



Pro-Crete Precast Concrete Lintels

Design Calculations

Prepared for Florida Product Approval
April 25, 2012

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April 25, 2012

Pro-Crete Materials Corporation
1617 Division Avenue
Orlando, FL 32805

Attention: Adam Freeman

Reference:

Precast Concrete Lintel Calculations
Certification of Independence

Dear Sir,

I, Michael J. Bojack, Florida PE License No. 37804, hereby certify that neither Lindemann Bentzon Bojack (LBBE) nor I currently have, intend or will have any financial interest or benefit in Pro-Crete Precast, Inc. the product, Precast Lintels, or any other third party who may or will have any financial interest in either the company or the product. Nor are there any entities that own or control either myself or LBBE.

I further certify that neither LBBE nor I, or any other third party that may or will have any financial interest, have, intend to have or will have any financial interest or benefit in any entity involved in the Florida product approval process.

Very truly yours,

Michael J. Bojack P.E.
Florida License No. 37804

CONCRETE LINTEL PROPERTIES AND SPECIFICATIONS:

PRODUCT DESCRIPTION

The product is a steel reinforced concrete beam designed to be placed over an opening in a masonry wall. The primary elements are steel reinforcing and high strength precast concert with a U-shaped cross-section, which may be grout filled. Masonry units may be placed on top of the primary beam element and poured solid with grout to form a deeper section for additional load capacity. Additional steel reinforcement may also be provided.

The products herein have been evaluated for compliance with the requirements of the Florida Department of Community affairs for statewide acceptance as per rule 9B-72.070. To the best of my knowledge, these products comply with the Florida Building Code 2010, Building sections 1901.2 and 2107 and with Florida Building Code 2010 Residential, Sections R402.2 and R606.

GENERAL STRUCTURAL NOTES:

1. Allowable loads conform to ACI 318 and ACI 530 and are based upon rational analysis.
2. Full mortar joints are required.
3. Steel reinforcing bar at bottom of lintel cavity may be added in the field.
4. Vertical reinforcement and grout may be placed in 5 1/2" long notches at each lintel end.
5. Mechanical anchorage provided by 7/32" dia. wire stirrups welded to the bottom longitudinal reinforcing bars.
6. Lintel installation must conform to construction documents
7. Poured in place concrete may be placed above primary precast lintel as an alternate to grouted CMU to form the composite beam.
8. When dead load plus construction load exceed the allowable load capacity of the unfilled precast lintel, lintels shall be shored at 8' o.c. maximum and shoring maintained until grout reaches maturity.
9. Lintels with a nominal height of 8" and longer then 17' 0" meet or exceed L/180 deflection ratio. All other lintels meet or exceed L/360 deflection ratio.
10. Using the following equation, lintels shall be checked for simultaneous load stresses when a combination of vertical and horizontal loads are applied:

$$\frac{Applied_{Vert}}{Allowed_{Vert}} + \frac{Applied_{Horiz}}{Allowed_{Horiz}} \leq 1.0$$

MATERIAL SPECIFICATIONS:

1. Precast, non-prestressed lintels are to be 3,500 psi (f'c), 6,000 psi otherwise
2. Grout to have a minimum compressive strength of 3,000 psi (f'g) per ASTM C476 with maximum aggregate size of 3/8" and a slump range from 8" to 11".
3. Concrete masonry units shall conform to ASTM C90 with a minimum 1,900 psi net area compressive strength.

4. Steel reinforcement shall be ASTM A615, Grade 60 if not prestressed ASTM A416, Grade 270, low relaxation otherwise
5. Mortar: ASTM C270, Type M or S.

LOAD TABLE NOTES CRITERIA

1. Load ratings are expressed as pounds per linear foot applied uniformly and assume bearing conditions conform to ACI 530 and ACI 318.
2. Composite beam loads assume matching top and bottom field-placed steel reinforcing.
3. Load ratings are net capacity (beam dead load subtracted or added as appropriate).
4. For beam heights not shown, use tabular values for next lower height.
5. For beam lengths not shown, use tabular values for next longer length.
6. Uplift ratings assume placement of 1 #5 vertical reinforcing bar in each beam end continuous to within 2" of the top of beam with hooks into filled cells.
7. Lateral load ratings assume grout filled cells at each end of the beam span with a minimum of 1-#5 vertical bar.
8. Tabular values assume a 6 1/2" full width bearing at each end and Grade 60 reinforcing steel. Reduce tabular values by 20% for a 4" bearing and another 20% if Grade 40 steel is being used as the tension steel (e.g. bond beam steel acceptable as grade 40 for gravity loading)

INSTALLATION OF PRECAST AND PRESTRESSED LINTELS

LINTEL PLACEMENT

1. Verify that the required minimum end bearing for the specified product is provided.
2. Clean the openings and lintel bearings until free of debris, trash, and mortar spillage.
3. Provide 3/8" bed and head joints unless project specifications require otherwise. Remove any cementitious burrs in grout cavities.
4. Provide shoring during mortar curing, where necessary. Do not support concrete lintels on wood construction.
5. Adjust lintel for level course and plumb parallel to wall face and allow the assembly to cure sufficiently before the application of loads.
6. For concrete masonry units placed upon the precast lintel, align vertical cells to facilitate grout filling by providing fully mortared bed joints.
7. Prepare field reinforcement by removing dirt and any foreign material that could degrade the effectiveness of the bond between the reinforcement and the concrete.
8. Tie and secure reinforcement to prevent compromise of specified clearances during the placement of the grout.
9. Reinforcement splices of laps shall be as specified and located as shown on the project plans. Do not bend reinforcement after grout placement.
10. Provide grout or concrete with a minimum compressive strength per this document or the construction documents, which ever is higher.

CLIENT PROCCRETE

JOB PRECAST LINTEL CALCULATIONS

JOB-ADDRESS FL. PRODUCT APPROX.

BUILDING CODE FBC/IBC EDITION '07/'06

PREPARED RCC CHECKED MJB DATE 10-27-09

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BASIS OF CALCULATION TABLES:

- THE LOAD TABLES FOR THE PRECAST AND PRESTRESSED CONCRETE LINTELS, AS ISSUED BY THIS OFFICE, HAVE BEEN CALCULATED VIA MICROSOFT EXCEL WITH THE FOLLOWING FORMULAS AND CONDITIONS.
- THE FORMAT OF THIS PRESENTATION SHALL BEGIN WITH THE FORMULAS USED TO PRODUCE THE END ALLOWABLE FORCES AND FIELD UPON THE VARIABLES GOING FORWARD.

PRECAST:

ALLOWABLE PLF:

PLF DETERMINED FROM THE MINIMUM ALLOWABLE OF 3 FAILURE MODES:

I. SHEAR:

$$\phi V \leq \frac{W L_v}{2} \rightarrow \boxed{W \leq \frac{2\phi V}{L_v}}$$

- WHERE 'L_v' IS THE "CLEAR" SPAN MINUS A DISTANCE 'd' (DEPTH OF SECTION) PER ACI 318-05 SECTION 11.3.1.

- BASED ON THE FULL BODY DIAGRAM R11.1.3.1(a) A DECISION HAS BEEN MADE TO LIMIT THE ALLOWABLE PLF TO THE VALUE FOR ONE PLAIN OF SHEAR IN THOSE CASES WHERE THE EFFECTIVE SPAN IS LESS THAN 12" OR THE DEPTH 'd' OF THE SECTION.

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CLIENT PROLEETE

JOB PRECAST LENTEL CALCULATIONS

JOB ADDRESS FL. PRODUCT APPROVAL

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1 SHEAR: (CONT.)

- THUS, THE EFFECTIVE LENGTH 'L_v' IS DETERMINED WITH:

IF

UNIT LENGTH = 2x 6.5" (BEARING) - 2d < 12"

OR

UNIT LENGTH = 2x 6.5" - 2d < d

THEN

L = 12" → W = V

ELSE

L = UNIT LENGTH - 2x 6.5 - 2d

- THE VALUE FOR THE ALLOWABLE SHEAR IS DETERMINED W/ A SIMPLIFIED APPROACH:

$d_v = \sqrt{d^2 + d'^2} = d\sqrt{2}$

WHERE

$\phi F_v = 0.6 \cdot n \cdot 2\sqrt{f_c}$

WHERE

$n = \frac{E_s}{E_c} = \frac{500 F_s}{57,000 \sqrt{f_c}} = 0.45$

- HOWEVER, THIS IS ASSUMING THE ENTIRE SECTION IS GROUT - AFTER SOME TRIAL ADJUSTMENTS USING THE ~36 SQ. IN. AREA OF CONCRETE COMPRESSING THE UNIT A MORE APPROPRIATE FACTOR OF 0.5 IS ASSUMED.

→ $\phi F_v = 0.6 \cdot 0.5 \cdot 2\sqrt{3,500} = 35.5 \text{ PSI}$

REARRANGING → $\sqrt{2} \cdot 35.5 = \underline{50 \text{ PSI}}$

- NOTE $\phi = 0.6$ IS CONSERVATIVELY TAKEN FROM THE MSJCDS FOR GROUT, REGARDLESS OF THE SECTION BEING TRANSFORMED.

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1. SHEAR: (CONT.)

THUS, THE RESULTING ALLOWABLE SHEAR IS:

$$\phi V = 50 \cdot b \cdot d - \text{SELF WEIGHT} \left\{ \begin{array}{l} 145 \text{ PCF} \cdot b/12 \cdot d/12 \cdot L_v/12 \\ \text{BUT, } 145/12 \cdot 12 \approx 1.0 \end{array} \right.$$

THUS,

$$\phi V = 50 \cdot b \cdot d - b \cdot d \cdot L_v/12$$

NOTE: THE CONTRIBUTION OF 3500 PSI CONCRETE FOR THE 12" WIDE SECTION RESULTS IN $f_c = 46 \text{ PSI}$

2. BENDING:

$$\phi M = \frac{w L_b^2}{8} \rightarrow \boxed{w_u = \frac{8 \phi M}{L_b^2}}$$

- WHERE 'L_b' IS THE CLEAR SPAN, UNIT LENGTH = 2.0.5"

$$- \phi M = 0.85 \cdot A_s \cdot f_y \cdot (d_c - a/2); f_y = 60,000 \text{ PSI}$$

- WHERE 'A_s' IS DEPENDANT UPON THE DEPTH AND LENGTH OF THE UNIT.

IF $d = 7.625$

THEN

"TOP STEEL" IS EXCLUDED (NOTE, BOND BEAM REINF. EDGE IS ALWAYS EXCLUDED)

ALL HORIZONTAL STEEL WITHIN PRECAST PORTION PLUS "IG" IF PRESENT

WHERE

A_s TOP STEEL = 2 x 0.1045

AND (SEE NEXT PAGE)

2. BENDING (CONT.)

A, BOTTOM STEEL, FOR 3" LINTELS (2.031 IF 12" UNIT)

IF

UNIT LENGTH $\leq 4'6"$

THEN

2.0.045 (#4.5'S)

ELSE, IF

UNIT LENGTH $\leq 5'10"$

THEN

2.0.11 (#3'S)

ELSE, IF

UNIT LENGTH $\leq 11'4"$, AND NOT RECESSED

2.0.196 (#4'S) ELSE 2.0.31 (#5'S)

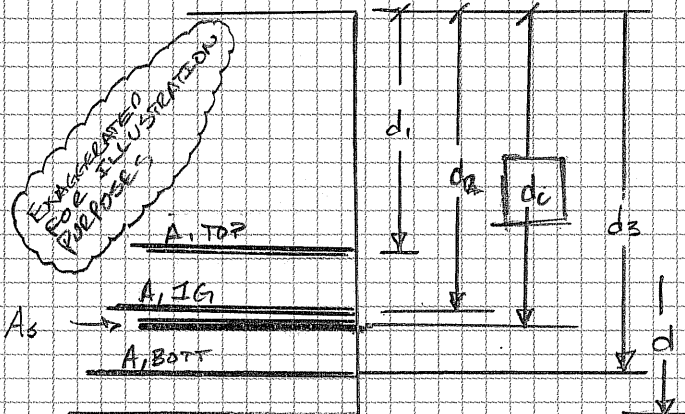
THUS, FOR THE EQUATION FOR ϕM ,

$A_s = A_{\text{BOTTOM STEEL}}$

+ $A_{\text{TOP STEEL, IF 'd' > 3"}}$

+ $A_{\text{IG, IF PRESENT}}$

- AND 'd_c' IS DETERMINED USING THE CENTER OF GRAVITY OF THE BARS BEING ACCOUNTED FOR IN THE FORMULATION OF A_s.



$$d_c = \frac{d_1 \times A_{\text{TOP}} + d_2 \times A_{\text{IG}} + d_3 \times A_{\text{BOTT}}}{A_s}$$

WHERE

$$d_1 = 'd' - 5.81$$

$$d_2 = 'd' - 2.0$$

$$d_3 = d - 0.945$$

ALL (-) 2.0 IF RECESSED

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2. BENDING (CONT.)

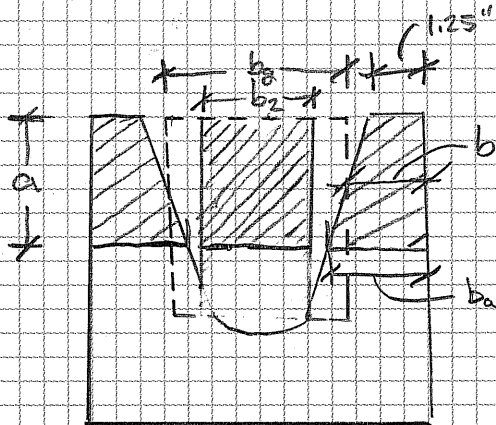
- THE COMPRESSIVE DEPTH 'a' IN THE FORMULA FOR ϕM ,
SEE PAGE 3, IS BASED ON THE TRANSFORMED
SECTION, USING THE FORMULA:

$$a = A_s f_y / \beta \cdot f'_c \cdot b_{eff}$$

WHERE A_s & f_y ARE AS PREVIOUSLY DETERMINED,
 $\beta = 0.85$ AND b_{eff} IS THE WIDTH OF THE TRANSFORMED
SECTION, FOR WHICH THE FORMULATION DIFFERS
DEPENDING ON WHETHER THE COMPRESSIVE DEPTH
OCCURS WITHIN THE UNIT OR THE MASONRY.

b_{eff} :

IF $d = 8''$



$$b_{eff} = 2 \cdot b_2 + b_1$$

BASED ON SIMILAR TRIANGLES:

$$b_1 = \frac{a \times 0.88}{2 \times 4.33}$$

WHERE 'a' IS AS DEFINED
ABOVE.

$$b_2 = b_g \cdot n = b_g \cdot \frac{E_s}{E_c}$$

AND

$$b_g = b - 2 \cdot b_1$$

THUS,

$$b_{eff} = n \left(b - 2 \cdot \frac{a \times 0.88}{2 \times 4.33} \right) + 2 \cdot \frac{a \times 0.88}{2 \times 4.33} \quad (\text{ITERATIVE ON 'a'})$$

ELSE, IF $d > 8''$

$$b_{eff} = 2 \cdot \frac{E_{cmu}}{E_c} \cdot 1.25 + \frac{E_s}{E_c} (b - 2 \cdot 1.25)$$

WHERE $E_{cmu} = 900 f'_{cmu}$

TABLES FOR 'a', 'b_{eff}', 'd_c' AND, ULTIMATELY, ' ϕM '
ARE PROVIDED HEREIN.

Bearing Depth 'a' (in.)

8 " Lintel 60 ksi steel Grout= 3000 psi
 CMU= 1900 psi Concrete= 3500 psi

	Type	E-8x8	P-8x8-0G	P-8x12-0G	P-8x16-0G	P-8x20-0G	P-8x24-0G	P-8x28-0G	P-8x32-0G
			P-8x8-1G	P-8x12-1G	P-8x16-1G	P-8x20-1G	P-8x24-1G	P-8x28-1G	P-8x32-1G
2'-10" (34")	Precast		0.377	1.024	1.024	1.024	1.024	1.024	1.024
			1.614	2.769	2.769	2.769	2.769	2.769	2.769
3'-6" (42")	Precast		0.377	1.024	1.024	1.024	1.024	1.024	1.024
			1.614	2.769	2.769	2.769	2.769	2.769	2.769
4'-0" (48")	Precast		0.377	1.024	1.024	1.024	1.024	1.024	1.024
			1.614	2.769	2.769	2.769	2.769	2.769	2.769
4'-6" (54")	Precast		0.377	1.024	1.024	1.024	1.024	1.024	1.024
			1.614	2.769	2.769	2.769	2.769	2.769	2.769
5'-4" (64")	Precast		0.913	1.769	1.769	1.769	1.769	1.769	1.769
			2.121	3.513	3.513	3.513	3.513	3.513	3.513
5'-10" (70")	Precast		0.913	1.769	1.769	1.769	1.769	1.769	1.769
			2.121	3.513	3.513	3.513	3.513	3.513	3.513
6'-6" (78")	Precast		1.598	2.745	2.745	2.745	2.745	2.745	2.745
			2.771	4.489	4.489	4.489	4.489	4.489	4.489
7'-6" (90")	Precast		1.598	2.745	2.745	2.745	2.745	2.745	2.745
			2.771	4.489	4.489	4.489	4.489	4.489	4.489
8'-6" (102")	Precast		1.598	2.745	2.745	2.745	2.745	2.745	2.745
			2.771	4.489	4.489	4.489	4.489	4.489	4.489
9'-4" (112")	Precast		1.598	2.745	2.745	2.745	2.745	2.745	2.745
			2.771	4.489	4.489	4.489	4.489	4.489	4.489
10'-6" (126")	Precast		1.598	2.745	2.745	2.745	2.745	2.745	2.745
			2.771	4.489	4.489	4.489	4.489	4.489	4.489
11'-4" (136")	Precast		2.448	4.745	4.745	4.745	4.745	4.745	4.745
			3.581	6.489	6.489	6.489	6.489	6.489	6.489
12'-0" (144")	Precast		2.448	4.745	4.745	4.745	4.745	4.745	4.745
			3.581	6.489	6.489	6.489	6.489	6.489	6.489
13'-4" (160")	Precast		2.448	4.745	4.745	4.745	4.745	4.745	4.745
			3.581	6.489	6.489	6.489	6.489	6.489	6.489
14'-0" (168")	Precast		2.448	4.745	4.745	4.745	4.745	4.745	4.745
			3.581	6.489	6.489	6.489	6.489	6.489	6.489
14'-8" (176")	Precast		2.448	4.745	4.745	4.745	4.745	4.745	4.745
			3.581	6.489	6.489	6.489	6.489	6.489	6.489
14'-8" (176")	Prestressed		xxx	xxx	xxx	xxx	xxx	xxx	xxx
			xxx	xxx	xxx	xxx	xxx	xxx	xxx
15'-4" (184")	Precast		2.448	4.745	4.745	4.745	4.745	4.745	4.745
			3.581	6.489	6.489	6.489	6.489	6.489	6.489
15'-4" (184")	Prestressed		xxx	xxx	xxx	xxx	xxx	xxx	xxx
			xxx	xxx	xxx	xxx	xxx	xxx	xxx
17'-4" (208")	Prestressed		xxx	xxx	xxx	xxx	xxx	xxx	xxx
			xxx	xxx	xxx	xxx	xxx	xxx	xxx
19'-4" (232")	Prestressed		xxx	xxx	xxx	xxx	xxx	xxx	xxx
			xxx	xxx	xxx	xxx	xxx	xxx	xxx
21'-4" (256")	Prestressed		xxx	xxx	xxx	xxx	xxx	xxx	xxx
			xxx	xxx	xxx	xxx	xxx	xxx	xxx
22'-0" (264")	Prestressed		xxx	xxx	xxx	xxx	xxx	xxx	xxx
			xxx	xxx	xxx	xxx	xxx	xxx	xxx
24'-0" (288")	Prestressed		xxx	xxx	xxx	xxx	xxx	xxx	xxx
			xxx	xxx	xxx	xxx	xxx	xxx	xxx

Length

Depth to Bar Center (dc - inches)

8" Lintel 60 ksi steel Grout= 3000 psi
 CMU= 1900 psi Concrete= 3500 psi

	Type	E-8x8	P-8x8-0G	P-8x12-0G	P-8x16-0G	P-8x20-0G	P-8x24-0G	P-8x28-0G	P-8x32-0G
			P-8x8-1G	P-8x12-1G	P-8x16-1G	P-8x20-1G	P-8x24-1G	P-8x28-1G	P-8x32-1G
2'-10" (34")	Precast		6.680	8.248	12.248	16.248	20.248	24.248	28.248
			5.864	9.116	13.116	17.116	21.116	25.116	29.116
3'-6" (42")	Precast		6.680	8.248	12.248	16.248	20.248	24.248	28.248
			5.864	9.116	13.116	17.116	21.116	25.116	29.116
4'-0" (48")	Precast		6.680	8.248	12.248	16.248	20.248	24.248	28.248
			5.864	9.116	13.116	17.116	21.116	25.116	29.116
4'-6" (54")	Precast		6.680	8.248	12.248	16.248	20.248	24.248	28.248
			5.864	9.116	13.116	17.116	21.116	25.116	29.116
5'-4" (64")	Precast		6.680	9.272	13.272	17.272	21.272	25.272	29.272
			6.067	9.447	13.447	17.447	21.447	25.447	29.447
5'-10" (70")	Precast		6.680	9.272	13.272	17.272	21.272	25.272	29.272
			6.067	9.447	13.447	17.447	21.447	25.447	29.447
6'-6" (78")	Precast		6.680	9.773	13.773	17.773	21.773	25.773	29.773
			6.217	9.715	13.715	17.715	21.715	25.715	29.715
7'-6" (90")	Precast		6.680	9.773	13.773	17.773	21.773	25.773	29.773
			6.217	9.715	13.715	17.715	21.715	25.715	29.715
8'-6" (102")	Precast		6.680	9.773	13.773	17.773	21.773	25.773	29.773
			6.217	9.715	13.715	17.715	21.715	25.715	29.715
9'-4" (112")	Precast		6.680	9.773	13.773	17.773	21.773	25.773	29.773
			6.217	9.715	13.715	17.715	21.715	25.715	29.715
10'-6" (126")	Precast		6.680	9.773	13.773	17.773	21.773	25.773	29.773
			6.217	9.715	13.715	17.715	21.715	25.715	29.715
11'-4" (136")	Precast		6.680	9.392	13.392	17.392	21.392	25.392	29.392
			6.328	9.455	13.455	17.455	21.455	25.455	29.455
12'-0" (144")	Precast		6.680	9.392	13.392	17.392	21.392	25.392	29.392
			6.328	9.455	13.455	17.455	21.455	25.455	29.455
13'-4" (160")	Precast		6.680	9.392	13.392	17.392	21.392	25.392	29.392
			6.328	9.455	13.455	17.455	21.455	25.455	29.455
14'-0" (168")	Precast		6.680	9.392	13.392	17.392	21.392	25.392	29.392
			6.328	9.455	13.455	17.455	21.455	25.455	29.455
14'-8" (176")	Precast		6.680	9.392	13.392	17.392	21.392	25.392	29.392
			6.328	9.455	13.455	17.455	21.455	25.455	29.455
14'-8" (176")	Prestressed		Prestressed	Prestressed	Prestressed	Prestressed	Prestressed	Prestressed	Prestressed
			Prestressed	Prestressed	Prestressed	Prestressed	Prestressed	Prestressed	Prestressed
15'-4" (184")	Precast		6.680	9.392	13.392	17.392	21.392	25.392	29.392
			6.328	9.455	13.455	17.455	21.455	25.455	29.455
15'-4" (184")	Prestressed		Prestressed	Prestressed	Prestressed	Prestressed	Prestressed	Prestressed	Prestressed
			Prestressed	Prestressed	Prestressed	Prestressed	Prestressed	Prestressed	Prestressed
17'-4" (208")	Prestressed		Prestressed	Prestressed	Prestressed	Prestressed	Prestressed	Prestressed	Prestressed
			Prestressed	Prestressed	Prestressed	Prestressed	Prestressed	Prestressed	Prestressed
19'-4" (232")	Prestressed		Prestressed	Prestressed	Prestressed	Prestressed	Prestressed	Prestressed	Prestressed
			Prestressed	Prestressed	Prestressed	Prestressed	Prestressed	Prestressed	Prestressed
21'-4" (256")	Prestressed		Prestressed	Prestressed	Prestressed	Prestressed	Prestressed	Prestressed	Prestressed
			Prestressed	Prestressed	Prestressed	Prestressed	Prestressed	Prestressed	Prestressed
22'-0" (264")	Prestressed		Prestressed	Prestressed	Prestressed	Prestressed	Prestressed	Prestressed	Prestressed
			Prestressed	Prestressed	Prestressed	Prestressed	Prestressed	Prestressed	Prestressed
24'-0" (288")	Prestressed		Prestressed	Prestressed	Prestressed	Prestressed	Prestressed	Prestressed	Prestressed
			Prestressed	Prestressed	Prestressed	Prestressed	Prestressed	Prestressed	Prestressed

Length

Allowable Shear (lbs)

8 " Lintel 60 ksi steel Grout= 3000 psi
 CMU= 1900 psi Concrete= 3500 psi

	Type	E-8x8	P-8x8-0G	P-8x12-0G	P-8x16-0G	P-8x20-0G	P-8x24-0G	P-8x28-0G	P-8x32-0G
			P-8x8-1G	P-8x12-1G	P-8x16-1G	P-8x20-1G	P-8x24-1G	P-8x28-1G	P-8x32-1G
2'-10" (34")	Precast	2526.71766	2849	4343	5838	7332	8827	10321	11816
			2849	4343	5838	7332	8827	10321	11816
3'-6" (42")	Precast	2487.11067	2846	4343	5838	7332	8827	10321	11816
			2846	4343	5838	7332	8827	10321	11816
4'-0" (48")	Precast	2441.92909	2817	4343	5838	7332	8827	10321	11816
			2817	4343	5838	7332	8827	10321	11816
4'-6" (54")	Precast	2399.1607	2788	4309	5838	7332	8827	10321	11816
			2788	4309	5838	7332	8827	10321	11816
5'-4" (64")	Precast	2464.96932	2739	4235	5772	7332	8827	10321	11816
			2739	4235	5772	7332	8827	10321	11816
5'-10" (70")	Precast	2420.53671	2710	4191	5713	7275	8827	10321	11816
			2710	4191	5713	7275	8827	10321	11816
6'-6" (78")	Precast	2513.84854	2671	4132	5633	7175	8757	10321	11816
			2671	4132	5633	7175	8757	10321	11816
7'-6" (90")	Precast	2423.92516	2613	4043	5514	7025	8577	10170	11803
			2613	4043	5514	7025	8577	10170	11803
8'-6" (102")	Precast	2344.58182	2555	3955	5395	6876	8397	9959	11562
			2555	3955	5395	6876	8397	9959	11562
9'-4" (112")	Precast	2284.62369	2507	3881	5296	6751	8247	9784	11361
			2507	3881	5296	6751	8247	9784	11361
10'-6" (126")	Precast	2207.87786	2439	3777	5157	6576	8037	9538	11080
			2439	3777	5157	6576	8037	9538	11080
11'-4" (136")	Precast	2310.927	2390	3704	5057	6452	7887	9363	10879
			2390	3704	5057	6452	7887	9363	10879
12'-0" (144")	Precast	2264.61121	2352	3644	4978	6352	7767	9222	10718
			2352	3644	4978	6352	7767	9222	10718
13'-4" (160")	Precast	2178.29972	2274	3526	4819	6152	7527	8941	10397
			2274	3526	4819	6152	7527	8941	10397
14'-0" (168")	Precast	2137.76809	2235	3467	4740	6053	7406	8801	10236
			2235	3467	4740	6053	7406	8801	10236
14'-8" (176")	Precast	2098.70025	2197	3408	4660	5953	7286	8660	10075
			2197	3408	4660	5953	7286	8660	10075
14'-8" (176")	Prestressed		2197	3408	4660	5953	7286	8660	10075
			2197	3408	4660	5953	7286	8660	10075
15'-4" (184")	Precast		2158	3349	4581	5853	7166	8520	9914
			2158	3349	4581	5853	7166	8520	9914
15'-4" (184")	Prestressed		2158	3349	4581	5853	7166	8520	9914
			2158	3349	4581	5853	7166	8520	9914
17'-4" (208")	Prestressed		2042	3172	4342	5554	6806	8099	9432
			2042	3172	4342	5554	6806	8099	9432
19'-4" (232")	Prestressed		1925	2994	4104	5255	6446	7677	8950
			1925	2994	4104	5255	6446	7677	8950
21'-4" (256")	Prestressed		1809	2817	3866	4955	6085	7256	8468
			1809	2817	3866	4955	6085	7256	8468
22'-0" (264")	Prestressed		1770	2758	3786	4856	5965	7116	8307
			1770	2758	3786	4856	5965	7116	8307
24'-0" (288")	Prestressed		1654	2581	3548	4556	5605	6694	7825
			1654	2581	3548	4556	5605	6694	7825

Length

Bearing Depth 'a' (in.)

12" Lintel 60 ksi steel Grout= 3000 psi
 CMU= 1900 psi Concrete= 3500 psi

	Type	E-8x8	P-12x8-0G	P-12x12-0G	P-12x16-0G	P-12x20-0G	P-12x24-0G	P-12x28-0G	P-12x32-0G
			P-12x8-2G	P-12x12-2G	P-12x16-2G	P-12x20-2G	P-12x24-2G	P-12x28-2G	P-12x32-2G
2'-10" (34")	Precast		0.276	0.748	0.748	0.748	0.748	0.748	0.748
			1.196	2.021	2.021	2.021	2.021	2.021	2.021
3'-6" (42")	Precast		0.276	0.748	0.748	0.748	0.748	0.748	0.748
			1.196	2.021	2.021	2.021	2.021	2.021	2.021
4'-0" (48")	Precast		0.276	0.748	0.748	0.748	0.748	0.748	0.748
			1.196	2.021	2.021	2.021	2.021	2.021	2.021
4'-6" (54")	Precast		0.276	0.748	0.748	0.748	0.748	0.748	0.748
			1.196	2.021	2.021	2.021	2.021	2.021	2.021
5'-4" (64")	Precast		0.672	1.291	1.291	1.291	1.291	1.291	1.291
			1.581	2.564	2.564	2.564	2.564	2.564	2.564
5'-10" (70")	Precast		0.672	1.291	1.291	1.291	1.291	1.291	1.291
			1.581	2.564	2.564	2.564	2.564	2.564	2.564
6'-6" (78")	Precast		1.184	2.004	2.004	2.004	2.004	2.004	2.004
			2.077	3.278	3.278	3.278	3.278	3.278	3.278
7'-6" (90")	Precast		1.184	2.004	2.004	2.004	2.004	2.004	2.004
			2.077	3.278	3.278	3.278	3.278	3.278	3.278
8'-6" (102")	Precast		1.184	2.004	2.004	2.004	2.004	2.004	2.004
			2.077	3.278	3.278	3.278	3.278	3.278	3.278
9'-4" (112")	Precast		1.184	2.004	2.004	2.004	2.004	2.004	2.004
			2.077	3.278	3.278	3.278	3.278	3.278	3.278
10'-6" (126")	Precast		1.184	2.004	2.004	2.004	2.004	2.004	2.004
			2.077	3.278	3.278	3.278	3.278	3.278	3.278
11'-4" (136")	Precast		1.830	3.464	3.464	3.464	3.464	3.464	3.464
			2.705	4.737	4.737	4.737	4.737	4.737	4.737
12'-0" (144")	Precast		1.830	3.464	3.464	3.464	3.464	3.464	3.464
			2.705	4.737	4.737	4.737	4.737	4.737	4.737
13'-4" (160")	Precast		1.830	3.464	3.464	3.464	3.464	3.464	3.464
			2.705	4.737	4.737	4.737	4.737	4.737	4.737
14'-0" (168")	Precast		1.830	3.464	3.464	3.464	3.464	3.464	3.464
			2.705	4.737	4.737	4.737	4.737	4.737	4.737
14'-8" (176")	Precast		1.830	3.464	3.464	3.464	3.464	3.464	3.464
			2.705	4.737	4.737	4.737	4.737	4.737	4.737
14'-8" (176")	Prestressed		precast	precast	precast	precast	precast	precast	precast
			precast	precast	precast	precast	precast	precast	precast
15'-4" (184")	Precast		1.830	3.464	3.464	3.464	3.464	3.464	3.464
			2.705	4.737	4.737	4.737	4.737	4.737	4.737
15'-4" (184")	Precast		1.830	4.737	4.737	4.737	4.737	4.737	4.737
			2.705	4.737	4.737	4.737	4.737	4.737	4.737
17'-4" (208")	Precast		1.830	3.464	3.464	3.464	3.464	3.464	3.464
			2.705	4.737	4.737	4.737	4.737	4.737	4.737
19'-4" (232")	Precast		1.830	3.464	3.464	3.464	3.464	3.464	3.464
			2.705	4.737	4.737	4.737	4.737	4.737	4.737
21'-4" (256")	Precast		1.830	3.464	3.464	3.464	3.464	3.464	3.464
			2.705	4.737	4.737	4.737	4.737	4.737	4.737
22'-0" (264")	Precast		1.830	3.464	3.464	3.464	3.464	3.464	3.464
			2.705	4.737	4.737	4.737	4.737	4.737	4.737
24'-0" (288")	Precast		1.830	3.464	3.464	3.464	3.464	3.464	3.464
			2.705	4.737	4.737	4.737	4.737	4.737	4.737

Length

Depth to Bar Center (dc - inches)

12 " Lintel 60 ksi steel Grout= 3000 psi
 CMU= 1900 psi Concrete= 3500 psi

	Type	E-8x8	P-12x8-0G	P-12x12-0G	P-12x16-0G	P-12x20-0G	P-12x24-0G	P-12x28-0G	P-12x32-0G
			P-12x8-2G	P-12x12-2G	P-12x16-2G	P-12x20-2G	P-12x24-2G	P-12x28-2G	P-12x32-2G
2'-10" (34")	Precast		6.680	8.248	12.248	16.248	20.248	24.248	28.248
			5.864	9.116	13.116	17.116	21.116	25.116	29.116
3'-6" (42")	Precast		6.680	8.248	12.248	16.248	20.248	24.248	28.248
			5.864	9.116	13.116	17.116	21.116	25.116	29.116
4'-0" (48")	Precast		6.680	8.248	12.248	16.248	20.248	24.248	28.248
			5.864	9.116	13.116	17.116	21.116	25.116	29.116
4'-6" (54")	Precast		6.680	8.248	12.248	16.248	20.248	24.248	28.248
			5.864	9.116	13.116	17.116	21.116	25.116	29.116
5'-4" (64")	Precast		6.680	9.272	13.272	17.272	21.272	25.272	29.272
			6.067	9.447	13.447	17.447	21.447	25.447	29.447
5'-10" (70")	Precast		6.680	9.272	13.272	17.272	21.272	25.272	29.272
			6.067	9.447	13.447	17.447	21.447	25.447	29.447
6'-6" (78")	Precast		6.680	9.773	13.773	17.773	21.773	25.773	29.773
			6.217	9.715	13.715	17.715	21.715	25.715	29.715
7'-6" (90")	Precast		6.680	9.773	13.773	17.773	21.773	25.773	29.773
			6.217	9.715	13.715	17.715	21.715	25.715	29.715
8'-6" (102")	Precast		6.680	9.773	13.773	17.773	21.773	25.773	29.773
			6.217	9.715	13.715	17.715	21.715	25.715	29.715
9'-4" (112")	Precast		6.680	9.773	13.773	17.773	21.773	25.773	29.773
			6.217	9.715	13.715	17.715	21.715	25.715	29.715
10'-6" (126")	Precast		6.680	9.773	13.773	17.773	21.773	25.773	29.773
			6.217	9.715	13.715	17.715	21.715	25.715	29.715
11'-4" (136")	Precast		6.680	9.392	13.392	17.392	21.392	25.392	29.392
			6.328	9.455	13.455	17.455	21.455	25.455	29.455
12'-0" (144")	Precast		6.680	9.392	13.392	17.392	21.392	25.392	29.392
			6.328	9.455	13.455	17.455	21.455	25.455	29.455
13'-4" (160")	Precast		6.680	9.392	13.392	17.392	21.392	25.392	29.392
			6.328	9.455	13.455	17.455	21.455	25.455	29.455
14'-0" (168")	Precast		6.680	9.392	13.392	17.392	21.392	25.392	29.392
			6.328	9.455	13.455	17.455	21.455	25.455	29.455
14'-8" (176")	Precast		6.680	9.392	13.392	17.392	21.392	25.392	29.392
			6.328	9.455	13.455	17.455	21.455	25.455	29.455
14'-8" (176")	Prestressed		Prestressed	Prestressed	Prestressed	Prestressed	Prestressed	Prestressed	Prestressed
			Prestressed	Prestressed	Prestressed	Prestressed	Prestressed	Prestressed	Prestressed
15'-4" (184")	Precast		6.680	9.392	13.392	17.392	21.392	25.392	29.392
			6.328	9.455	13.455	17.455	21.455	25.455	29.455
15'-4" (184")	Precast		6.328	9.455	13.455	17.455	21.455	25.455	29.455
			6.328	9.455	13.455	17.455	21.455	25.455	29.455
17'-4" (208")	Precast		6.680	9.392	13.392	17.392	21.392	25.392	29.392
			6.328	9.455	13.455	17.455	21.455	25.455	29.455
19'-4" (232")	Precast		6.680	9.392	13.392	17.392	21.392	25.392	29.392
			6.328	9.455	13.455	17.455	21.455	25.455	29.455
21'-4" (256")	Precast		6.680	9.392	13.392	17.392	21.392	25.392	29.392
			6.328	9.455	13.455	17.455	21.455	25.455	29.455
22'-0" (264")	Precast		6.680	9.392	13.392	17.392	21.392	25.392	29.392
			6.328	9.455	13.455	17.455	21.455	25.455	29.455
24'-0" (288")	Precast		6.680	9.392	13.392	17.392	21.392	25.392	29.392
			6.328	9.455	13.455	17.455	21.455	25.455	29.455

Length

Allowable Bending Moment (lb-ft)

12 " Lintel 60 ksi steel Grout= 3000 psi
 CMU= 1900 psi Concrete= 3500 psi

Length	Type	E-8x8	P-12x8-0G	P-12x12-0G	P-12x16-0G	P-12x20-0G	P-12x24-0G	P-12x28-0G	P-12x32-0G
			P-12x8-2G	P-12x12-2G	P-12x16-2G	P-12x20-2G	P-12x24-2G	P-12x28-2G	P-12x32-2G
			2'-10" (34")	Precast	1619	3428	5224	7021	8818
		5329	10143	15200	20256	25312	30369	35425	
3'-6" (42")	Precast	1447	3586	5437	7288	9138	10989	12840	
		5433	10301	15412	20523	25633	30744	35855	
4'-0" (48")	Precast	1483	3641	5511	7381	9251	11121	12991	
		5469	10357	15486	20616	25746	30875	36005	
4'-6" (54")	Precast	1505	3674	5556	7437	9318	11200	13081	
		5491	10390	15531	20672	25813	30954	36095	
5'-4" (64")	Precast	3684	7065	10348	13631	16914	20197	23480	
		7357	13338	19881	26423	32966	39509	46052	
5'-10" (70")	Precast	3691	7076	10363	13650	16938	20225	23512	
		7365	13349	19896	26443	32990	39536	46083	
6'-6" (78")	Precast	6326	11209	16326	21442	26558	31674	36790	
		9598	16901	25277	33653	42029	50405	58781	
7'-6" (90")	Precast	6333	11220	16340	21459	26579	31699	36819	
		9605	16912	25291	33671	42050	50430	58809	
8'-6" (102")	Precast	6338	11226	16348	21470	26592	31714	36836	
		9609	16918	25300	33682	42063	50445	58827	
9'-4" (112")	Precast	6340	11230	16353	21476	26600	31723	36846	
		9612	16922	25305	33688	42071	50454	58837	
10'-6" (126")	Precast	6342	11234	16358	21483	26607	31732	36856	
		9614	16926	25310	33694	42078	50462	58847	
11'-4" (136")	Precast	9389	16969	25832	34695	43558	52421	61284	
		12158	21471	33594	45717	57839	69962	82084	
12'-0" (144")	Precast	9390	16970	25834	34697	43560	52424	61287	
		12159	21473	33596	45719	57842	69965	82088	
13'-4" (160")	Precast	9391	16972	25836	34700	43564	52428	61292	
		12160	21474	33598	45722	57845	69969	82093	
14'-0" (168")	Precast	9392	16973	25837	34701	43566	52430	61294	
		12161	21475	33599	45723	57847	69971	82095	
14'-8" (176")	Precast	9392	16974	25838	34702	43567	52431	61296	
		12161	21476	33600	45724	57848	69972	82096	
14'-8" (176")	Prestressed		#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	
			#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	
15'-4" (184")	Precast	9393	16974	25839	34703	43568	52432	61297	
		12161	21476	33601	45725	57849	69973	82098	
15'-4" (184")	Precast	13231	21476	33601	45725	57849	69973	82098	
		12161	21476	33601	45725	57849	69973	82098	
17'-4" (208")	Precast	9393	16975	25840	34705	43570	52435	61300	
		12162	21478	33602	45727	57852	69976	82101	
19'-4" (232")	Precast	9394	16976	25841	34707	43572	52437	61303	
		12163	21478	33603	45728	57853	69978	82103	
21'-4" (256")	Precast	9394	16977	25842	34708	43573	52439	61304	
		12163	21479	33604	45729	57855	69980	82105	
22'-0" (264")	Precast	9394	16977	25842	34708	43574	52439	61305	
		12163	21479	33604	45730	57855	69980	82105	
24'-0" (288")	Precast	9395	16977	25843	34709	43574	52440	61306	
		12163	21480	33605	45730	57856	69981	82107	

Allowable Gravity Loading (PLF)

12 " Lintel 60 ksi steel Grout= 3000 psi
 CMU= 1900 psi Concrete= 3500 psi

Length	Type	E-8x8	P-12x8-2G	P-12x12-2G	P-12x16-2G	P-12x20-2G	P-12x24-2G	P-12x28-2G	P-12x32-2G
	2'-10" (34")	Precast	3256	3457	5270	7084	8897	10711	12524
3'-6" (42")	Precast	1793	6563	5270	7084	8897	10711	12524	14338
4'-0" (48")	Precast	1235	4392	5270	7084	8897	10711	12524	14338
4'-6" (54")	Precast	899	3278	6950	7084	8897	10711	12524	14338
5'-4" (64")	Precast	1478	2280	4602	8635	8897	10711	12524	14338
5'-10" (70")	Precast	1123	1917	3706	6718	9214	10711	12524	14338
6'-6" (78")	Precast	1442	1573	2923	4982	8438	11285	12524	14338
7'-6" (90")	Precast	1101	1226	2195	3544	5524	8065	9672	11280
8'-6" (102")	Precast	798	994	1737	2716	4048	5941	7255	8460
9'-4" (112")	Precast	624	853	1468	2254	3280	4659	5871	6846
10'-6" (126")	Precast	453	703	1194	1800	2559	3530	4513	5262
11'-4" (136")	Precast	507	621	1045	1561	2194	2984	3985	5285
12'-0" (144")	Precast	451	565	946	1405	1960	2642	3489	4562
13'-4" (160")	Precast	360	474	788	1158	1598	2124	2760	3536
14'-0" (168")	Precast	323	437	723	1059	1454	1923	2484	3159
14'-8" (176")	Precast	289	403	666	972	1330	1751	2249	2843
15'-4" (184")	Precast	259	373	615	895	1220	1601	2047	2575
17'-4" (208")	Precast	185	299	490	709	960	1249	1582	1967
19'-4" (232")	Precast	129	243	396	571	770	996	1253	1547

Allowable Shear (lbs)

12 " Lintel 60 ksi steel Grout= 3000 psi
 CMU= 1900 psi Concrete= 3500 psi

Length	Type	E-8x8	P-12x8-0G	P-12x12-0G	P-12x16-0G	P-12x20-0G	P-12x24-0G	P-12x28-0G	P-12x32-0G
			P-12x8-2G	P-12x12-2G	P-12x16-2G	P-12x20-2G	P-12x24-2G	P-12x28-2G	P-12x32-2G
2'-10" (34")	Precast	2509.59961	3457	5270	7084	8897	10711	12524	14338
			3457	5270	7084	8897	10711	12524	14338
3'-6" (42")	Precast	2469.10105	3452	5270	7084	8897	10711	12524	14338
			3452	5270	7084	8897	10711	12524	14338
4'-0" (48")	Precast	2415.36044	3408	5270	7084	8897	10711	12524	14338
			3408	5270	7084	8897	10711	12524	14338
4'-6" (54")	Precast	2364.03302	3364	5218	7084	8897	10711	12524	14338
			3364	5218	7084	8897	10711	12524	14338
5'-4" (64")	Precast	2415.5766	3290	5106	6984	8897	10711	12524	14338
			3290	5106	6984	8897	10711	12524	14338
5'-10" (70")	Precast	2362.58496	3246	5038	6893	8810	10711	12524	14338
			3246	5038	6893	8810	10711	12524	14338
6'-6" (78")	Precast	2444.48476	3186	4948	6772	8657	10605	12524	14338
			3186	4948	6772	8657	10605	12524	14338
7'-6" (90")	Precast	2337.44331	3098	4813	6590	8429	10330	12294	14319
			3098	4813	6590	8429	10330	12294	14319
8'-6" (102")	Precast	2240.98192	3009	4678	6409	8201	10056	11973	13951
			3009	4678	6409	8201	10056	11973	13951
9'-4" (112")	Precast	2166.75875	2935	4565	6257	8011	9827	11705	13645
			2935	4565	6257	8011	9827	11705	13645
10'-6" (126")	Precast	2070.04185	2832	4408	6045	7745	9507	11330	13216
			2832	4408	6045	7745	9507	11330	13216
11'-4" (136")	Precast	2158.82594	2758	4295	5894	7555	9278	11063	12910
			2758	4295	5894	7555	9278	11063	12910
12'-0" (144")	Precast	2101.09811	2699	4205	5773	7403	9095	10849	12664
			2699	4205	5773	7403	9095	10849	12664
13'-4" (160")	Precast	1991.96255	2581	4025	5531	7099	8728	10420	12174
			2581	4025	5531	7099	8728	10420	12174
14'-0" (168")	Precast	1940.01889	2522	3935	5409	6946	8545	10206	11929
			2522	3935	5409	6946	8545	10206	11929
14'-8" (176")	Precast	1889.539	2463	3844	5288	6794	8362	9992	11684
			2463	3844	5288	6794	8362	9992	11684
14'-8" (176")	Prestressed		2463	3844	5288	6794	8362	9992	11684
			2463	3844	5288	6794	8362	9992	11684
15'-4" (184")	Precast		2403	3754	5167	6642	8179	9778	11439
			2403	3754	5167	6642	8179	9778	11439
15'-4" (184")	Precast		2403	3754	5167	6642	8179	9778	11439
			2403	3754	5167	6642	8179	9778	11439
17'-4" (208")	Precast		2226	3484	4804	6186	7630	9136	10704
			2226	3484	4804	6186	7630	9136	10704
19'-4" (232")	Precast		2049	3214	4441	5730	7081	8494	9968
			2049	3214	4441	5730	7081	8494	9968
21'-4" (256")	Precast		1872	2944	4077	5273	6531	7851	9233
			1872	2944	4077	5273	6531	7851	9233
22'-0" (264")	Precast		1813	2853	3956	5121	6348	7637	8988
			1813	2853	3956	5121	6348	7637	8988
24'-0" (288")	Precast		1635	2583	3593	4665	5799	6995	8253
			1635	2583	3593	4665	5799	6995	8253

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CLIENT PCO-CRETE

JOB PRECAST LINTEL CALCULATIONS

JOB ADDRESS FL PRODUCT APPROVAL

BUILDING CODE _____ EDITION _____

PREPARED RCC CHECKED NJB DATE 10-27-09

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DEFLECTION:

- THE MAXIMUM ALLOWABLE LOAD PER LINEAR FOOT WHICH PRODUCES THE LIMIT DEFLECTION, Δ , IS DETERMINED VIA:

$$A = 5W L_b^4 / 384 E_{eff} I_{eff} \leq \frac{L_b}{F} \rightarrow W = \frac{384 \cdot E_c \cdot I_{eff}}{5 F L_b^3}$$

- WHERE 'F' IS 360 EXCEPT FOR BEAMS LONGER THAN 17'0" THAT ARE 8" DEEP, FOR WHICH 'F' = 180.

- 'L_b' IS AS DESCRIBED FOR THE BENDING LENGTH.

$$I_{eff} = \left(\frac{M_{cr}}{M} \right)^3 I_g + \left[1 + \left(\frac{M_{cr}}{M} \right)^3 \right] I_{cc} \leq I_g$$

WHERE

• $M_{cr} = I_g f_r / y_t$

• $I_g = b d^3 / 12$

• $f_r = 7.5 \sqrt{f_c'}$ IF $d = 8"$, $7.5 \sqrt{f_g'}$ OTHERWISE

• $y_t = d / 2$

- M IS THE ALLOWABLE BENDING MOMENT, AS PREVIOUSLY OUTLINED, DIVIDED THROUGH BY THE 0.85 SAFETY FACTOR.

$$I_{cc} = \frac{I_{eff} \cdot c^2}{3} + n A_s (d - c)^2$$

WHERE

$$c = \frac{-n A_s + \sqrt{n^2 A_s^2 + 4 \alpha n A_s d_c}}{2 \alpha}; \quad \alpha = b / 2$$

↳ SEE NEXT SHEET.

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CLIENT PROCRETE
 JOB PRECAST LINTEL CALCULATION
 JOB ADDRESS FL PRODUCT APPROVAL
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DEFLECTION:

$$\Delta C = \frac{-NA_s + \sqrt{N^2 A_s^2 + 2 b_{eff} d_c NA_s}}{b_{eff}}$$

WHERE

- $n = E_s / E_{cm}$ UNLESS $d \leq B$, THEN $E_{cm} \rightarrow E_c$
- A_s IS AS DESCRIBED IN THE 'BENDING' SECTION
- b_{eff} "
- d_c "

EXAMPLE CALCULATION:

CAPACITY OF 70" P 8x20-16:

- SHEAR:

$$V = 50 \times 7.625 \times 19.625 - 7.625 \times 19.625 \times L_v / 12$$

$$L_v = 70 - 2 \cdot 6.5 - 2 \cdot 19.625 = 17.75$$

$$\hookrightarrow 17.75 > 12$$

$$17.75 < 19.625 \rightarrow \text{LIMIT } W = V$$

$$V = 50 \times 7.625 \times 19.625 - 7.625 \times 19.625 \times 17.75 / 12$$

$$= 7,261$$

SINCE $W = V$

$$\boxed{W = 7,261} \quad \checkmark \text{ MATCHES EXCEL RESULTS}$$

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CLIENT PROCRETE

JOB PRECAST LINTEL CALCULATIONS

JOB ADDRESS FL PRODUCT APPROVAL

BUILDING CODE FBC/FRC EDITION '07/'06'

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EXAMPLE CALCULATION (CONT.)

BENDING:

$$\phi M = 0.85 A_s f_y (d_c - a/2)$$

A_s : $d > 8"$, INCLUDE TOP STEEL $\rightarrow 2 \cdot 0.045 = 0.09 \text{ IN}^2$

2G PRESENT $\rightarrow 0.31 \text{ IN}^2$

$70" \leq 5'10" \rightarrow 2 \cdot 0.11 = 0.22 \text{ IN}^2$

$$\hookrightarrow A_s = 0.09 + 0.31 + 0.22 = \underline{0.62 \text{ IN}^2}$$

d_c :	A_{si}	d_i	$d_i \cdot A_{si}$
	0.09	$19.625 - 5.31 = 13.31$	1.2429
	0.31	$19.625 - 2.0 = 17.625$	5.46375
	<u>0.22</u>	$19.625 - 0.945 = 18.68$	<u>4.1099</u>
	$\Sigma A_{si} = 0.62$		$\Sigma d_i A_{si} = 10.8163$

$$d_c = \frac{10.8163}{0.62} = \underline{17.45"}$$

$$b_{eff} = 2 \times \frac{1.71}{3.37} \times 1.25 + \frac{1.5}{3.37} \times (7.625 - 2.125) = \underline{3.55 \text{ IN}}$$

$$a = 0.62 \times 60,000 / 0.85 \times 3,500 \times 3.55 = \underline{3.52 \text{ IN}}$$

THUS,

$$\phi M = 0.85 \times 0.62 \times 60,000 \times (17.45 - 3.52/2) = 496,118.16 \text{ -in} / 12 \text{ in} = \underline{41,343.2 \text{ #-ft FACTORED ALLOW}}$$

ASSUMING WORST CASE OF 100% LIVE LOAD:

$$41,343.2 \div 1.6 = 25,839.5 \text{ 16-ft}$$

SUBTRACTING SELF WGT. @ 145 PCF

$$M_{DL} = 145 \text{ PCF} \times (7.625/12) \times (19.625/12) \times \left(\frac{51.5}{12}\right)^2 / 8 = 346.91 \text{ #-ft}$$

$$25,839.5 - 346.91 = \underline{25,492 \text{ #-ft} \checkmark}$$

CLIENT PROCESE
JOB PRECAST LINTEL CALCULATIONS
JOB ADDRESS FL. PRODUCT APPROVAL
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EXAMPLE CALCULATION (CONT.)

TIPS, THE ALLOWABLE LINEAR LOAD IN BENDING IS:

$$25,492 = \frac{W \cdot (51.5/12)^2}{15} \rightarrow W = \boxed{11,072 \text{ PLF}}$$

DEFLECTION

$$n = 2.9 / 1.71 = 1.69$$

$$A_s = 0.61$$

$$b_{eff} = 3.55 \text{ m}$$

$$d_c = 17.45$$

$$c = \frac{-1.69 \times 0.61 + \sqrt{1.69^2 \times 0.61^2 + 2 \times 3.55 \times 17.45 \times 1.69 \times 0.61}}{3.55}$$

$$= 2.91$$

$$I_{cr} = \frac{3.55 \times 2.91^3}{3} + 1.69 \times 0.61 (19.625 - 2.91)$$

$$= 46.4 \text{ IN}^4$$

$$I_g = 71625 \times 19.625^2 / 12 = 4802.7 \text{ IN}^4$$

$$f_r = 7.5 \times \sqrt{3500} = 443.7$$

$$M_{cr} = 4802.7 \times 443.7 / (19.625/12) = 217,168 \text{ ft-lb}$$

$$I_{eff} = \left(\frac{217,168}{(25,492 \times 12)} \right)^3 \times 4802.7$$

$$+ 46.4 \times \left(1 + \left(\frac{217,168}{(25,492 \times 12)} \right)^3 \right)$$

$$= \underline{17,81 \text{ IN}^4}$$

$$F = 360$$

$$W = \frac{384 \times 3.37 \times 10^9 \times 17,81}{5 \times 360 \times 51.5^2} = 9,374.13 \text{ lb/IN} \times 12 \text{ IN/ft} = \boxed{112 \text{ KLF}}$$

SHEAR CONTROLS \rightarrow $W_{allow} = 7,201 \text{ PLF}$

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CLIENT PRECRETE

JOB PRECAST LENSIL CALCULATIONS

JOB ADDRESS FL. PRODUCT APPROVAL

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PRESTRESSED

THE CALCULATIONS PREVIOUSLY OBTAINED ARE ACCURATE FOR ALL CASES EXCEPT THE BENDING MOMENT ALLOWABLE IS AS PREVIOUS PLUS!

$$M_n = A_{ps} f_{ps} \left[1 - 0.59 \left[w_p + \frac{d}{d_p} w_t \right] \right]$$

WITH

$$A_{ps} = 0.09$$

$$f_{ps} = f_{pu} \left[1 - \frac{\gamma_b}{\beta_1} \left[\rho_p \frac{f_{pu}}{f_c} + \frac{d}{d_p} (w - w_t) \right] \right]$$

$$f_{pu} = 270,000 \text{ PSI LOW-RELAX.}$$

$$\gamma_b = 0.55$$

$$\beta_1 = 0.85 - 0.05 \times (10,000 - 4,000) / 1000 = 0.75$$

$$\rho_p = A_{ps} / b \cdot d$$

$$w = \rho_p \cdot f_{ps} / f_c \leftarrow \text{NOTE } f_{ps} \text{ IS ITERATIVE ON } w$$

FOR THIS PURPOSE, THE ADDED STRENGTH OF PRESTRESSING IS GENERALLY ~ 50% OF THE TOTAL STRENGTH.

Allowable Gravity Loading (PLF)

8" Lintel 60 ksi steel Grout= 3000 psi
 CMU= 1900 psi Concrete= 3500 psi

Length	Type	E-8x8	P-8x8-0G	P-8x12-0G	P-8x16-0G	P-8x20-0G	P-8x24-0G	P-8x28-0G	P-8x32-0G
			P-8x8-1G	P-8x12-1G	P-8x16-1G	P-8x20-1G	P-8x24-1G	P-8x28-1G	P-8x32-1G
2'-10" (34")	Precast	2215	2849	4343	5838	7332	8827	10321	11816
			2849	4343	5838	7332	8827	10321	11816
3'-6" (42")	Precast	1820	1952	4343	5838	7332	8827	10321	11816
			2846	4343	5838	7332	8827	10321	11816
4'-0" (48")	Precast	1185	1370	3307	5029	6752	8475	10198	11816
			2817	4343	5838	7332	8827	10321	11816
4'-6" (54")	Precast	854	1012	2434	3700	4965	6231	7497	8762
			2717	4309	5838	7332	8827	10321	11816
5'-4" (64")	Precast	1462	1575	2992	4421	5850	7279	8708	10137
			1899	3818	5772	7332	8827	10321	11816
5'-10" (70")	Precast	932	1265	2403	3550	4697	5844	6992	8139
			1601	3083	5568	7275	8827	10321	11816
6'-6" (78")	Precast	986	1319	2441	4144	5636	7010	8385	9760
			1319	2441	4144	6993	8757	10321	11816
7'-6" (90")	Precast	860	1035	1844	2966	4028	5010	5993	6975
			1035	1844	2966	4604	7191	9433	11040
8'-6" (102")	Precast	670	844	1469	2284	3021	3758	4495	5232
			844	1469	2287	3394	4961	7074	8280
9'-4" (112")	Precast	539	713	1248	1848	2445	3041	3638	4234
			728	1248	1908	2764	3910	5509	6700
10'-6" (126")	Precast	374	548	962	1421	1879	2338	2796	3254
			606	1023	1535	2173	2985	4043	5150
11'-4" (136")	Precast	364	538	901	1339	1874	2536	3373	4454
			538	901	1339	1874	2536	3373	4454
12'-0" (144")	Precast	318	492	820	1211	1682	2256	2966	3861
			492	820	1211	1682	2256	2966	3861
13'-4" (160")	Precast	243	418	690	1009	1385	1832	2368	3020
			418	690	1009	1385	1832	2368	3020
14'-0" (168")	Precast	212	387	637	928	1267	1667	2142	2711
			387	637	928	1267	1667	2142	2711
14'-8" (176")	Precast	185	360	590	856	1165	1526	1949	2452
			360	590	856	1165	1526	1949	2452
14'-8" (176")	Prestressed	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
			380	628	1215	1698	1920	2290	2632
15'-4" (184")	Precast	160	335	548	793	1075	1403	1784	2232
			335	548	793	1075	1403	1784	2232
15'-4" (184")	Prestressed	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
			337	564	1129	1591	1791	2140	2460
17'-4" (208")	Prestressed	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
			290	370	871	1268	1404	1689	1945
19'-4" (232")	Prestressed	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
			208	298	799	1196	1332	1617	1873
21'-4" (256")	Prestressed	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
			171	261	762	1159	1295	1580	1836
22'-0" (264")	Prestressed	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
			162	252	753	1150	1286	1571	1827
24'-0" (288")	Prestressed	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
			128	218	719	1116	1252	1537	1793

Allowable Uplift Loading (PLF)

8" Lintel 60 ksi steel Grout= 3000 psi
 CMU= 1900 psi Concrete= 3500 psi

Length	Type	P-8x8-1T	P-8x12-1T	P-8x16-1T	P-8x20-1T	P-8x24-1T	P-8x28-1T	P-8x32-1T
		P-8x8-2T	P-8x12-2T	P-8x16-2T	P-8x20-2T	P-8x24-2T	P-8x28-2T	P-8x32-2T
2'-10" (34")	Precast	2151	3280	4408	5537	6665	7794	8922
		2151	3280	4408	5537	6665	7794	8922
3'-6" (42")	Precast	2148	3280	4408	5537	6665	7794	8922
		2148	3280	4408	5537	6665	7794	8922
4'-0" (48")	Precast	2119	3280	4408	5537	6665	7794	8922
		2119	3280	4408	5537	6665	7794	8922
4'-6" (54")	Precast	2037	3246	4408	5537	6665	7794	8922
		2037	3246	4408	5537	6665	7794	8922
5'-4" (64")	Precast	1371	2708	4133	5537	6665	7794	8922
		1415	2859	4342	5537	6665	7794	8922
5'-10" (70")	Precast	1102	2175	3319	4463	5607	6751	7895
		1189	2301	4174	5479	6665	7794	8922
6'-6" (78")	Precast	850	1678	2560	3443	4325	5207	6089
		974	1813	3092	5243	6596	7794	8922
7'-6" (90")	Precast	608	1200	1831	2461	3092	3722	4353
		758	1359	2197	3427	5379	7174	8437
8'-6" (102")	Precast	456	900	1373	1846	2320	2793	3266
		614	1074	1681	2507	3684	5381	6328
9'-4" (112")	Precast	369	729	1112	1494	1877	2260	2643
		525	906	1393	2029	2885	4086	5120
10'-6" (126")	Precast	284	560	855	1149	1443	1737	2032
		432	735	1109	1580	2182	2971	3936
11'-4" (136")	Precast	240	473	722	971	1219	1468	1716
		381	642	961	1352	1841	2462	3269
12'-0" (144")	Precast	212	418	637	856	1075	1295	1514
		346	581	863	1207	1628	2153	2819
13'-4" (160")	Precast	168	332	506	681	855	1029	1204
		284	482	710	981	1306	1698	2179
14'-0" (168")	Precast	151	299	456	612	769	926	1083
		256	442	648	891	1181	1527	1944
14'-8" (176")	Precast	137	270	412	554	696	838	980
		232	406	594	814	1073	1380	1748
14'-8" (176")	Prestressed	149	282	415	571	715	851	1048
		239	408	790	1104	1248	1489	1711
15'-4" (184")	Precast	125	246	375	503	632	761	890
		210	374	546	745	979	1255	1580
15'-4" (184")	Prestressed	131	265	397	542	681	807	995
		196	344	704	996	1119	1338	1539
17'-4" (208")	Prestressed	121	242	361	497	624	750	876
		182	274	446	674	732	887	1023
19'-4" (232")	Prestressed	105	218	335	459	587	718	825
		165	233	429	657	715	870	1006
21'-4" (256")	Prestressed	91	194	309	421	550	686	774
		135	203	399	627	685	840	976
22'-0" (264")	Prestressed	77	170	283	383	513	654	723
		102	201	397	625	683	838	974
24'-0" (288")	Prestressed	63	146	257	345	476	622	672
		82	181	377	605	663	818	954

Allowable Gravity Loading (PLF)

8" Lintel - Recessed 60 ksi steel 3000 psi Grout
1900 psi CMU 3500 psi Concrete

Length	Type	E-8x8	P-8x6R-0G	P-8x10R-0G	P-8x14R-0G	P-8x18R-0G	P-8x22R-0G	P-8x26R-0G	P-8x30R-0G
			P-8x6R-1G	P-8x10R-1G	P-8x14R-1G	P-8x18R-1G	P-8x22R-1G	P-8x26R-1G	P-8x30R-1G
3'-8" (44")	Precast	1883	2541	3596	5091	6585	8080	9574	11069
			2541	3596	5091	6585	8080	9574	11069
4'-0" (48")	Precast	1547	1820	2445	4168	5891	7614	9336	11059
			2011	3596	5091	6585	8080	9574	11069
4'-4" (52")	Precast	1007	1220	1985	3380	4776	6171	7566	8962
			1630	3596	5091	6585	8080	9574	11069
4'-6" (54")	Precast	726	935	1801	3067	4333	5598	6864	8129
			1478	3596	5091	6585	8080	9574	11069
5'-8" (68")	Precast	810	910	1962	3194	4425	5656	6887	8118
			1032	2397	4475	6585	8080	9574	11069
5'-10" (70")	Precast	671	712	1829	2976	4123	5271	6418	7565
			961	2258	4147	6585	8080	9574	11069
6'-8" (80")	Precast	720	775	1742	3020	4660	5955	7249	8544
			777	1742	3020	4997	8416	9574	11069
7'-0" (84")	Precast	621	691	1593	2717	4154	5308	6462	7616
			693	1593	2717	4389	7102	9574	11069
7'-6" (90")	Precast	510	589	1409	2356	3536	4519	5502	6484
			590	1409	2356	3701	5735	8629	10237
9'-8" (116")	Precast	288	330	882	1433	1984	2535	3086	3638
			331	919	1463	2152	3045	4241	5742

Allowable Uplift Loading (PLF)

8" Lintel - Recessed 60 ksi steel 3000 psi Grout
1900 psi CMU 3500 psi Concrete

	Type	P-8x6R-1T	P-8x10R-1T	P-8x14R-1T	P-8x18R-1T	P-8x22R-1T	P-8x26R-1T	P-8x30R-1T
		P-8x6R-2T	P-8x10R-2T	P-8x14R-2T	P-8x18R-2T	P-8x22R-2T	P-8x26R-2T	P-8x30R-2T
3'-8" (44")	Precast	1351	2715	3844	4972	6101	7229	8358
		1351	2715	3844	4972	6101	7229	8358
4'-0" (48")	Precast	1074	2699	3844	4972	6101	7229	8358
		1074	2699	3844	4972	6101	7229	8358
4'-4" (52")	Precast	873	2675	3844	4972	6101	7229	8358
		873	2675	3844	4972	6101	7229	8358
4'-6" (54")	Precast	793	2663	3839	4972	6101	7229	8358
		793	2663	3839	4972	6101	7229	8358
5'-8" (68")	Precast	448	1720	2948	4175	5403	6630	7858
		448	1786	3351	4898	6101	7229	8358
5'-10" (70")	Precast	418	1603	2747	3891	5035	6179	7323
		418	1681	3102	4876	6092	7229	8358
6'-8" (80")	Precast	304	1165	1996	2827	3658	4488	5319
		304	1289	2245	3733	5955	7187	8358
7'-0" (84")	Precast	271	1039	1779	2520	3261	4001	4742
		271	1175	2015	3271	5318	7122	8358
7'-6" (90")	Precast	231	885	1515	2146	2776	3407	4038
		231	1035	1741	2748	4280	6543	7805
9'-8" (116")	Precast	130	497	851	1204	1558	1912	2266
		130	663	1062	1571	2235	3129	4378

Length

Allowable Gravity Loading (PLF)

12" Lintel 60 ksi steel Grout= 3000 psi
 CMU= 1900 psi Concrete= 3500 psi

Length	Type	E-8x8	P-12x8-2G	P-12x12-2G	P-12x16-2G	P-12x20-2G	P-12x24-2G	P-12x28-2G	P-12x32-2G
	2'-10" (34")	Precast	3256	3457	5270	7084	8897	10711	12524
3'-6" (42")	Precast	1793	3452	5270	7084	8897	10711	12524	14338
4'-0" (48")	Precast	1235	3408	5270	7084	8897	10711	12524	14338
4'-6" (54")	Precast	899	3278	5218	7084	8897	10711	12524	14338
5'-4" (64")	Precast	1478	2280	4602	6984	8897	10711	12524	14338
5'-10" (70")	Precast	1123	1917	3706	6718	8810	10711	12524	14338
6'-6" (78")	Precast	1442	1573	2923	4982	8438	10605	12524	14338
7'-6" (90")	Precast	1101	1226	2195	3544	5524	8065	9672	11280
8'-6" (102")	Precast	798	994	1737	2716	4048	5941	7255	8460
9'-4" (112")	Precast	624	853	1468	2254	3280	4659	5871	6846
10'-6" (126")	Precast	453	703	1194	1800	2559	3530	4513	5262
11'-4" (136")	Precast	507	621	1045	1561	2194	2984	3985	5285
12'-0" (144")	Precast	451	565	946	1405	1960	2642	3489	4562
13'-4" (160")	Precast	360	474	788	1158	1598	2124	2760	3536
14'-0" (168")	Precast	323	437	723	1059	1454	1923	2484	3159
14'-8" (176")	Precast	289	403	666	972	1330	1751	2249	2843
15'-4" (184")	Precast	259	373	615	895	1220	1601	2047	2575
17'-4" (208")	Precast	185	299	490	709	960	1249	1582	1967
19'-4" (232")	Precast	129	243	396	571	770	996	1253	1547

Allowable Uplift Loading (PLF)

12" Lintel 60 ksi steel Grout= 3000 psi
 CMU= 1900 psi Concrete= 3500 psi

	Type	P-12x8-2T	P-12x12-2T	P-12x16-2T	P-12x20-2T	P-12x24-2T	P-12x28-2T	P-12x32-2T
Length	2'-10" (34")	2837	4325	5813	7301	8789	10277	11765
	3'-6" (42")	2832	4325	5813	7301	8789	10277	11765
	4'-0" (48")	2788	4325	5813	7301	8789	10277	11765
	4'-6" (54")	2674	4272	5813	7301	8789	10277	11765
	5'-4" (64")	1850	3750	5712	7301	8789	10277	11765
	5'-10" (70")	1551	3010	5479	7213	8789	10277	11765
	6'-6" (78")	1266	2364	4046	6711	8476	10242	11765
	7'-6" (90")	981	1764	2860	4477	6059	7320	8582
	8'-6" (102")	789	1386	2177	3260	4545	5491	6438
	9'-4" (112")	672	1164	1796	2626	3678	4444	5210
	10'-6" (126")	526	937	1421	2032	2817	3416	4005
	11'-4" (136")	444	815	1224	1731	2365	2886	3383
	12'-0" (144")	392	734	1095	1538	2083	2545	2984
	13'-4" (160")	312	603	892	1238	1656	2023	2372
	14'-0" (168")	280	549	810	1120	1491	1821	2134
	14'-8" (176")	254	502	738	1017	1348	1647	1931
	15'-4" (184")	231	460	674	927	1225	1497	1755
	17'-4" (208")	156	357	521	712	934	1152	1350
	19'-4" (232")	124	280	408	555	726	914	1071

Allowable Lateral Loading (PLF)

	Type	E-8x8	P-8x8	E-8x6R	P-8x6R	E-12x8	P-12x8	
Length	2'-10" (34")	Precast	1245	1598	N/A	N/A	1301	1555
	3'-6" (42")	Precast	998	1121	N/A	N/A	1301	1555
	4'-0" (48")	Precast	746	801	N/A	N/A	1301	1555
	4'-6" (54")	Precast	580	613	559	591	1047	1421
	5'-4" (64")	Precast	402	429	N/A	N/A	901	1370
	5'-10" (70")	Precast	329	354	310	334	739	1123
	6'-6" (78")	Precast	488	721	450	699	1080	1642
	7'-6" (90")	Precast	408	531	388	500	889	1351
	8'-6" (102")	Precast	350	525	N/A	N/A	760	1155
	9'-4" (112")	Precast	312	502	299	462	672	1021
	10'-6" (126")	Precast	274	390	N/A	N/A	570	866
	11'-4" (136")	Precast	250	440	N/A	N/A	480	730
	12'-0" (144")	Precast	235	389	N/A	N/A	370	562
	13'-4" (160")	Precast	209	310	N/A	N/A	280	426
	14'-0" (168")	Precast	198	278	N/A	N/A	240	365
	14'-8" (176")	Precast	185	246	N/A	N/A	210	319
	14'-8" (176")	Prestressed	N/A	251	N/A	N/A	N/A	N/A
	15'-4" (184")	Precast	168	225	N/A	N/A	198	301
	15'-4" (184")	Prestressed	N/A	246	N/A	N/A	181	275
	17'-4" (208")	Prestressed	N/A	201	N/A	N/A	156	237
	19'-4" (232")	Prestressed	N/A	150	N/A	N/A	125	190
	21'-4" (256")	Prestressed	N/A	124	N/A	N/A	N/A	N/A
	22'-0" (264")	Prestressed	N/A	112	N/A	N/A	N/A	N/A
	24'-0" (288")	Prestressed	N/A	85	N/A	N/A	N/A	N/A