	660
	3-1/2	1/2	830	590	590	750	520	520	720	490	490	710	480	480	690	460	460
		5/8	1290	880	880	1170	780	780	1120	700	700	1110	690	690	1070	650	650
		3/4	1860	1190	1190	1690	960	960	1610	870	870	1600	850	850	1540	800	800
		7/8	2540	1410	1410	2170	1160	1160	1970	1060	1060	1940	1040	1040	1810	980	980
		1	3020	1670	1670	2480	1360	1360	2260	1230	1230	2210	1190	1190	2070	1110	1110
4-1/2	1-1/2	5/8	1070	660	760	940	560	640	880	520	590	870	520	590	830	470	560
		3/4	1450	890	990	1270	660	840	1200	590	750	1190	560	720	1140	520	670
		7/8	1890	960	1210	1680	720	930	1590	630	820	1570	600	790	1520	550	730
		1	2410	1020	1310	2150	770	1000	2050	680	890	2030	650	860	1930	600	800
		5/8	1290	880	880	1170	780	780	1120	700	730	1110	690	720	1070	650	690

















# Timber

## *Marklund Charities Geneva, Illinois*

### Primary Structural System

- Heavy Timber Decking
- Heavy Timber Glulam Rafters and Trusses
- Composite Steel Floor Framing
- Masonry Bearing Walls

### Exterior Wall System

- Brick Masonry & Glass Curtainwall Systems

















# Cold Form Steel Framing

## *Studs*

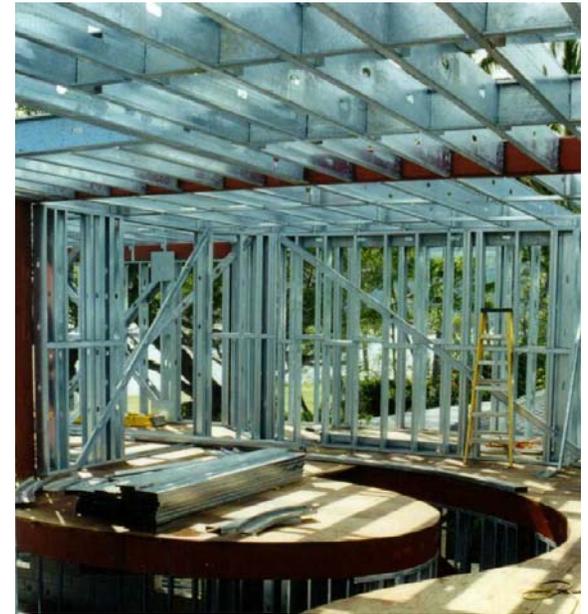
Load Bearing Stud Walls

Curtain Wall Backup

## *Trusses*

## *Joists*

Floor and Roof



### Allowable Axial Loads (Lbs.) – 6" Studs

Wind Load = 5 PSF

Size and Style		60CSN				60CSJ				60CSW				
Ht.	Spa.	20-ga.	18-ga.	16-ga.	14-ga.	20-ga.	18-ga.	16-ga.	14-ga.	20-ga.	18-ga.	16-ga.	14-ga.	12-ga.
(ft.)	(in.)	20-ga.	18-ga.	16-ga.	14-ga.	20-ga.	18-ga.	16-ga.	14-ga.	20-ga.	18-ga.	16-ga.	14-ga.	12-ga.
8	12	1729†	2454†	3546†	4670†	2637†	3633†	6529†	8624†	2770†	3972†	6797†	9518†	15420†
	16	1729†	2454†	3546†	4670†	2637†	3633†	6529†	8624†	2770†	3972†	6797†	9518†	15420†
	24	1729†	2454†	3546†	4670†	2637†	3633†	6529†	8624†	2770†	3972†	6797†	9518†	15420†
9	12	1729†	2454†	3546†	4670†	2637†	3633†	6529†	8624†	2758†	3961†	6761†	9443†	15264†
	16	1729†	2454†	3546†	4670†	2637†	3633†	6529†	8624†	2758†	3961†	6761†	9443†	15264†
	24	1729†	2454†	3546†	4670†	2637†	3633†	6529†	8624†	2758†	3961†	6761†	9443†	15264†
10	12	1729†	2454†	3546†	4670†	2626†	3628†	6525†	8624†	2742†	3946†	6715†	9349†	15065†
	16	1729†	2454†	3546†	4670†	2626†	3628†	6525†	8624†	2742†	3946†	6715†	9349†	15065†
	24	1729†	2454†	3546†	4670†	2626†	3628†	6525†	8624†	2742†	3946†	6715†	9349†	15065†
11	12	1729†	2454†	3546†	4670†	2607†	3600†	6429†	8575†	2723†	3928†	6657†	9232†	14816†
	16	1729†	2454†	3546†	4670†	2607†	3600†	6429†	8575†	2723†	3928†	6657†	9232†	14816†
	24	1729†	2454†	3546†	4670†	2607†	3600†	6429†	8575†	2723†	3928†	6657†	9232†	14816†
12	12	1729†	2454†	3546†	4670†	2581†	3565†	6309†	8415†	2700†	3905†	6585†	9092†	14509†
	16	1729†	2454†	3546†	4670†	2581†	3565†	6309†	8415†	2700†	3905†	6585†	9092†	14509†
	24	1729†	2454†	3546†	4670†	2581†	3565†	6309†	8415†	2700†	3905†	6585†	9092†	14509†
14	12	1729†	2454†	3546†	4670†	2509†	3467†	5979†	7976†	2637†	3846†	6293†	8740†	13706†
	16	1729†	2454†	3546†	4670†	2509†	3467†	5979†	7976†	2637†	3846†	6293†	8740†	13706†
	24	1568†	2454†	3546†	4670†	2441†	3467†	5979†	7976†	2613†	3846†	6293†	8740†	13706†
16	12	1729†	2454†	3546†	4670†	2406†	3327†	5521†	7365†	2554†	3715†	5900†	8128†	12641†
	16	1605†	2454†	3546†	4670†	2373†	3327†	5521†	7365†	2554†	3715†	5900†	8128†	12641†
	24	<b>1318</b>	<b>2195</b>	3546†	4670†	<b>2038</b>	3132†	5521†	7365†	<b>2220</b>	3520†	5900†	8128†	12641†

### Allowable Axial Loads (Lbs.) – 6" Studs

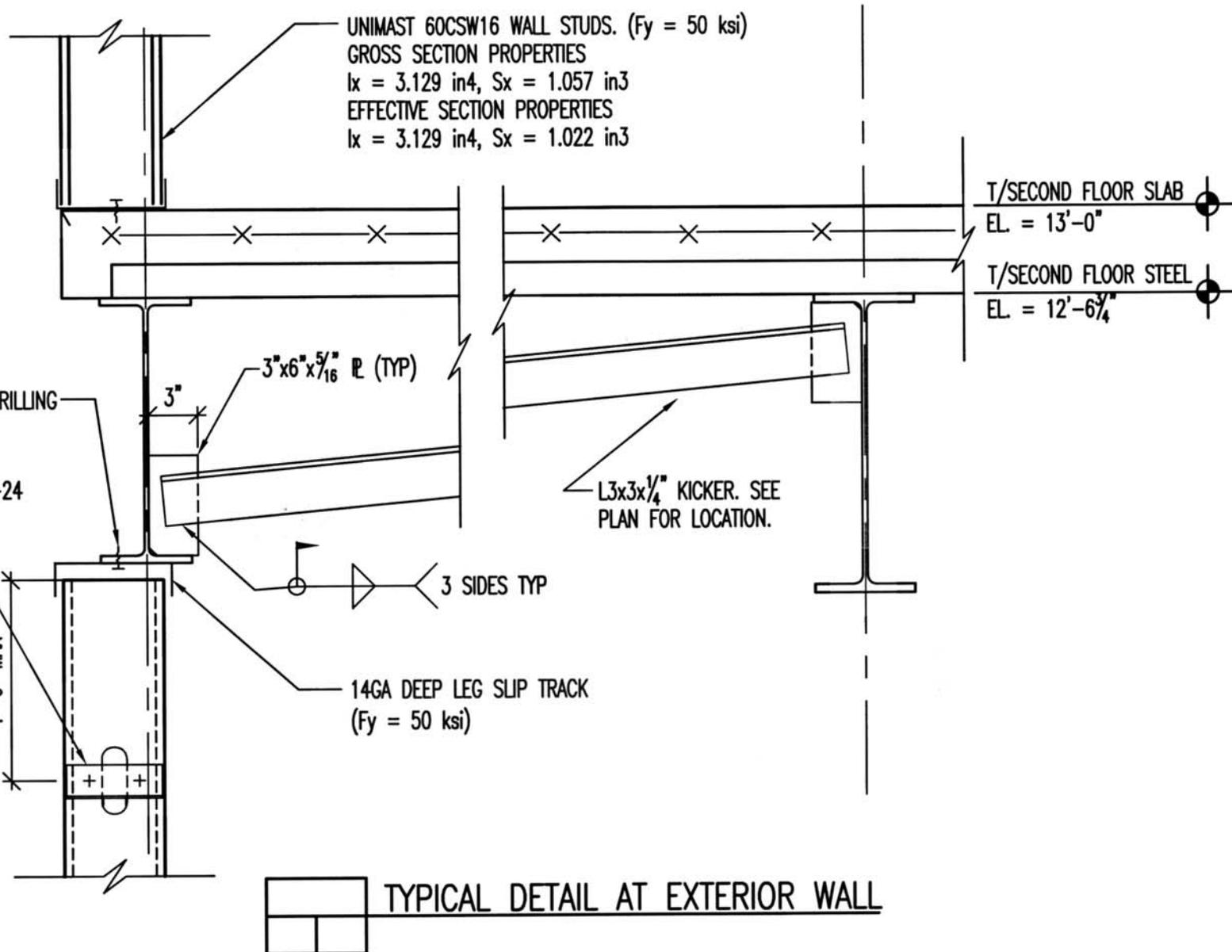
Wind Load = 20 PSF

Size and Style		60CSN				60CSJ				60CSW				
Ht.	Spa.	20-ga.	18-ga.	16-ga.	14-ga.	20-ga.	18-ga.	16-ga.	14-ga.	20-ga.	18-ga.	16-ga.	14-ga.	12-ga.
(ft.)	(in.)	20-ga.	18-ga.	16-ga.	14-ga.	20-ga.	18-ga.	16-ga.	14-ga.	20-ga.	18-ga.	16-ga.	14-ga.	12-ga.
8	12	1729†	2454†	3546†	4670†	2637†	3633†	6529†	8624†	2770†	3972†	6797†	9518†	15420†
	16	1729†	2454†	3546†	4670†	2637†	3633†	6529†	8624†	2770†	3972†	6797†	9518†	15420†
	24	1484† <sub>w</sub>	2434†	3546†	4670†	2513† <sub>w</sub>	3633†	6529†	8624†	2678† <sub>w</sub>	3972†	6797†	9518†	15420†
9	12	1729†	2454†	3546†	4670†	2637†	3633†	6529†	8624†	2758†	3961†	6761†	9443†	15264†
	16	1596†	2454†	3546†	4670†	2637†	3633†	6529†	8624†	2758†	3961†	6761†	9443†	15264†
	24	1260† <sub>w</sub>	2199†	3546†	4670†	2231† <sub>w</sub>	3495†	6529†	8624†	2383† <sub>w</sub>	3835†	6761†	9443†	15264†
10	12	1632†	2454†	3546†	4670†	2626†	3628†	6525†	8624†	2742†	3946†	6715†	9349†	15065†
	16	1421†	2359†	3546†	4670†	2408†	3628†	6525†	8624†	2561†	3946†	6715†	9349†	15065†
	24	<b>1016<sub>w</sub></b>	1935†	3546†	4670†	1911† <sub>w</sub>	3148†	6525†	8624†	2057† <sub>w</sub>	3456†	6715†	9349†	15065†
11	12	1481†	2416†	3546†	4670†	2454†	3600†	6429†	8575†	2610†	3928†	6657†	9232†	14816†
	16	1230†	2152†	3546†	4670†	2147†	3382†	6429†	8575†	2298†	3718†	6657†	9232†	14816†
	24	<b>756<sub>w</sub></b>	<b>1649</b>	3359†	4670†	<b>1558<sub>w</sub></b>	2753†	6387†	8575†	<b>1708<sub>w</sub></b>	3041†	6542†	9232†	14816†
12	12	1316†	2235†	3546†	4670†	2220†	3441†	6309†	8415†	2376†	3797†	6585†	9092†	14509†
	16	<b>1026<sub>w</sub></b>	<b>1926</b>	3546†	4670†	<b>1866<sub>w</sub></b>	3055†	6309†	8415†	<b>2016<sub>w</sub></b>	3380†	6585†	9092†	14509†
	24	488 <sub>w</sub>	<b>1347</b>	<b>3070</b>	<b>4437</b>	<b>1214<sub>w</sub></b>	<b>2337</b>	<b>5788</b>	8233†	<b>1347<sub>w</sub></b>	<b>2601</b>	<b>5957</b>	9031†	14509†
14	12	<b>960</b>	<b>1829</b>	<b>3451</b>	<b>4670†</b>	<b>1712</b>	<b>2829</b>	<b>5968</b>	7976†	<b>1867</b>	3169†	6233†	8740†	13706†
	16	601 <sub>w</sub>	<b>1436</b>	<b>3091</b>	<b>4431</b>	1284 <sub>w</sub>	<b>2350</b>	<b>5443</b>	<b>7691</b>	<b>1424<sub>w</sub></b>	<b>2643</b>	<b>5661</b>	<b>8540</b>	13706†
	24		726 <sub>w</sub>	2432 <sub>w</sub>	3700 <sub>w</sub>	522 <sub>w</sub>	1492 <sub>w</sub>	4508 <sub>w</sub>	<b>6607</b>	630 <sub>w</sub>	1697 <sub>w</sub>	<b>4640</b>	<b>7384</b>	<b>12918</b>
16	12	594 <sub>w</sub>	1391 <sub>w</sub>	2976 <sub>w</sub>	<b>4266</b>	1200 <sub>w</sub>	<b>2182</b>	<b>4847</b>	<b>6832</b>	1345 <sub>w</sub>	<b>2469</b>	<b>5109</b>	<b>7631</b>	<b>12641</b>
	16		932 <sub>w</sub>	2537 <sub>w</sub>	3772 <sub>w</sub>	729 <sub>w</sub>	1645 <sub>w</sub>	4269 <sub>w</sub>	6157 <sub>w</sub>	848 <sub>w</sub>	1873 <sub>w</sub>	4470 <sub>w</sub>	<b>6904</b>	<b>11773</b>
	24			1766 <sub>w</sub>	2901 <sub>w</sub>		712 <sub>w</sub>	3272 <sub>w</sub>	4995 <sub>w</sub>		836 <sub>w</sub>	3364 <sub>w</sub>	5652 <sub>w</sub>	10223 <sub>w</sub>

### Allowable Axial Loads (Lbs.) – 6" Studs

Wind Load = 15 PSF

Size and Style		60CSN				60CSJ				60CSW				
Ht.	Spa.	20-ga.	18-ga.	16-ga.	14-ga.	20-ga.	18-ga.	16-ga.	14-ga.	20-ga.	18-ga.	16-ga.	14-ga.	12-ga.
(ft.)	(in.)	20-ga.	18-ga.	16-ga.	14-ga.	20-ga.	18-ga.	16-ga.	14-ga.	20-ga.	18-ga.	16-ga.	14-ga.	12-ga.
8	12	1729†	2454†	3546†	4670†	2637†	3633†	6529†	8624†	2770†	3972†	6797†	9518†	15420†
	16	1729†	2454†	3546†	4670†	2637†	3633†	6529†	8624†	2770†	3972†	6797†	9518†	15420†
	24	1684†	2454†	3546†	4670†	2637†	3633†	6529†	8624†	2770†	3972†	6797†	9518†	15420†
9	12	1729†	2454†	3546†	4670†	2637†	3633†	6529†	8624†	2758†	3961†	6761†	9443†	15264†
	16	1729†	2454†	3546†	4670†	2637†	3633†	6529†	8624†	2758†	3961†	6761†	9443†	15264†
	24	1511†	2454†	3546†	4670†	2537†	3633†	6529†	8624†	2694†	3961†	6761†	9443†	15264†
10	12	1729†	2454†	3546†	4670†	2626†	3628†	6525†	8624†	2742†	3946†	6715†	9349†	15065†
	16	1632†	2454†	3546†	4670†	2626†	3628†	6525†	8624†	2742†	3946†	6715†	9349†	15065†
	24	1318†	2252†	3546†	4670†	2281†	3545†	6525†	8624†	2432†	3882†	6715†	9349†	15065†
11	12	1676†	2454†	3546†	4670†	2607†	3600†	6429†	8575†	2723†	3928†	6657†	9232†	14816†
	16	1481†	2416†	3546†	4670†	2454†	3600†	6429†	8575†	2610†	3928†	6657†	9232†	14816†
	24	<b>1108<sub>w</sub></b>	2023†	3546†	4670†	1998† <sub>w</sub>	3221†	6429†	8575†	2147† <sub>w</sub>	3545†	6657†	9232†	14816†
12	12	1545†	2454†	3546†	4670†	2500†	3565†	6309†	8415†	2659†	3905†	6585†	9092†	14509†
	16	1316†	2235†	3546†	4670†	2220†	3441†	6309†	8415†	2376†	3797†	6585†	9092†	14509†
	24	<b>887<sub>w</sub></b>	<b>1777</b>	3450†	4670†	<b>1697<sub>w</sub></b>	<b>2869</b>	6309†	8415†	<b>1843<sub>w</sub></b>	3178†	6582†	9092†	14509†
14	12	<b>1252</b>	2147†	3546†	4670†	<b>2061</b>	3218†	5979†	7976†	2225†	3596†	6293†	8740†	13706†
	16	<b>960</b>	<b>1829</b>	<b>3451</b>	4670†	<b>1712</b>	<b>2829</b>	<b>5968</b>	7976†	<b>1867</b>	3169†	6233†	8740†	13706†
	24	431 <sub>w</sub>	2249 <sub>w</sub>	<b>2919</b>	<b>4241</b>	1083 <sub>w</sub>	<b>2124</b>	<b>5197</b>	<b>7405</b>	2147† <sub>w</sub>	3545†	6657†	9232†	14816†
16	12	936 <sub>w</sub>	<b>1771</b>	<b>3338</b>	<b>4670</b>	<b>1595</b>	<b>2630</b>	<b>5332</b>	<b>7365</b>	<b>1758</b>	<b>2965</b>	<b>5645</b>	8128†	12641†
	16	594 <sub>w</sub>	1391 <sub>w</sub>	2976 <sub>w</sub>	<b>4266</b>	1200 <sub>w</sub>	<b>2182</b>	<b>4847</b>	<b>6832</b>	1345 <sub>w</sub>	<b>2469</b>	<b>5109</b>	<b>7631</b>	<b>12641</b>
	24		719 <sub>w</sub>	2333 <sub>w</sub>	3541 <sub>w</sub>	511 <sub>w</sub>	1397 <sub>w</sub>	4003 <sub>w</sub>	5846 <sub>w</sub>	618 <sub>w</sub>	1597 <sub>w</sub>	4175 <sub>w</sub>	6569 <sub>w</sub>	<b>11358</b>





















## Special Projects - Steel and Aluminum

### *Rooftop Artwork - Harold Washington Library Chicago, Illinois*

Primary Structural System

- Structural Steel Frame,

Exterior Wall System

- Aluminum





# Special Projects - Steel, Concrete and Glass

## *Private Residence Gulf Breeze, Florida*

### Primary Structural System

- Structural Steel Frame,
- Composite Metal Deck / Framing
- Reinforced Concrete Shear Wall

### Exterior Wall System

- Glass Curtain Wall
- Light Gauge Metal Framing





















## Special Projects - Steel, Concrete and Glass

### *Spertus Institute of Jewish Studies Chicago, Illinois*

#### Primary Structural System

- Structural Steel Frame,
- Composite Metal Deck / Framing
- Reinforced Concrete Shear Wall

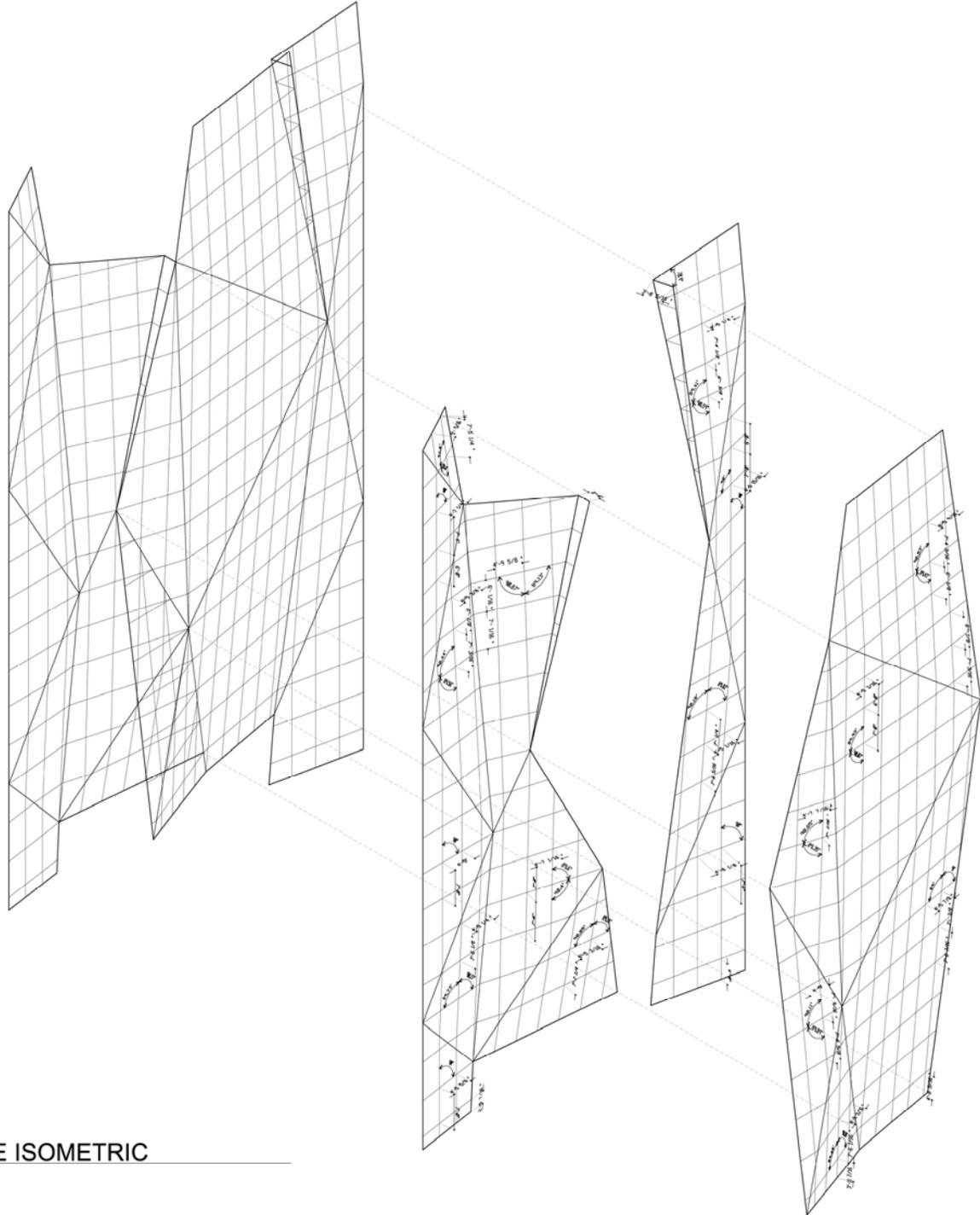
#### Exterior Wall System

- ***Glass Curtain Wall***



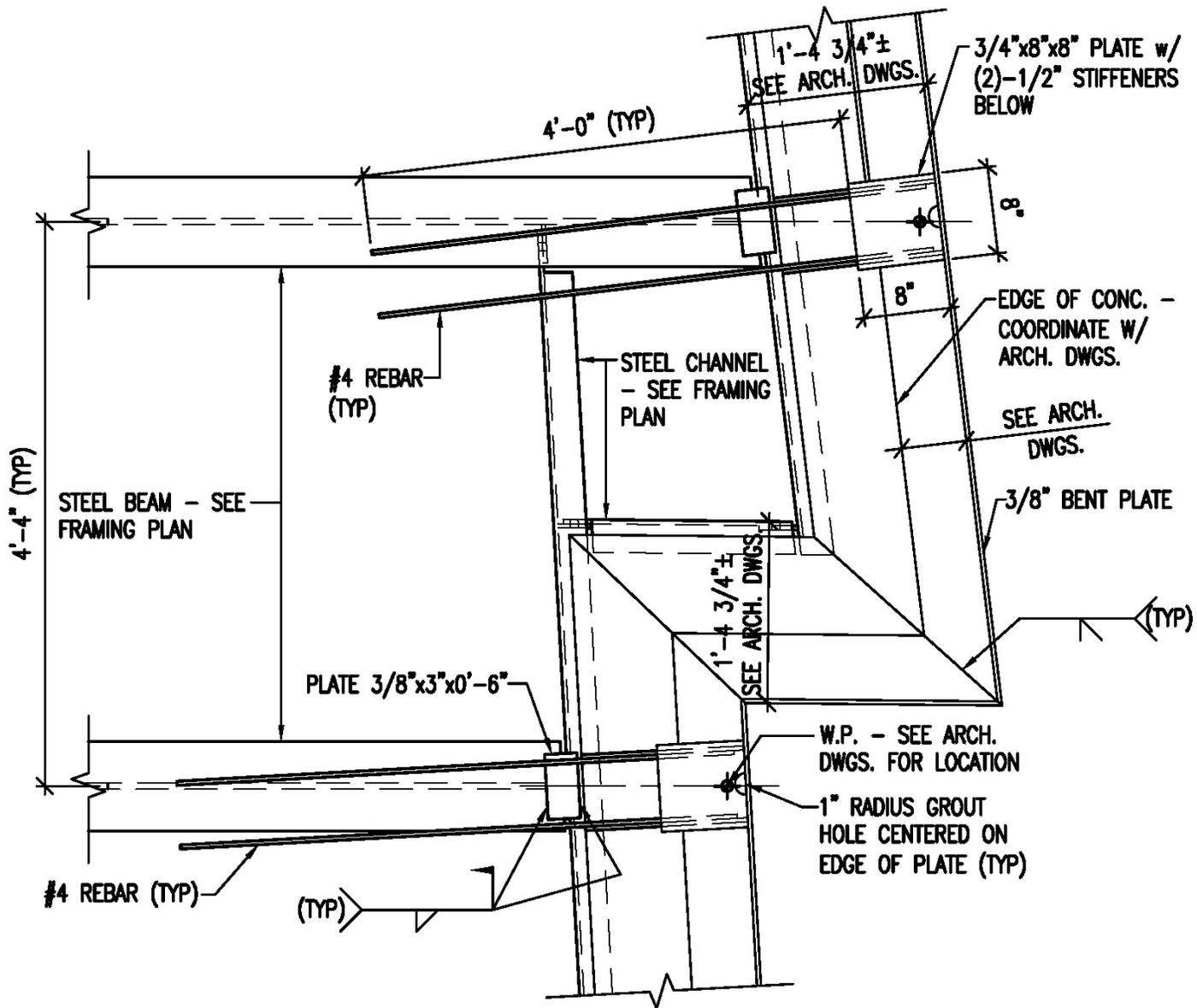




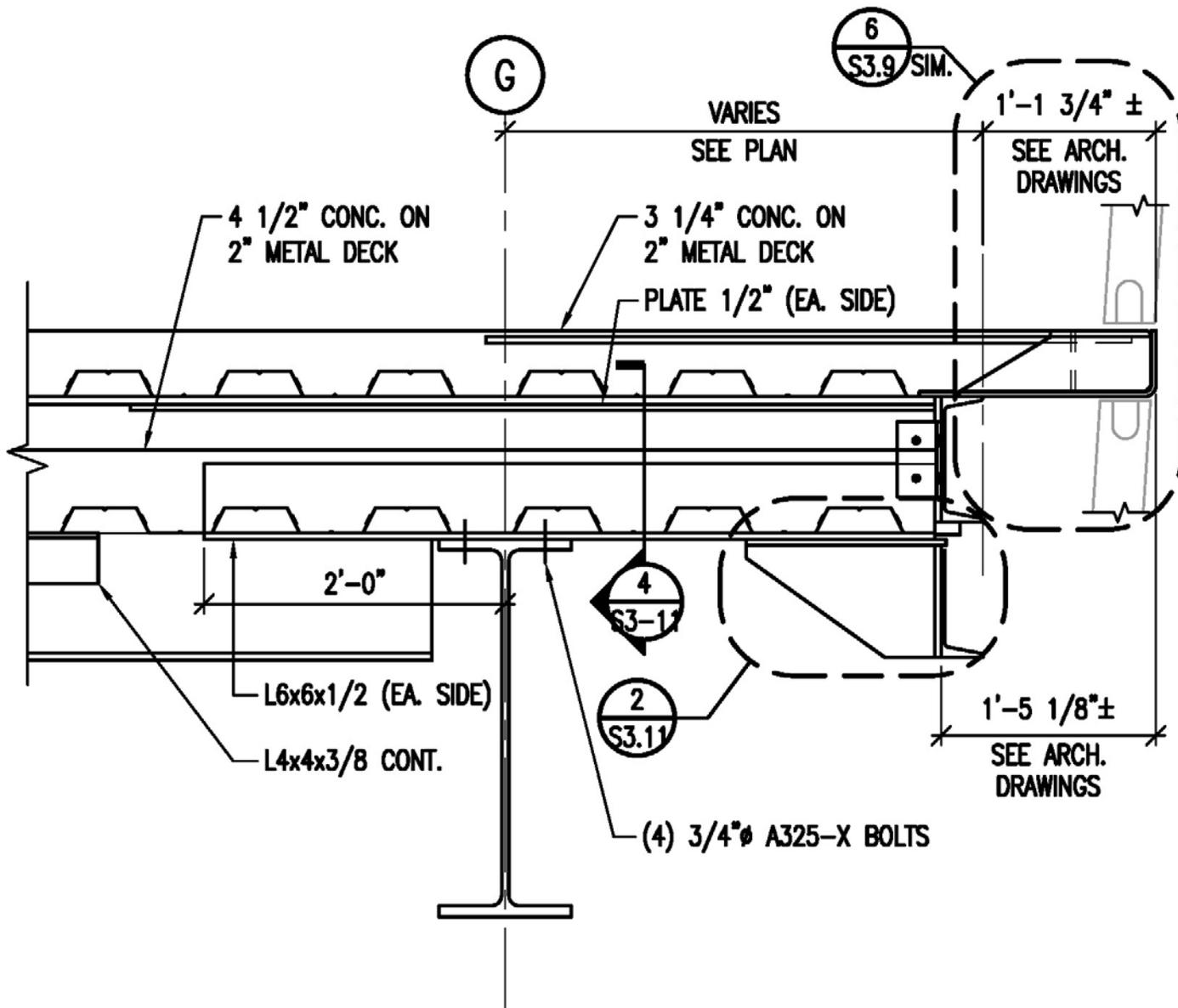


1 **FACADE ISOMETRIC**

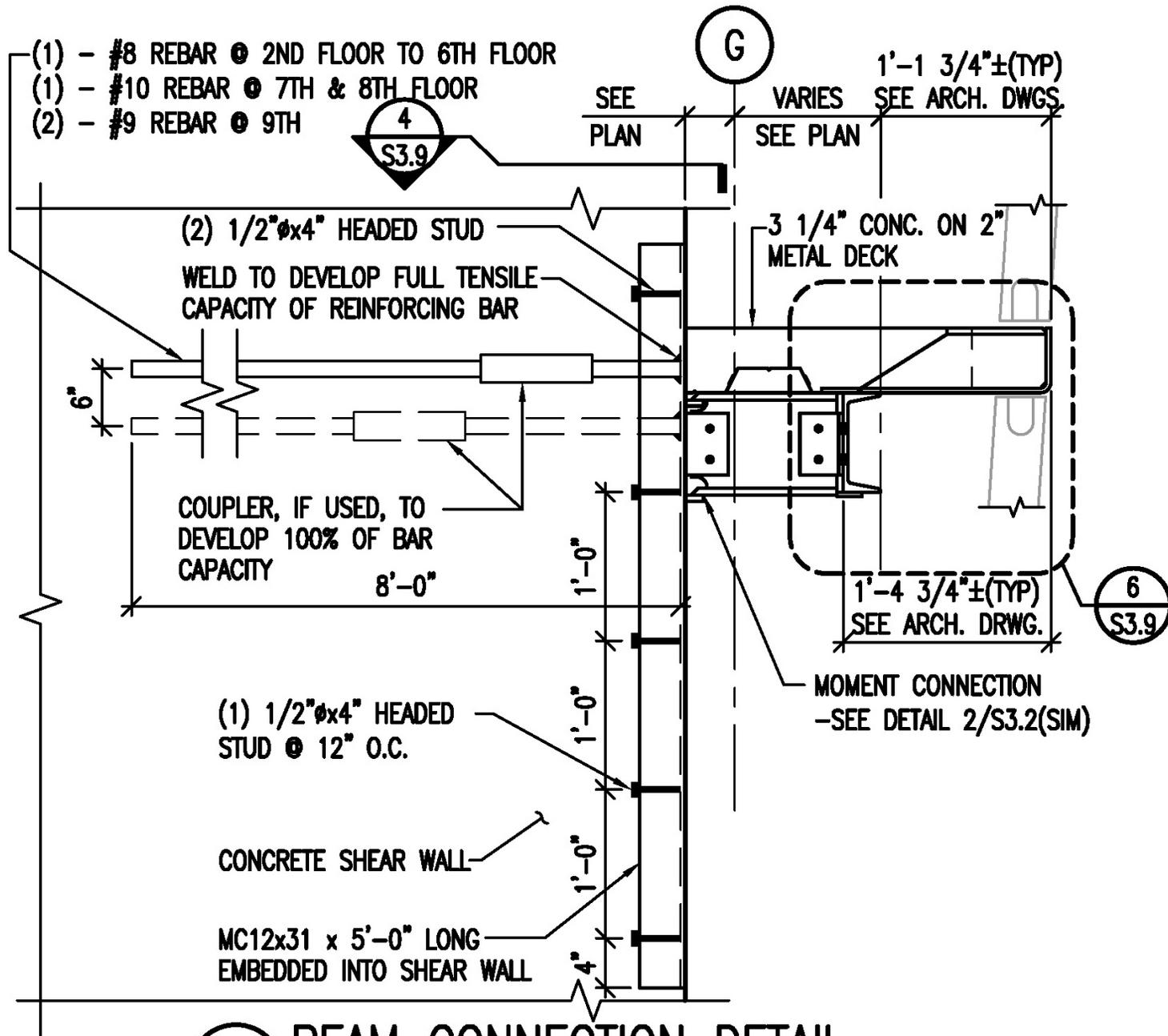
Scale: 1:100



9 PLAN @ BENT PLATE  
 INTERSECTION



1 FACADE CONNECTION DETAIL  
 @ 10TH/SKY GARDEN



**3** BEAM CONNECTION DETAIL @ SHEAR WALL

# *TGRWA*

*Structural Engineers*

***Structural Materials,  
Components and Systems***

***Tylk Gustafson Reckers Wilson Andrews, LLC  
Chicago, Illinois***