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## Abstract

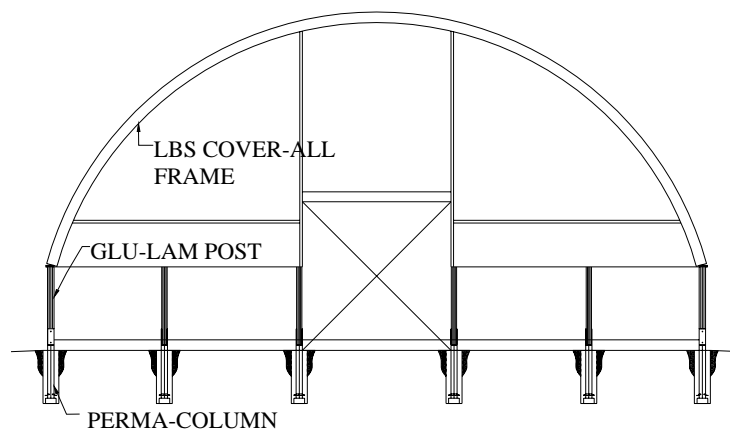
*Perma-Columns* are typically used as a foundation option for conventional post-frame buildings, but can also be considered for tensioned fabric buildings. *Cover-All's Legend Building Series (LBS)* frames are often elevated on post foundations, similar to those used in post-frame construction. The follow document is a guide to the design process for the use of *Perma-Columns* with *LBS* post mount buildings.

## Disclaimer

*Perma-Column* and wood post design methods presented herein are based on sample load cases provided by Cover-All, Inc. Specific building loads vary depending on *Cover-All* frame type, location, local building codes, and overall dimensions of the building. The load cases given in this document are based on site conditions for Oakland County, Michigan. This manual is a guide for preliminary design of *Cover-All LBS* post mount buildings on *Perma-Column* foundations located in the United States. Consult a Structural Engineer with experience in tensioned fabric buildings for final foundation design.

## Introduction to Cover-All Legend Building Series (LBS)

LBS buildings are conventional tensioned fabric structures with arched frames that provide high interior clearances. The arch design also gives the building structural stability and good resistance to exterior forces, such as wind and snow loads. They can be placed on several different kinds of foundations including: concrete walls and footings, piers, and wood or steel posts. The frame widths available for the post mount application are 18, 19, 30, 32, 36, 40, 42, 50, 55, and 62 foot spans. The distance between frames (bay spacing) generally ranges from 6 to 16 feet in two (2) foot increments. Although 70 and 72 foot spans are available, they are not intended for post mount applications.

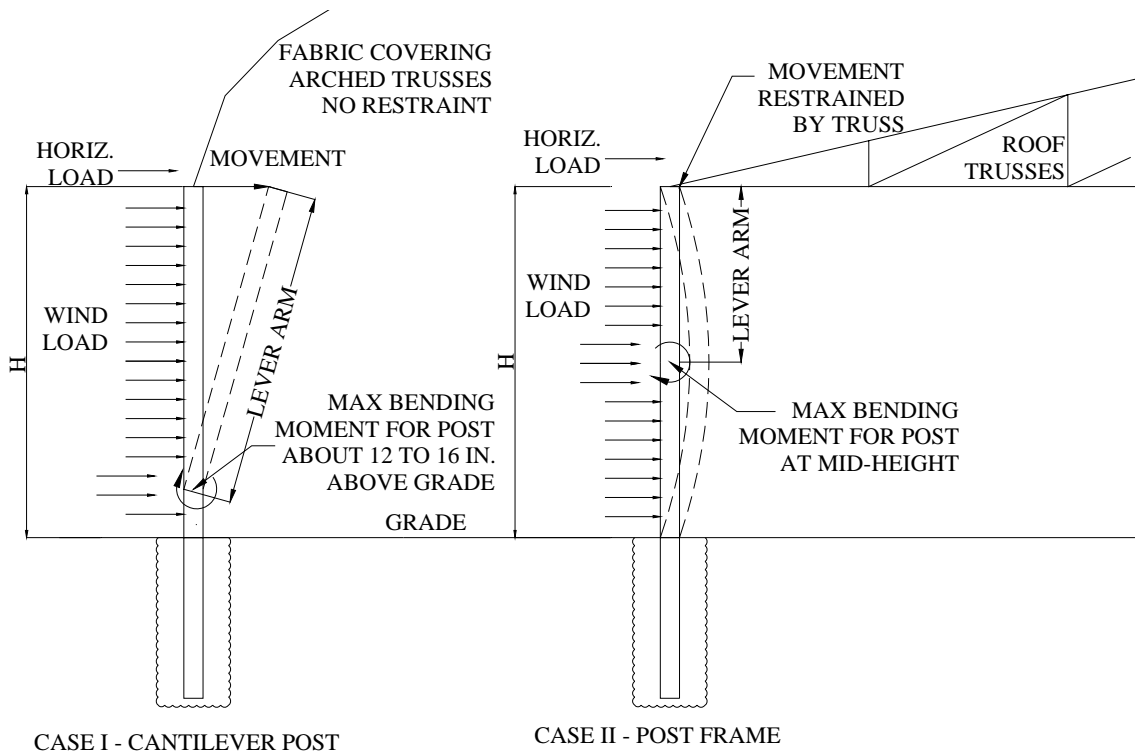


**Fig. 1** Elevation of Cover-All LBS Building

# LBS Post Mount Design

## 1. Design Analysis

Historically post frame buildings have been supported by rough sawn posts. However, because tensioned fabric buildings need support in both vertical and horizontal directions, Servinsky Engineering LLC recommends a stronger post. This requirement is because the semi-circular or arched profile of a LBS frame does not have a horizontal chord common to that of a standard roof truss. Without this horizontal chord the post acts as a cantilever beam with a bending moment that occurs near the base. Bending moment is measured by multiplying the horizontal load by the length of the post acting as a lever arm as per **Figure 2**. The lever arm for the fabric building is roughly twice that of the post frame design. Since solid timber posts only have an allowable bending stress less than 1000 psi, the proper solution for providing the necessary support is either glue or nail laminated wooden posts. The glu-lam posts are rated with high allowable bending stress (typically in the range of 1900 psi to 2400 psi). Nail-lams are also acceptable but are susceptible to corrosion of the nails and prying of the top plys.



**Fig. 2** Bending Moment of LBS vs. Post Frame Building

Because the Perma-Column is able to with stand higher bending stress than most glu-lam posts, the building design is controlled by the required post size. However, it is important to consider the stability of the embedded part of the Perma-Column. Soil conditions and depth of embedment will determine the overall stability of the Perma-Column. The bending stress of a fabric building's post also transfers into an overturning force in the foundation. For this reason it most likely be required that the Perma-Column be in cased in hard packed soil or for larger loads, concrete. Embedding the Column in the site's existing soil usually will not provide enough resistance to the buildings overturning force. The example stability designs giving in Table A include the use of 24" diameter auger cast holes used to encase the Perma-Column in concrete. Extensions are available from Perma-Column Co. if the standard length does not meet depth requirements. The extensions come in 18", 24", and 36" sizes.

## 2. Design Procedure

There are four (4) steps for designing a post mount Cover-All LBS building using Perma-Column.

1. Calculate the Foundation Loads (Anchor Point Reactions)
2. Design of glu/nail-lam post for size
3. Determine the required Perma-Columns size

### 1. Calculate the Foundation Loads

The foundation loads are given by the building manufacturer as frame anchor loads. These loads are typically found by using a load calculator program supplied by the manufacturer. The following factors are used by Cover-All's calculator to determine the foundation "anchor point" loads.

- Wind, snow and live loads are automatically calculated using local building codes, depending on state and county conditions.
- Bay spacing: 5 feet to 16 feet for all LBS buildings.
- Number of ends that have fabric covering.
- A Thermal Factor ( $c_t$ ) is chosen depending on if the building in heated of not.
- Wind exposure of the building
- Occupancy use

### 2. Design of glu/nail-lam post for size

The controlling factor in wooden post design is usually its capacity to resist bending moments. As mentioned before the bending moment equals the horizontal force multiplied by the lever arm of the post. The length of the lever arm is taken as the distance from the top of the post to the point of the post that is most likely to rotate when under stress. Since the post is connected to the top of the Perma-Column, the lever arm is assumed from top of the post to the steel U-bracket. The design in this report uses a lever arm of 6 feet for an 8-foot high post. The horizontal force is reported on Cover-All's load calculator for a given frame size and bay spacing. Once the anchor point loads are calculated, the post can be design to meet the stress requirements.

### 3. Determine the required Perma-Column size

The size of the Perma-Column for a given project is controlled by three things. First, the size of the column should match that of the post. This ensures the column will be able to withstand the building loads, and a proper connection will be made to the wooden post. Secondly, a stability analysis should be carried out to determine if the column will rotate in the soil. The depth of embedment and soil properties of the location will determine if the column will remain stable under load. Finally, an uplift calculation will determine if the column will pull out of the soil under wind load. A section of angled steel is attached near the base of the column to help resist the uplift. As mentioned above most LBS buildings usually require the Perma-Column to be placed in compacted soil or in concrete to satisfy stability requirements.

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# *Perma-Column Foundations For Cover-All<sup>®</sup> Buildings*

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**Table A1: Bending Moments for Perma-Columns and Posts of Cover-All Legend Series Buildings (LBS)**

Revised 7/19/06

**LBS Post Mount Building, 8' Overall Post Height****Prepared by: Mark S. Servinsky, P.E.****Prepared for : Perma- Column, Inc., Ossian, Indiana**

Cover-All Model No.	Building Width (feet)	Design Loads			Maximum Bay Spacing (feet)	Perma-Column Lever Arm (feet)	Post Lever Arm (feet)	Perma-Column Moment (ft-kips)	Post Moment (ft-kips)
		Horiz. (kips)	Down (kips)	Up (kips)					
LBS-18	18	1.3	1.2	1.1	12*	8	6	10.40	7.80
LBS-19	19	1.1	1.7	1.0	16	8	6	8.80	6.60
LBS-30	30	1.8	2.8	1.6	16	8	6	14.40	10.80
LBS-32	32	2.0	3.2	1.5	16	8	6	16.00	12.00
LBS-36	36	2.0	3.0	1.9	16	8	6	16.00	12.00
LBS-40	40	3.1	4.0	2.1	16	8	6	24.80	18.60
LBS-42	42	2.1	3.3	1.9	14*	8	6	16.80	12.60
LBS-50	50	3.8	4.9	2.7	16	8	6	30.40	22.80
LBS-55	55	1.6	2.6	1.2	8*	8	6	12.80	9.60
LBS-62	62	2.4	3.8	2.1	10*	8	6	19.20	14.40

**Design Criteria:**

Loads based on LBS Cover-All building with both ends enclosed.

Loads are given for maximum allowed bay spacing of each LBS frame type

Wind Speed: 90 mph, Exposure C

Ground Snow Load 25 psf

Thermal Factor  $C_t = 1.0$ 

Table is for Class A-4 Assembly Arenas, and Storage/Agriculture Buildings.

For other Building types consult Cover-All Engineer.

**Notes:**

The design follows IBC 2003 and ASCE-7-02

Exposure C is usually recommended for Cover-All Buildings; for Exposure B or D, consult Engineer

Perma-Column lever arm is taken from point of load (top of post) to grade.

Wood Post lever arm is taken from point of load to top of the Perma-Column's steel connection bracket.

\* Maximum allowed bay spacing, wind load exceeds frame ratings for bays any larger.

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**Table A2: Bending Moments for Perma-Columns and Posts of Cover-All Legend Series Buildings (LBS)**

Revised 7/19/06

**LBS Post Mount Building, 10' Overall Post Height****Prepared by: Mark S. Servinsky, P.E.****Prepared for : Perma- Column, Inc., Ossian, Indiana**

Cover-All Model No.	Building Width (feet)	Design Loads			Maximum Bay Spacing (feet)	Perma-Column Lever Arm (feet)	Wood Post Lever Arm (feet)	Perma Column Moment (ft-kips)	Post Moment (ft-kips)
		Horiz. (kips)	Down (kips)	Up (kips)					
LBS-18	18	1.3	1.2	1.1	12*	10	8.5	13.00	11.05
LBS-19	19	1.1	1.7	1.0	16	10	8.5	11.00	9.35
LBS-30	30	1.8	2.8	1.6	16	10	8.5	18.00	15.30
LBS-32	32	2.0	3.2	1.5	16	10	8.5	20.00	17.00
LBS-36	36	2.0	3.0	1.9	16	10	8.5	20.00	17.00
LBS-40	40	3.1	4.0	2.1	16	10	8.5	31.00	26.35
LBS-42	42	2.1	3.3	1.9	14*	10	8.5	21.00	17.85
LBS-50	50	3.8	4.9	2.7	16	10	8.5	38.00	32.30
LBS-55	55	1.6	2.6	1.2	8*	10	8.5	16.00	13.60
LBS-62	62	2.4	3.8	2.1	10*	10	8.5	24.00	20.40

**Design Criteria:**

Loads based on LBS Cover-All building with both ends enclosed.

Loads are given for maximum allowed bay spacing of each LBS frame type

Wind Speed: 90 mph, Exposure C

Ground Snow Load 25 psf

Thermal Factor  $C_t = 1.0$ 

Table is for Class A-4 Assembly Arenas, and Storage/Agriculture Buildings.

For other Building types consult Cover-All Engineer.

**Notes:**

The design follows IBC 2003 and ASCE-7-02

Exposure C is usually recommended for Cover-All Buildings; for Exposure B or D, consult Engineer

Perma-Column lever arm is taken from point of load (top of post) to grade.

Wood Post lever arm is taken from point of load to top of the Perma-Column's steel connection bracket.

\* Maximum allowed bay spacing, wind load exceeds frame ratings for bays any larger.

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**Table: B1 Recommended Laminated Post and Perma-Column Sizes for Cover-All Legend Building Series (LBS)**  
**LBS-18 Post Mount Building, 8' Overall Post Height**

Revised 7/19/06

		Properties											
		3-ply 2x8			4-ply 2x8			5-ply 2x8					
		Area (in <sup>2</sup> )	27.84	Area (in <sup>2</sup> )	37.13	Area (in <sup>2</sup> )	46.41						
		S <sub>y</sub> (in <sup>3</sup> )	31.30	S <sub>x</sub> (in <sup>3</sup> )	34.03	S <sub>x</sub> (in <sup>3</sup> )	53.17						
Cover-All Model No.	Bay Spacing (feet)	Design Loads			Glulam Post Moment (ft-kips)	Bending Stress F <sub>b</sub> (psi)	Axial Stress F <sub>c</sub> (psi)	Bending Stress F <sub>b</sub> (psi)	Axial Stress F <sub>c</sub> (psi)	Bending Stress F <sub>b</sub> (psi)	Axial Stress F <sub>c</sub> (psi)	Required Laminated Post Size	Required Perma-Column Size
		Horiz. (kips)	Down (kips)	Up (kips)									
LBS-18	16	<b>Bay Spacing Not Allowed, Wind Load Exceeds Frame Rating</b>											
	14	<b>Bay Spacing Not Allowed, Wind Load Exceeds Frame Rating</b>											
	12	1.3	1.4	1.1	7.8	2990	50	2751	38	1760	30	<b>5-ply 2x8</b>	<b>Special*</b>
	10	1.1	1.0	0.9	6.6	2530	36	2327	27	1490	22	<b>4-ply 2x8</b>	<b>PC8400</b>
	8	0.9	0.8	0.8	5.4	2070	29	1904	22	1219	17	<b>4-ply 2x8</b>	<b>PC8400</b>
	6	0.7	0.6	0.6	4.2	1610	22	1481	16	948	13	<b>3-ply 2x8</b>	<b>PC8300</b>
	5	0.5	0.5	0.5	3.0	1150	18	1058	13	677	11	<b>3-ply 2x8</b>	<b>PC8300</b>

**Design Criteria:**

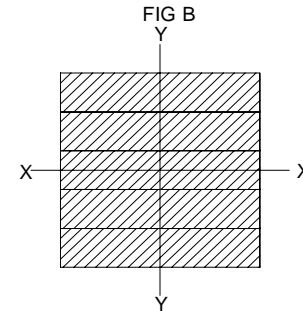
Loads based on LBS Cover-All building with both ends enclosed.  
 Loads are given for maximum allowed bay spacing of each LBS frame type  
 Wind Speed: 90 mph, Exposure C  
 Ground Snow Load 25 psf  
 Thermal Factor C<sub>t</sub> = 1.0  
 Table is for Class A-4 Assembly Arenas, and Storage/Agriculture Buildings.  
 For other Building types consult Cover-All Engineer.

**Notes:**

The design follows IBC 2003 and ASCE-7-02  
 Laminated post include Glu-Lam and Nail-Lam posts.  
 Allowable Glulam Bending Stress F<sub>b</sub> = 2400 psi bent about the X-axis, and 1750 psi bent about the Y-axis. See Figure B.  
 Allowable Glulam Axial Stress F<sub>c</sub> = 1600 psi for compression.

\* Perma-Column steel connection bracket is not yet available for this size post.

\*\* Small overstress, check with Engineer



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**Table: B2 Recommended Laminated Post and Perma-Column Sizes for Cover-All Legend Building Series (LBS)**

Revised 7/19/06

**LBS-19 Post Mount Building, 8' Overall Post Height**

Prepared by: Mark S. Servinsky, P.E.

Prepared for : Perma- Column, Inc., Ossian, Indiana

Properties					
3-ply 2x8		4-ply 2x8		5-ply 2x8	
Area (in <sup>2</sup> )	27.84	Area (in <sup>2</sup> )	37.13	Area (in <sup>2</sup> )	46.41
S <sub>y</sub> (in <sup>3</sup> )	31.30	S <sub>x</sub> (in <sup>3</sup> )	34.03	S <sub>x</sub> (in <sup>3</sup> )	53.17

Cover-All Model No.	Bay Spacing (feet)	Design Loads			Glulam Post Moment (ft-kips)	Bending Stress F <sub>b</sub> (psi)	Axial Stress F <sub>c</sub> (psi)	Bending Stress F <sub>b</sub> (psi)	Axial Stress F <sub>c</sub> (psi)	Bending Stress F <sub>b</sub> (psi)	Axial Stress F <sub>c</sub> (psi)	Required Laminated Post Size	Required Perma-Column Size
		Horiz. (kips)	Down (kips)	Up (kips)									
LBS-19	16	1.1	1.7	1.0	6.6	2530	61	2327	46	1490	37	4-ply 2x8	PC8400
	14	0.9	1.5	0.9	5.4	2070	54	1904	40	1219	32	4-ply 2x8	PC8400
	12	0.8	1.3	0.8	4.8	1840	47	1693	35	1083	28	4-ply 2x8	PC8400
	10	0.7	1.0	0.6	4.2	1610	36	1481	27	948	22	3-ply 2x8	PC8300
	8	0.5	0.8	0.5	3.0	1150	29	1058	22	677	17	3-ply 2x8	PC8300
	6	0.4	0.6	0.4	2.4	920	22	846	16	542	13	3-ply 2x8	PC8300
	5	0.3	0.5	0.3	1.8	690	18	635	13	406	11	3-ply 2x8	PC8300

**Design Criteria:**

Loads based on LBS Cover-All building with both ends enclosed.

Loads are given for maximum allowed bay spacing of each LBS frame type

Wind Speed: 90 mph, Exposure C

Ground Snow Load 25 psf

Thermal Factor C<sub>t</sub>= 1.0

Table is for Class A-4 Assembly Arenas, and Storage/Agriculture Buildings.

For other Building types consult Cover-All Engineer.

**Notes:**

The design follows IBC 2003 and ASCE-7-02

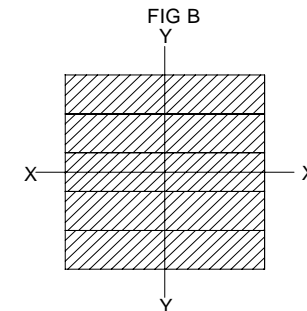
Laminated post include Glu-Lam and Nail-Lam posts.

Allowable Glulam Bending Stress F<sub>b</sub> = 2400 psi bent about the X-axis, and 1750 psi bent about the Y-axis. See Figure B.

Allowable Glulam Axial Stress F<sub>c</sub> = 1600 psi for compression.

\* Perma-Column steel connection bracket is not yet available for this size post.

\*\* Small overstress, check with Engineer



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**Table: B3 Recommended Laminated Post and Perma-Column Sizes for Cover-All Legend Building Series (LBS)**

Revised 7/19/06

**LBS-30 Post Mount Building, 8' Overall Post Height**

Prepared by: Mark S. Servinsky, P.E.

Prepared for : Perma- Column, Inc., Ossian, Indiana

													<b>Properties</b>					
													<b>3-ply 2x8</b>		<b>4-ply 2x8</b>		<b>5-ply 2x8</b>	
													Area (in <sup>2</sup> )	27.84	Area (in <sup>2</sup> )	37.13	Area (in <sup>2</sup> )	46.41
													S <sub>y</sub> (in <sup>3</sup> )	31.3	S <sub>x</sub> (in <sup>3</sup> )	34.03	S <sub>x</sub> (in <sup>3</sup> )	53.17
Cover-All Model No.	Bay Spacing (feet)	Design Loads			Glulam Post Moment (ft-kips)	Bending Stress F <sub>b</sub> (psi)	Axial Stress F <sub>c</sub> (psi)	Bending Stress F <sub>b</sub> (psi)	Axial Stress F <sub>c</sub> (psi)	Bending Stress F <sub>b</sub> (psi)	Axial Stress F <sub>c</sub> (psi)	Required Laminated Post Size	Required Perma-Column Size					
		Horiz. (kips)	Down (kips)	Up (kips)														
LBS-30	16	1.8	2.8	1.6	10.8	4141	101	3808	75	2437	60	<b>5-ply 2x8**</b>	<b>Special*</b>					
	14	1.6	2.5	1.4	9.6	3681	90	3385	67	2167	54	<b>5-ply 2x8</b>	<b>Special*</b>					
	12	1.4	2.1	1.2	8.4	3220	75	2962	57	1896	45	<b>5-ply 2x8</b>	<b>Special*</b>					
	10	1.1	1.8	1.0	6.6	2530	65	2327	48	1490	39	<b>4-ply 2x8</b>	<b>PC8400</b>					
	8	0.9	1.4	0.8	5.4	2070	50	1904	38	1219	30	<b>4-ply 2x8</b>	<b>PC8400</b>					
	6	0.7	1.1	0.7	4.2	1610	40	1481	30	948	24	<b>3-ply 2x8</b>	<b>PC8300</b>					
	5	0.6	0.9	0.5	3.6	1380	32	1269	24	812	19	<b>3-ply 2x8</b>	<b>PC8300</b>					

**Design Criteria:**

Loads based on LBS Cover-All building with both ends enclosed.

Loads are given for maximum allowed bay spacing of each LBS frame type

Wind Speed: 90 mph, Exposure C

Ground Snow Load 25 psf

Thermal Factor C<sub>t</sub>= 1.0

Table is for Class A-4 Assembly Arenas, and Storage/Agriculture Buildings.

For other Building types consult Cover-All Engineer.

**Notes:**

The design follows IBC 2003 and ASCE-7-02

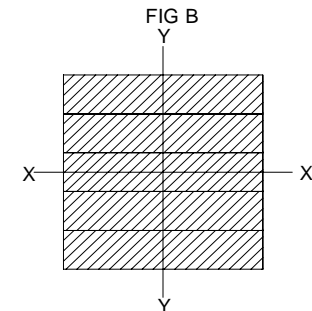
Laminated post include Glu-Lam and Nail-Lam posts.

Allowable Glulam Bending Stress F<sub>b</sub> = 2400 psi bent about the X-axis, and 1750 psi bent about the Y-axis. See Figure B.

Allowable Glulam Axial Stress F<sub>c</sub> = 1600 psi for compression.

\* Perma-Column steel connection bracket is not yet available for this size post.

\*\* Small overstress, check with Engineer



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**Table: B4 Recommended Laminated Post and Perma-Column Sizes for Cover-All Legend Building Series (LBS)**

Revised 7/19/06

**LBS-32 Post Mount Building, 8' Overall Post Height**

**Prepared by: Mark S. Servinsky, P.E.**

**Prepared for : Perma- Column, Inc., Ossian, Indiana**

		Properties													
		3-ply 2x8			4-ply 2x8			5-ply 2x8			6-ply 2x8				
		Area (in <sup>2</sup> )	27.84	Area (in <sup>2</sup> )	37.13	Area (in <sup>2</sup> )	46.41	Area (in <sup>2</sup> )	55.69						
		S <sub>y</sub> (in <sup>3</sup> )	31.30	S <sub>x</sub> (in <sup>3</sup> )	34.03	S <sub>x</sub> (in <sup>3</sup> )	53.17	S <sub>x</sub> (in <sup>3</sup> )	76.57						
Cover-All Model No.	Bay Spacing (feet)	Design Loads (kips)			Glulam Post Moment (ft-kips)	Bending Stress F <sub>b</sub> (psi)	Axial Stress F <sub>c</sub> (psi)	Bending Stress F <sub>b</sub> (psi)	Axial Stress F <sub>c</sub> (psi)	Bending Stress F <sub>b</sub> (psi)	Axial Stress F <sub>c</sub> (psi)	Bending Stress F <sub>b</sub> (psi)	Axial Stress F <sub>c</sub> (psi)	Required Laminated Post Size	Required Perma-Column Size
LBS-32	16	2.0	3.2	1.5	12.0	4601	115	4232	86	2708	69	1881	57	<b>6-ply 2x8</b>	<b>Special*</b>
	14	1.8	2.8	1.4	10.8	4141	101	3808	75	2437	60	1693	50	<b>5-ply 2x8**</b>	<b>Special*</b>
	12	1.5	2.4	1.2	9.0	3450	86	3174	65	2031	52	1410	43	<b>5-ply 2x8</b>	<b>Special*</b>
	10	1.3	2.0	1.0	7.8	2990	72	2751	54	1760	43	1222	36	<b>5-ply 2x8</b>	<b>Special*</b>
	8	1.0	1.6	0.8	6.0	2300	57	2116	43	1354	34	940	29	<b>4-ply 2x8</b>	<b>PC8400</b>
	6	0.8	1.2	0.6	4.8	1840	43	1693	32	1083	26	752	22	<b>4-ply 2x8</b>	<b>PC8400</b>
	5	0.6	1.0	0.8	3.6	1380	36	1269	27	812	22	564	18	<b>3-ply 2x8</b>	<b>PC8300</b>

**Design Criteria:**

Loads based on LBS Cover-All building with both ends enclosed.

Loads are given for maximum allowed bay spacing of each LBS frame type

Wind Speed: 90 mph, Exposure C

Ground Snow Load 25 psf

Thermal Factor C<sub>t</sub>= 1.0

Table is for Class A-4 Assembly Arenas, and Storage/Agriculture Buildings.

For other Building types consult Cover-All Engineer.

**Notes:**

The design follows IBC 2003 and ASCE-7-02

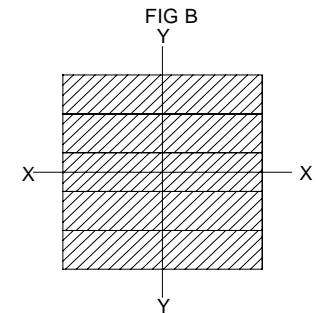
Laminated post include Glu-Lam and Nail-Lam posts.

Allowable Glulam Bending Stress F<sub>b</sub> = 2400 psi bent about the X-axis, and 1750 psi bent about the Y-axis. See Figure B.

Allowable Glulam Axial Stress F<sub>c</sub> = 1600 psi for compression.

\* Perma-Column steel connection bracket is not yet available for this size post.

\*\* Small overstress, check with engineer



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**Table: B5 Recommended Laminated Post and Perma-Column Sizes for Cover-All Legend Building Series (LBS)**

Revised 7/19/06

**LBS-36 Post Mount Building, 8' Overall Post Height**

**Prepared by: Mark S. Servinsky, P.E.**

**Prepared for : Perma- Column, Inc., Ossian, Indiana**

		Properties													
		3-ply 2x8			4-ply 2x8			5-ply 2x8			6-ply 2x8				
		Area (in <sup>2</sup> )	27.84	Area (in <sup>2</sup> )	37.13	Area (in <sup>2</sup> )	46.41	Area (in <sup>2</sup> )	55.69						
		S <sub>y</sub> (in <sup>3</sup> )	31.30	S <sub>x</sub> (in <sup>3</sup> )	34.03	S <sub>x</sub> (in <sup>3</sup> )	53.17	S <sub>x</sub> (in <sup>3</sup> )	76.57						
Cover-All Model No.	Bay Spacing (feet)	Design Loads (kips)			Glulam Post Moment (ft-kips)	Bending Stress F <sub>b</sub> (psi)	Axial Stress F <sub>c</sub> (psi)	Bending Stress F <sub>b</sub> (psi)	Axial Stress F <sub>c</sub> (psi)	Bending Stress F <sub>b</sub> (psi)	Axial Stress F <sub>c</sub> (psi)	Bending Stress F <sub>b</sub> (psi)	Axial Stress F <sub>c</sub> (psi)	Required Laminated Post Size	Required Perma-Column Size
LBS-36	16	2.0	3.0	1.9	12.0	4601	108	4232	81	2708	65	1881	54	<b>6-ply 2x8</b>	<b>Special*</b>
	14	1.7	2.0	1.7	10.2	3911	72	3597	54	2302	43	1599	36	<b>5-ply 2x8</b>	<b>Special*</b>
	12	1.5	2.3	1.4	9.0	3450	83	3174	62	2031	50	1410	41	<b>5-ply 2x8</b>	<b>Special*</b>
	10	1.2	1.9	1.2	7.2	2760	68	2539	51	1625	41	1128	34	<b>5-ply 2x8</b>	<b>Special*</b>
	8	1.0	1.5	1.0	6.0	2300	54	2116	40	1354	32	940	27	<b>4-ply 2x8</b>	<b>PC8400</b>
	6	0.7	1.1	0.7	4.2	1610	40	1481	30	948	24	658	20	<b>3-ply 2x8</b>	<b>PC8300</b>
	5	0.6	0.9	0.6	3.6	1380	32	1269	24	812	19	564	16	<b>3-ply 2x8</b>	<b>PC8300</b>

**Design Criteria:**

Loads based on LBS Cover-All building with both ends enclosed.

Loads are given for maximum allowed bay spacing of each LBS frame type

Wind Speed: 90 mph, Exposure C

Ground Snow Load 25 psf

Thermal Factor C<sub>t</sub> = 1.0

Table is for Class A-4 Assembly Arenas, and Storage/Agriculture Buildings.

For other Building types consult Cover-All Engineer.

**Notes:**

The design follows IBC 2003 and ASCE-7-02

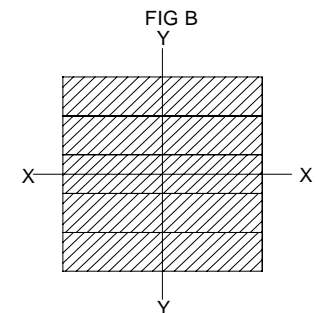
Laminated post include Glu-Lam and Nail-Lam posts.

Allowable Glulam Bending Stress F<sub>b</sub> = 2400 psi bent about the X-axis, and 1750 psi bent about the Y-axis. See Figure B.

Allowable Glulam Axial Stress F<sub>c</sub> = 1600 psi for compression.

\* Perma-Column steel connection bracket is not yet available for this size post.

\*\* Small overstress, check with Engineer



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**Table: B6 Recommended Laminated Post and Perma-Column Sizes for Cover-All Legend Building Series (LBS)**

Revised 7/19/06

**LBS-40 Post Mount Building, 8' Overall Post Height**

Prepared by: Mark S. Servinsky, P.E.

Prepared for : Perma- Column, Inc., Ossian, Indiana

													<b>Properties</b>											
													<b>4-ply 2x8</b>		<b>5-ply 2x8</b>		<b>6-ply 2x8</b>							
													Area (in <sup>2</sup> )	37.13	Area (in <sup>2</sup> )	46.41	Area (in <sup>2</sup> )	55.69						
													S <sub>x</sub> (in <sup>3</sup> )	34.03	S <sub>x</sub> (in <sup>3</sup> )	53.17	S <sub>x</sub> (in <sup>3</sup> )	76.57						
Cover-All Model No.	Bay Spacing (feet)	Design Loads			Glulam Post Moment (ft-kips)	Bending Stress F <sub>b</sub> (psi)	Axial Stress F <sub>c</sub> (psi)	Bending Stress F <sub>b</sub> (psi)	Axial Stress F <sub>c</sub> (psi)	Bending Stress F <sub>b</sub> (psi)	Axial Stress F <sub>c</sub> (psi)	Required Laminated Post Size	Required Perma-Column Size											
		Horiz. (kips)	Down (kips)	Up (kips)																				
LBS-40	16	<b>Bay Spacing Not Recommended, Unpractical Number of Plys Required</b>																						
	14	<b>Bay Spacing Not Recommended, Unpractical Number of Plys Required</b>																						
	12	2.3	3.0	1.6	13.8	4866	81	3115	65	2163	54	<b>6-ply 2x8</b>	<b>Special*</b>											
	10	1.9	2.5	1.3	11.4	4020	67	2573	54	1787	45	<b>6-ply 2x8</b>	<b>Special*</b>											
	8	1.5	2.0	1.1	9.0	3174	54	2031	43	1410	36	<b>5-ply 2x8</b>	<b>Special*</b>											
	6	1.1	1.5	0.8	6.6	2327	40	1490	32	1034	27	<b>4-ply 2x8</b>	<b>PC8400</b>											
	5	1.0	1.2	0.7	6.0	2116	32	1354	26	940	22	<b>4-ply 2x8</b>	<b>PC8400</b>											

**Design Criteria:**

Loads based on LBS Cover-All building with both ends enclosed.

Loads are given for maximum allowed bay spacing of each LBS frame type

Wind Speed: 90 mph, Exposure C

Ground Snow Load 25 psf

Thermal Factor C<sub>t</sub> = 1.0

Table is for Class A-4 Assembly Arenas, and Storage/Agriculture Buildings.

For other Building types consult Cover-All Engineer.

**Notes:**

The design follows IBC 2003 and ASCE-7-02

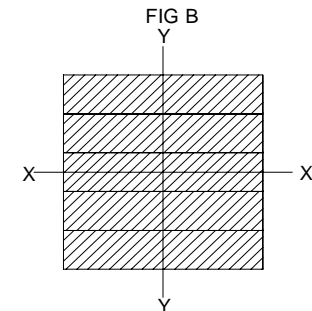
Laminated post include Glu-Lam and Nail-Lam posts.

Allowable Glulam Bending Stress F<sub>b</sub> = 2400 psi bent about the X-axis, and 1750 psi bent about the Y-axis. See Figure B.

Allowable Glulam Axial Stress F<sub>c</sub> = 1600 psi for compression.

\* Perma-Column steel connection bracket is not yet available for this size post.

\*\* Small overstress, check with Engineer



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**Table: B7 Recommended Laminated Post and Perma-Column Sizes for Cover-All Legend Building Series (LBS)**

Revised 7/19/06

**LBS-42 Post Mount Building, 8' Overall Post Height**

Prepared by: Mark S. Servinsky, P.E.

Prepared for : Perma- Column, Inc., Ossian, Indiana

		Properties											
		4-ply 2x8			5-ply 2x8			6-ply 2x8					
		Area (in <sup>2</sup> )	37.13	Area (in <sup>2</sup> )	46.41	Area (in <sup>2</sup> )	55.69						
		S <sub>x</sub> (in <sup>3</sup> )	34.03	S <sub>x</sub> (in <sup>3</sup> )	53.17	S <sub>x</sub> (in <sup>3</sup> )	76.57						
Cover-All Model No.	Bay Spacing (feet)	Design Loads (kips)			Glulam Post Moment (ft-kips)	Bending Stress F <sub>b</sub> (psi)	Axial Stress F <sub>c</sub> (psi)	Bending Stress F <sub>b</sub> (psi)	Axial Stress F <sub>c</sub> (psi)	Bending Stress F <sub>b</sub> (psi)	Axial Stress F <sub>c</sub> (psi)	Required Laminated Post Size	Required Perma-Column Size
LBS-42	16	<b>Bay Spacing Not Allowed, Wind Load Exceeds Frame Rating</b>											
	14	2.1	4.2	1.9	12.6	4443	113	2844	90	1975	75	6-ply 2x8	Special*
	12	1.8	3.6	1.6	10.8	3808	97	2437	78	1693	65	5-ply 2x8**	Special*
	10	1.5	3.0	1.3	9.0	3174	81	2031	65	1410	54	5-ply 2x8	Special*
	8	1.2	2.4	1.1	7.2	2539	65	1625	52	1128	43	5-ply 2x8	Special*
	6	0.9	1.8	0.8	5.4	1904	48	1219	39	846	32	4-ply 2x8	PC8400
	5	0.8	1.5	0.7	4.8	1693	40	1083	32	752	27	4-ply 2x8	PC8400

**Design Criteria:**

Loads based on LBS Cover-All building with both ends enclosed.

Loads are given for maximum allowed bay spacing of each LBS frame type

Wind Speed: 90 mph, Exposure C

Ground Snow Load 25 psf

Thermal Factor C<sub>t</sub> = 1.0

Table is for Class A-4 Assembly Arenas, and Storage/Agriculture Buildings.

For other Building types consult Cover-All Engineer.

**Notes:**

The design follows IBC 2003 and ASCE-7-02

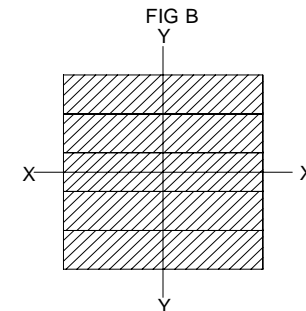
Laminated post include Glu-Lam and Nail-Lam posts.

Allowable Glulam Bending Stress F<sub>b</sub> = 2400 psi bent about the X-axis, and 1750 psi bent about the Y-axis. See Figure B.

Allowable Glulam Axial Stress F<sub>c</sub> = 1600 psi for compression.

\* Perma-Column steel connection bracket is not yet available for this size post.

\*\* Small overstress, check with Engineer



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**Table: B8 Recommended Laminated Post and Perma-Column Sizes for Cover-All Legend Building Series (LBS)**

Revised 7/19/06

**LBS-50 Post Mount Building, 8' Overall Post Height**

Prepared by: Mark S. Servinsky, P.E.

Prepared for : Perma- Column, Inc., Ossian, Indiana

		Properties											
		4-ply 2x8			5-ply 2x8			6-ply 2x8					
		Area (in <sup>2</sup> )	37.13	Area (in <sup>2</sup> )	46.41	Area (in <sup>2</sup> )	55.69						
		S <sub>x</sub> (in <sup>3</sup> )	34.03	S <sub>x</sub> (in <sup>3</sup> )	53.17	S <sub>x</sub> (in <sup>3</sup> )	76.57						
Cover-All Model No.	Bay Spacing (feet)	Design Loads (kips)			Glulam Post Moment (ft-kips)	Bending Stress F <sub>b</sub> (psi)	Axial Stress F <sub>c</sub> (psi)	Bending Stress F <sub>b</sub> (psi)	Axial Stress F <sub>c</sub> (psi)	Bending Stress F <sub>b</sub> (psi)	Axial Stress F <sub>c</sub> (psi)	Required Laminated Post Size	Required Perma-Column Size
LBS-50	16	<b>Bay Spacing Not Recommended, Unpractical Number of Plys Required</b>											
	14	<b>Bay Spacing Not Recommended, Unpractical Number of Plys Required</b>											
	12	<b>Bay Spacing Not Recommended, Unpractical Number of Plys Required</b>											
	10	2.4	3.0	1.7	14.4	5078	81	3250	65	2257	54	<b>6-ply 2x8</b>	<b>Special*</b>
	8	1.9	2.4	1.3	11.4	4020	65	2573	52	1787	43	<b>6-ply 2x8</b>	<b>Special*</b>
	6	1.9	2.4	1.3	11.4	4020	65	2573	52	1787	43	<b>6-ply 2x8</b>	<b>Special*</b>
	5	1.9	2.4	1.3	11.4	4020	65	2573	52	1787	43	<b>6-ply 2x8</b>	<b>Special*</b>

**Design Criteria:**

Loads based on LBS Cover-All building with both ends enclosed.

Loads are given for maximum allowed bay spacing of each LBS frame type

Wind Speed: 90 mph, Exposure C

Ground Snow Load 25 psf

Thermal Factor C<sub>t</sub> = 1.0

Table is for Class A-4 Assembly Arenas, and Storage/Agriculture Buildings.

For other Building types consult Cover-All Engineer.

**Notes:**

The design follows IBC 2003 and ASCE-7-02

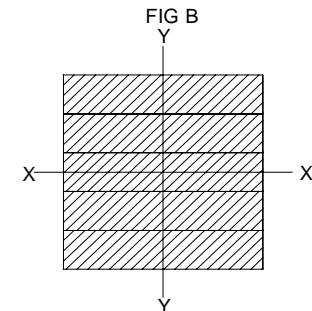
Laminated post include Glu-Lam and Nail-Lam posts.

Allowable Glulam Bending Stress F<sub>b</sub> = 2400 psi bent about the X-axis, and 1750 psi bent about the Y-axis. See Figure B.

Allowable Glulam Axial Stress F<sub>c</sub> = 1600 psi for compression.

\* Perma-Column steel connection bracket is not yet available for this size post.

\*\* Small overstress, check with Engineer



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**Table: B9 Recommended Laminated Post and Perma-Column Sizes for Cover-All Legend Building Series (LBS)**

Revised 7/19/06

**LBS-55 Post Mount Building, 8' Overall Post Height**

Prepared by: Mark S. Servinsky, P.E.

Prepared for : Perma- Column, Inc., Ossian, Indiana

		Properties											
		4-ply 2x8		5-ply 2x8		6-ply 2x8							
		Area (in <sup>2</sup> )	37.13	Area (in <sup>2</sup> )	46.41	Area (in <sup>2</sup> )	55.69						
		S <sub>x</sub> (in <sup>3</sup> )	34.03	S <sub>x</sub> (in <sup>3</sup> )	53.17	S <sub>x</sub> (in <sup>3</sup> )	76.57						
Cover-All Model No.	Bay Spacing (feet)	Design Loads (kips)			Glulam Post Moment (ft-kips)	Bending Stress F <sub>b</sub> (psi)	Axial Stress F <sub>c</sub> (psi)	Bending Stress F <sub>b</sub> (psi)	Axial Stress F <sub>c</sub> (psi)	Bending Stress F <sub>b</sub> (psi)	Axial Stress F <sub>c</sub> (psi)	Required Laminated Post Size	Required Perma-Column Size
LBS-55	16	<b>Bay Spacing Not Allowed, Wind Load Exceeds Frame Rating</b>											
	14	<b>Bay Spacing Not Allowed, Wind Load Exceeds Frame Rating</b>											
	12	<b>Bay Spacing Not Allowed, Wind Load Exceeds Frame Rating</b>											
	10	<b>Bay Spacing Not Allowed, Wind Load Exceeds Frame Rating</b>											
	8	1.3	2.6	1.2	7.8	2751	70	1760	56	1222	47	5-ply 2x8	Special*
	6	1.0	2.0	0.9	6.0	2116	54	1354	43	940	36	4-ply 2x8	PC8400
	5	0.8	1.6	0.7	4.8	1693	43	1083	34	752	29	4-ply 2x8	PC8400

**Design Criteria:**

Loads based on LBS Cover-All building with both ends enclosed.

Loads are given for maximum allowed bay spacing of each LBS frame type

Wind Speed: 90 mph, Exposure C

Ground Snow Load 25 psf

Thermal Factor C<sub>t</sub>= 1.0

Table is for Class A-4 Assembly Arenas, and Storage/Agriculture Buildings.

For other Building types consult Cover-All Engineer.

**Notes:**

The design follows IBC 2003 and ASCE-7-02

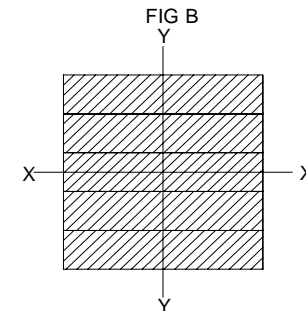
Laminated post include Glu-Lam and Nail-Lam posts.

Allowable Glulam Bending Stress F<sub>b</sub> = 2400 psi bent about the X-axis, and 1750 psi bent about the Y-axis. See Figure B.

Allowable Glulam Axial Stress F<sub>c</sub> = 1600 psi for compression.

\* Perma-Column steel connection bracket is not yet available for this size post.

\*\* Small overstress, check with Engineer



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**Table: B10 Recommended Laminated Post and Perma-Column Sizes for Cover-All Legend Building Series (LBS)**

Revised 7/19/06

**LBS-62 Post Mount Building, 8' Overall Post Height**

**Prepared by: Mark S. Servinsky, P.E.**

**Prepared for : Perma- Column, Inc., Ossian, Indiana**

		Properties											
		4-ply 2x8			5-ply 2x8			6-ply 2x8					
		Area (in <sup>2</sup> )	37.13	Area (in <sup>2</sup> )	46.41	Area (in <sup>2</sup> )	55.69						
		S <sub>x</sub> (in <sup>3</sup> )	34.03	S <sub>x</sub> (in <sup>3</sup> )	53.17	S <sub>x</sub> (in <sup>3</sup> )	76.57						
Cover-All Model No.	Bay Spacing (feet)	Design Loads (kips)			Glulam Post Moment (ft-kips)	Bending Stress F <sub>b</sub> (psi)	Axial Stress F <sub>c</sub> (psi)	Bending Stress F <sub>b</sub> (psi)	Axial Stress F <sub>c</sub> (psi)	Bending Stress F <sub>b</sub> (psi)	Axial Stress F <sub>c</sub> (psi)	Required Laminated Post Size	Required Perma-Column Size
LBS-62	16	<b>Bay Spacing Not Allowed, Wind Load Exceeds Frame Rating</b>											
	14	<b>Bay Spacing Not Allowed, Wind Load Exceeds Frame Rating</b>											
	12	<b>Bay Spacing Not Allowed, Wind Load Exceeds Frame Rating</b>											
	10	2.4	3.5	2.1	14.4	5078	94	3250	75	2257	63	<b>6-ply 2x8</b>	<b>Special*</b>
	8	1.9	2.8	1.7	11.4	4020	75	2573	60	1787	50	<b>6-ply 2x8</b>	<b>Special*</b>
	6	1.4	2.1	1.3	8.4	2962	57	1896	45	1316	38	<b>5-ply 2x8</b>	<b>Special*</b>
	5	1.2	1.7	1.0	7.2	2539	46	1625	37	1128	31	<b>5-ply 2x8</b>	<b>Special*</b>

**Design Criteria:**

Loads based on LBS Cover-All building with both ends enclosed.

Loads are given for maximum allowed bay spacing of each LBS frame type

Wind Speed: 90 mph, Exposure C

Ground Snow Load 25 psf

Thermal Factor C<sub>t</sub>= 1.0

Table is for Class A-4 Assembly Arenas, and Storage/Agriculture Buildings.

For other Building types consult Cover-All Engineer.

**Notes:**

The design follows IBC 2003 and ASCE-7-02

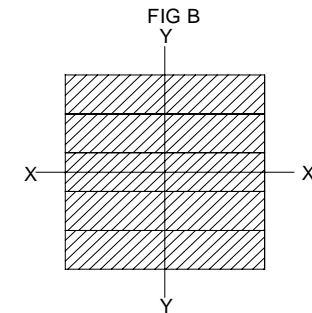
Laminated post include Glu-Lam and Nail-Lam posts.

Allowable Glulam Bending Stress F<sub>b</sub> = 2400 psi bent about the X-axis, and 1750 psi bent about the Y-axis. See Figure B.

Allowable Glulam Axial Stress F<sub>c</sub> = 1600 psi for compression.

\* Perma-Column steel connection bracket is not yet available for this size post.

\*\* Small overstress, check with Engineer



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**Table C1: Perma-Column Embedment Depth for Cover-All Legend Building Series (LBS)**

Revised 7/18/06

**LBS-18 Post-Mount Building**

Prepared by: **Mark S. Servinsky, P.E.**

For: **Perma- Column, Inc. Ossian, Indiana**

Cover-All Model No.	Bay Spacing (feet)	Horiz. Load (kips)	Augered hole diameter <b>b</b> (feet)	Assumed Depth (feet)	Allowable lateral Soil Bearing Pressure <b>S</b> (psf)	Post Height Above Grade (feet)	Lever Arm (feet)	<b>A</b> *	Non-Constrained		Constrained	
									Calculated Ground Embedment (feet)	Recommended Perma-Column Length (feet)	Calculated Ground Embedment (feet)	Recommended Perma-Column Length (feet)
LBS-18	16	<b>Bay Spacing Not Allowed, Wind Load Exceeds Frame Rating</b>										
	14	<b>Bay Spacing Not Allowed, Wind Load Exceeds Frame Rating</b>										
	12	1.3	2	5	798	8	6.5	1.91	4.7	Standard	4.7	Standard
	10	1.1	2	5	798	8	6.5	1.61	4.3	Standard	4.4	Standard
	8	0.9	2	5	798	8	6.5	1.32	4	Standard	4	Standard
	6	0.7	2	5	798	8	6.5	1.03	4	Standard	4	Standard
	5	0.5	2	5	798	8	6.5	0.73	4	Standard	4	Standard

**Design Criteria:**

Loads based on LBS Cover-All building with both ends enclosed.

Wind Speed: 90 mph, Exposure C

Ground Snow Load 25 psf

Thermal Factor  $C_t = 1.0$

Table is for Class A-4 Assembly Arenas, and Storage/Agriculture Buildings. For other Building types consult Cover-All Engineer

Minimum hole diameter is 24 inches.

Minimum Ground Embedment should be no less than 4 feet unless otherwise specified.

Standard Perma-Column length is 5' plus 3/2" concrete base.

Recommended Column length is based on standard Perma-Column with 8" above grade and a 4'-7 1/2" embedment (including base). See Figure E.

Perma-Column requires an extension if Calculated Embedment exceeds 5'.

18", 24", and 36" extensions are available

**Notes:**

The design follows IBC 2003 and ASCE-7-02

Embedment formulas are per IBC 2003 Section 1805.7.2.1, and 1805.7.2.2; Constrained and Non-Constrained conditions

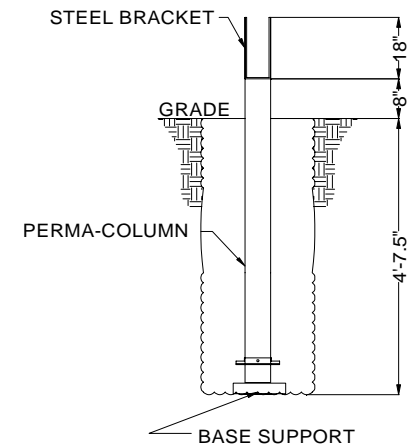
Allowable lateral Soil Bearing Pressure (**S**) is based on assumed depth and IBC Table 1804.2 for Sand, silt, and gravel conditions.

For all other soil conditions, consult with Engineer.

**S** is increased by 33% for wind allowable per IBC Section 1804.

\* **A** is a constant given by the equation  $(2.34 \times \text{Horz. load}) / (\mathbf{S} \times \mathbf{b})$

**Fig. E**



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**Table C2: Perma-Column Embedment Depth for Cover-All Legend Building Series (LBS)**

Revised 7/18/06

**LBS-19 Post-Mount Building**

Prepared by: **Mark S. Servinsky, P.E.**

For: **Perma- Column, Inc. Ossian, Indiana**

Cover-All Model No.	Bay Spacing (feet)	Horiz. Load (kips)	Augered hole diameter <b>b</b> (feet)	Assumed Depth (feet)	Allowable lateral Soil Bearing Pressure <b>S</b> (psf)	Post Height Above Grade (feet)	Lever Arm (feet)	<b>A</b> *	Non-Constrained		Constrained	
									Calculated Ground Embedment (feet)	Recommended Perma-Column Length (feet)	Calculated Ground Embedment (feet)	Recommended Perma-Column Length (feet)
LBS-19	16	1.1	2	5	798	8	6.5	1.61	4.3	Standard	4.4	Standard
	14	0.9	2	5	798	8	6.5	1.32	4	Standard	4	Standard
	12	0.8	2	5	798	8	6.5	1.17	4	Standard	4	Standard
	10	0.7	2	5	798	8	6.5	1.03	4	Standard	4	Standard
	8	0.5	2	5	798	8	6.5	0.73	4	Standard	4	Standard
	6	0.4	2	5	798	8	6.5	0.59	4	Standard	4	Standard
	5	0.3	2	5	798	8	6.5	0.44	4	Standard	4	Standard

**Design Criteria:**

Loads based on LBS Cover-All building with both ends enclosed.

Wind Speed: 90 mph, Exposure C

Ground Snow Load 25 psf

Thermal Factor  $C_t = 1.0$

Table is for Class A-4 Assembly Arenas, and Storage/Agriculture Buildings. For other Building types consult Cover-All Engineer

Minimum hole diameter is 24 inches.

Minimum Ground Embedment should be no less than 4 feet unless otherwise specified.

Standard Perma-Column length is 5' plus 3/2" concrete base.

Recommended Column length is based on standard Perma-Column with 8" above grade and a 4'-7 1/2" embedment (including base). See Figure E.

Perma-Column requires an extension if Calculated Embedment exceeds 5'.

18", 24", and 36" extensions are available

**Notes:**

The design follows IBC 2003 and ASCE-7-02

Embedment formulas are per IBC 2003 Section 1805.7.2.1, and 1805.7.2.2; Constrained and Non-Constrained conditions

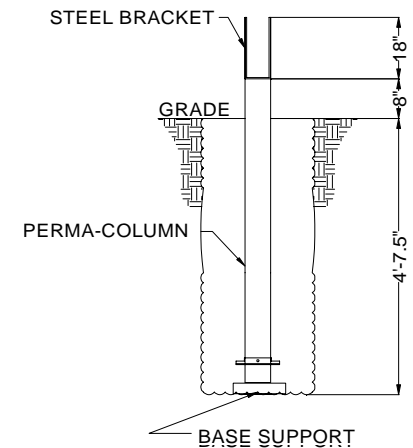
Allowable lateral Soil Bearing Pressure (**S**) is based on assumed depth and IBC Table 1804.2 for Sand, silt, and gravel conditions.

For all other soil conditions, consult with Engineer.

**S** is increased by 33% for wind allowable per IBC Section 1804.

\* **A** is a constant given by the equation  $(2.34 \times \text{Horz. load}) / (\mathbf{S} \times \mathbf{b})$

**Fig. E**



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**Table C3: Perma-Column Embedment Depth for Cover-All Legend Building Series (LBS)**

Revised 7/18/06

**LBS-30 Post-Mount Building**

Prepared by: Mark S. Servinsky, P.E.

For: Perma- Column, Inc. Ossian, Indiana

Cover-All Model No.	Bay Spacing (feet)	Horiz. Load (kips)	Augered hole diameter <b>b</b> (feet)	Assumed Depth (feet)	Allowable lateral Soil Bearing Pressure <b>S</b> (psf)	Post Height Above Grade (feet)	Lever Arm (feet)	<b>A</b> *	Non-Constrained		Constrained	
									Calculated Ground Embedment (feet)	Recommended Perma-Column Length (feet)	Calculated Ground Embedment (feet)	Recommended Perma-Column Length (feet)
LBS-30	16	1.8	2	5	798	8	6.5	2.64	5.8	Standard + 18" Ext.	5.6	Standard + 18" Ext.
	14	1.6	2	5	798	8	6.5	2.35	5.4	Standard + 18" Ext.	5.3	Standard + 18" Ext.
	12	1.4	2	5	798	8	6.5	2.05	5.0	Standard	4.9	Standard
	10	1.1	2	5	798	8	6.5	1.61	4.3	Standard	4.4	Standard
	8	0.9	2	5	798	8	6.5	1.32	4	Standard	4	Standard
	6	0.7	2	5	798	8	6.5	1.03	4	Standard	4	Standard
	5	0.6	2	5	798	8	6.5	0.88	4	Standard	4	Standard

**Design Criteria:**

Loads based on LBS Cover-All building with both ends enclosed.

Wind Speed: 90 mph, Exposure C

Ground Snow Load 25 psf

Thermal Factor Ct= 1.0

Table is for Class A-4 Assembly Arenas, and Storage/Agriculture Buildings. For other Building types consult Cover-All Engineer

Minimum hole diameter is 24 inches.

Minimum Ground Embedment should be no less than 4 feet unless otherwise specified.

Standard Perma-Column length is 5' plus 3½" concrete base.

Recommended Column length is based on standard Perma-Column with 8" above grade and a 4'-7½" embedment (including base). See Figure E.

Perma-Column requires an extension if Calculated Embedment exceeds 5'.

18", 24", and 36" extensions are available

**Notes:**

The design follows IBC 2003 and ASCE-7-02

Embedment formulas are per IBC 2003 Section 1805.7.2.1, and 1805.7.2.2; Constrained and Non-Constrained conditions

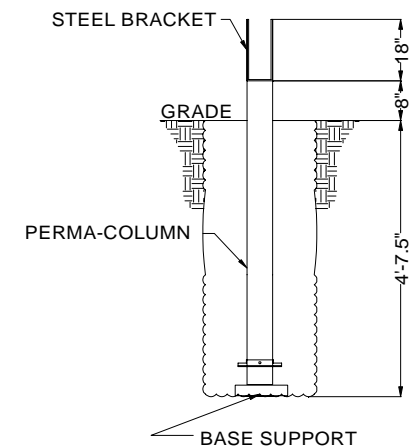
Allowable lateral Soil Bearing Pressure (**S**) is based on assumed depth and IBC Table 1804.2 for Sand, silt, and gravel conditions.

For all other soil conditions, consult with Engineer.

**S** is increased by 33% for wind allowable per IBC Section 1804.

\* **A** is a constant given by the equation  $(2.34 \times \text{Horz. load})/(\mathbf{S} \times \mathbf{b})$

**Fig. E**



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**Table C4: Perma-Column Embedment Depth for Cover-All Legend Building Series (LBS)**

Revised 7/18/06

**LBS-32 Post-Mount Building**

Prepared by: Mark S. Servinsky, P.E.

For: Perma- Column, Inc. Ossian, Indiana

Cover-All Model No.	Bay Spacing (feet)	Horiz. Load (kips)	Augered hole diameter <b>b</b> (feet)	Assumed Depth (feet)	Allowable lateral Soil Bearing Pressure <b>S</b> (psf)	Post Height Above Grade (feet)	Lever Arm (feet)	<b>A</b> *	Non-Constrained		Constrained	
									Calculated Ground Embedment (feet)	Recommended Perma-Column Length (feet)	Calculated Ground Embedment (feet)	Recommended Perma-Column Length (feet)
LBS-32	16	2	2	6	931	8	6.5	2.51	5.7	Standard + 18" Ext.	5.4	Standard + 18" Ext.
	14	1.8	2	6	931	8	6.5	2.26	5.3	Standard + 18" Ext.	5.2	Standard + 18" Ext.
	12	1.5	2	5	798	8	6.5	2.20	5.2	Standard + 18" Ext.	5.1	Standard + 18" Ext.
	10	1.3	2	5	798	8	6.5	1.91	4.7	Standard	4.7	Standard
	8	1	2	5	798	8	6.5	1.47	4.0	Standard	4.2	Standard
	6	0.8	2	5	798	8	6.5	1.17	4	Standard	4	Standard
	5	0.6	2	5	798	8	6.5	0.88	4	Standard	4	Standard

**Design Criteria:**

Loads based on LBS Cover-All building with both ends enclosed.

Wind Speed: 90 mph, Exposure C

Ground Snow Load 25 psf

Thermal Factor Ct= 1.0

Table is for Class A-4 Assembly Arenas, and Storage/Agriculture Buildings. For other Building types consult Cover-All Engineer

Minimum hole diameter is 24 inches.

Minimum Ground Embedment should be no less than 4 feet unless otherwise specified.

Standard Perma-Column length is 5' plus 3½" concrete base.

Recommended Column length is based on standard Perma-Column with 8" above grade and a 4'-7½" embedment (including base). See Figure E.

Perma-Column requires an extension if Calculated Embedment exceeds 5'.

18", 24", and 36" extensions are available

**Notes:**

The design follows IBC 2003 and ASCE-7-02

Embedment formulas are per IBC 2003 Section 1805.7.2.1, and 1805.7.2.2; Constrained and Non-Constrained conditions

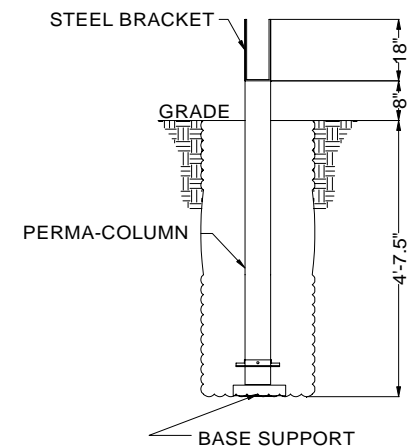
Allowable lateral Soil Bearing Pressure (**S**) is based on assumed depth and IBC Table 1804.2 for Sand, silt, and gravel conditions.

For all other soil conditions, consult with Engineer.

**S** is increased by 33% for wind allowable per IBC Section 1804.

\* **A** is a constant given by the equation  $(2.34 \times \text{Horz. load}) / (\mathbf{S} \times \mathbf{b})$

**Fig. E**



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**Table C5: Perma-Column Embedment Depth for Cover-All Legend Building Series (LBS)**

Revised 7/18/06

**LBS-36 Post-Mount Building**

Prepared by: Mark S. Servinsky, P.E.

For: Perma- Column, Inc. Ossian, Indiana

Cover-All Model No.	Bay Spacing (feet)	Horiz. Load (kips)	Augered hole diameter <b>b</b> (feet)	Assumed Depth (feet)	Allowable lateral Soil Bearing Pressure <b>S</b> (psf)	Post Height Above Grade (feet)	Lever Arm (feet)	<b>A</b> *	Non-Constrained		Constrained	
									Calculated Ground Embedment (feet)	Recommended Perma-Column Length (feet)	Calculated Ground Embedment (feet)	Recommended Perma-Column Length (feet)
LBS-36	16	2	2	6	931	8	6.5	2.51	5.7	Standard + 18" Ext.	5.4	Standard + 18" Ext.
	14	1.7	2	5	798	8	6.5	2.49	5.6	Standard + 18" Ext.	5.4	Standard + 18" Ext.
	12	1.5	2	5	798	8	6.5	2.20	5.2	Standard + 18" Ext.	5.1	Standard + 18" Ext.
	10	1.2	2	5	798	8	6.5	1.76	4.5	Standard	4.6	Standard
	8	1.0	2	5	798	8	6.5	1.47	4.0	Standard	4.2	Standard
	6	0.7	2	5	798	8	6.5	1.03	4	Standard	4	Standard
	5	0.6	2	5	798	8	6.5	0.88	4	Standard	4	Standard

**Design Criteria:**

Loads based on LBS Cover-All building with both ends enclosed.

Wind Speed: 90 mph, Exposure C

Ground Snow Load 25 psf

Thermal Factor Ct= 1.0

Table is for Class A-4 Assembly Arenas, and Storage/Agriculture Buildings. For other Building types consult Cover-All Engineer

Minimum hole diameter is 24 inches.

Minimum Ground Embedment should be no less than 4 feet unless otherwise specified.

Standard Perma-Column length is 5' plus 3½" concrete base.

Recommended Column length is based on standard Perma-Column with 8" above grade and a 4'-7½" embedment (including base). See Figure E.

Perma-Column requires an extension if Calculated Embedment exceeds 5'.

18", 24", and 36" extensions are available

**Notes:**

The design follows IBC 2003 and ASCE-7-02

Embedment formulas are per IBC 2003 Section 1805.7.2.1, and 1805.7.2.2; Constrained and Non-Constrained conditions

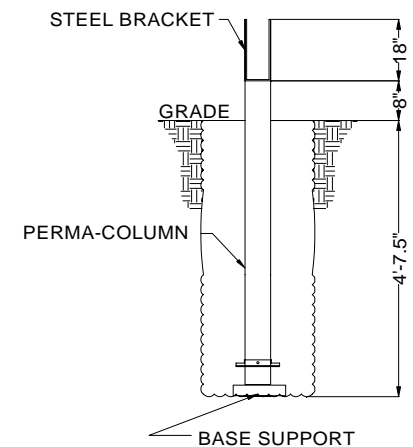
Allowable lateral Soil Bearing Pressure (**S**) is based on assumed depth and IBC Table 1804.2 for Sand, silt, and gravel conditions.

For all other soil conditions, consult with Engineer.

**S** is increased by 33% for wind allowable per IBC Section 1804.

\* **A** is a constant given by the equation  $(2.34 \times \text{Horz. load})/(\mathbf{S} \times \mathbf{b})$

**Fig. E**



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**Table C6: Perma-Column Embedment Depth for Cover-All Legend Building Series (LBS)**

Revised 7/18/06

**LBS-40 Post-Mount Building**

Prepared by: Mark S. Servinsky, P.E.

For: Perma- Column, Inc. Ossian, Indiana

Cover-All Model No.	Bay Spacing (feet)	Horiz. Load (kips)	Augered hole diameter <b>b</b> (feet)	Assumed Depth (feet)	Allowable lateral Soil Bearing Pressure <b>S</b> (psf)	Post Height Above Grade (feet)	Lever Arm (feet)	<b>A</b> *	Non-Constrained		Constrained	
									Calculated Ground Embedment (feet)	Recommended Perma-Column Length (feet)	Calculated Ground Embedment (feet)	Recommended Perma-Column Length (feet)
LBS-40	16	3.1	2	7	1064	8	6.5	3.41	6.9	Standard + 24" Ext.	6.3	Standard + 18" Ext.
	14	2.7	2	7	1064	8	6.5	2.97	6.3	Standard + 18" Ext.	5.9	Standard + 18" Ext.
	12	2.3	2	6	931	8	6.5	2.89	6.2	Standard + 18" Ext.	5.8	Standard + 18" Ext.
	10	1.9	2	6	931	8	6.5	2.39	5.5	Standard + 18" Ext.	5.3	Standard + 18" Ext.
	8	1.5	2	5	798	8	6.5	2.20	5.2	Standard + 18" Ext.	5.1	Standard + 18" Ext.
	6	1.1	2	5	798	8	6.5	1.61	4.3	Standard	4.4	Standard
	5	1.0	2	5	798	8	6.5	1.47	4.0	Standard	4.2	Standard

**Design Criteria:**

Loads based on LBS Cover-All building with both ends enclosed.

Wind Speed: 90 mph, Exposure C

Ground Snow Load 25 psf

Thermal Factor Ct= 1.0

Table is for Class A-4 Assembly Arenas, and Storage/Agriculture Buildings. For other Building types consult Cover-All Engineer

Minimum hole diameter is 24 inches.

Minimum Ground Embedment should be no less than 4 feet unless otherwise specified.

Standard Perma-Column length is 5' plus 3/2" concrete base.

Recommended Column length is based on standard Perma-Column with 8" above grade and a 4'-7 1/2" embedment (including base). See Figure E.

Perma-Column requires an extension if Calculated Embedment exceeds 5'.

18", 24", and 36" extensions are available

**Notes:**

The design follows IBC 2003 and ASCE-7-02

Embedment formulas are per IBC 2003 Section 1805.7.2.1, and 1805.7.2.2; Constrained and Non-Constrained conditions

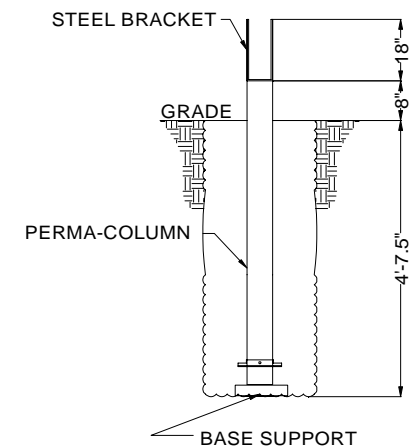
Allowable lateral Soil Bearing Pressure (**S**) is based on assumed depth and IBC Table 1804.2 for Sand, silt, and gravel conditions.

For all other soil conditions, consult with Engineer.

**S** is increased by 33% for wind allowable per IBC Section 1804.

\* **A** is a constant given by the equation  $(2.34 \times \text{Horz. load}) / (\mathbf{S} \times \mathbf{b})$

**Fig. E**



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**Table C7: Perma-Column Embedment Depth for Cover-All Legend Building Series (LBS)**

Revised 7/18/06

**LBS-42 Post-Mount Building**

Prepared by: Mark S. Servinsky, P.E.

For: Perma- Column, Inc. Ossian, Indiana

Cover-All Model No.	Bay Spacing (feet)	Horiz. Load (kips)	Augered hole diameter <b>b</b> (feet)	Assumed Depth (feet)	Allowable lateral Soil Bearing Pressure <b>S</b> (psf)	Post Height Above Grade (feet)	Lever Arm (feet)	<b>A</b> *	Non-Constrained		Constrained	
									Calculated Ground Embedment (feet)	Recommended Perma-Column Length (feet)	Calculated Ground Embedment (feet)	Recommended Perma-Column Length (feet)
LBS-42	16	<b>Bay Spacing Not Allowed, Wind Load Exceeds Frame Rating</b>										
	14	1.7	2	5	798	8	6.5	2.49	5.6	Standard + 18" Ext.	5.4	Standard + 18" Ext.
	12	1.8	2	5	798	8	6.5	2.64	5.8	Standard + 18" Ext.	5.6	Standard + 18" Ext.
	10	1.5	2	5	798	8	6.5	2.20	5.2	Standard + 18" Ext.	5.1	Standard + 18" Ext.
	8	1.2	2	5	798	8	6.5	1.76	4.5	Standard	4.6	Standard
	6	0.9	2	5	798	8	6.5	1.32	4	Standard	4	Standard
	5	0.8	2	5	798	8	6.5	1.17	4	Standard	4	Standard

**Design Criteria:**

Loads based on LBS Cover-All building with both ends enclosed.

Wind Speed: 90 mph, Exposure C

Ground Snow Load 25 psf

Thermal Factor Ct= 1.0

Table is for Class A-4 Assembly Arenas, and Storage/Agriculture Buildings. For other Building types consult Cover-All Engineer

Minimum hole diameter is 24 inches.

Minimum Ground Embedment should be no less than 4 feet unless otherwise specified.

Standard Perma-Column length is 5' plus 3½" concrete base.

Recommended Column length is based on standard Perma-Column with 8" above grade and a 4'-7½" embedment (including base). See Figure E.

Perma-Column requires an extension if Calculated Embedment exceeds 5'.

18", 24", and 36" extensions are available

**Notes:**

The design follows IBC 2003 and ASCE-7-02

Embedment formulas are per IBC 2003 Section 1805.7.2.1, and 1805.7.2.2; Constrained and Non-Constrained conditions

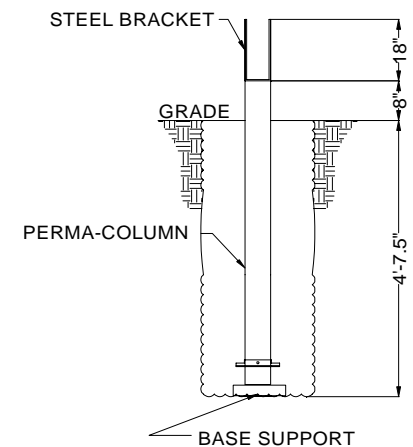
Allowable lateral Soil Bearing Pressure (**S**) is based on assumed depth and IBC Table 1804.2 for Sand, silt, and gravel conditions.

For all other soil conditions, consult with Engineer.

**S** is increased by 33% for wind allowable per IBC Section 1804.

\* **A** is a constant given by the equation  $(2.34 \times \text{Horz. load})/(\mathbf{S} \times \mathbf{b})$

**Fig. E**



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**Table C8: Perma-Column Embedment Depth for Cover-All Legend Building Series (LBS)**

Revised 7/18/06

**LBS-50 Post-Mount Building**

Prepared by: Mark S. Servinsky, P.E.

For: Perma- Column, Inc. Ossian, Indiana

Cover-All Model No.	Bay Spacing (feet)	Horiz. Load (kips)	Augered hole diameter <b>b</b> (feet)	Assumed Depth (feet)	Allowable lateral Soil Bearing Pressure <b>S</b> (psf)	Post Height Above Grade (feet)	Lever Arm (feet)	<b>A *</b>	Non-Constrained		Constrained	
									Calculated Ground Embedment (feet)	Recommended Perma-Column Length (feet)	Calculated Ground Embedment (feet)	Recommended Perma-Column Length (feet)
LBS-50	16	3.8	2	8	1197	8	6.5	3.71	7.3	Standard + 36" Ext.	6.6	Standard + 24" Ext.
	14	3.4	2	7	1064	8	6.5	3.74	7.3	Standard + 36" Ext.	6.6	Standard + 24" Ext.
	12	2.9	2	7	1064	8	6.5	3.19	6.6	Standard + 24" Ext.	6.1	Standard + 18" Ext.
	10	2.4	2	6	931	8	6.5	3.02	6.4	Standard + 18" Ext.	6.0	Standard + 18" Ext.
	8	1.9	2	5	798	8	6.5	2.79	6.0	Standard + 18" Ext.	5.7	Standard + 18" Ext.
	6	1.9	2	5	798	8	6.5	2.79	6.0	Standard + 18" Ext.	5.7	Standard + 18" Ext.
	5	1.9	2	5	798	8	6.5	2.79	6.0	Standard + 18" Ext.	5.7	Standard + 18" Ext.

**Design Criteria:**

Loads based on LBS Cover-All building with both ends enclosed.

Wind Speed: 90 mph, Exposure C

Ground Snow Load 25 psf

Thermal Factor Ct= 1.0

Table is for Class A-4 Assembly Arenas, and Storage/Agriculture Buildings. For other Building types consult Cover-All Engineer

Minimum hole diameter is 24 inches.

Minimum Ground Embedment should be no less than 4 feet unless otherwise specified.

Standard Perma-Column length is 5' plus 3½" concrete base.

Recommended Column length is based on standard Perma-Column with 8" above grade and a 4'-7½" embedment (including base). See Figure E.

Perma-Column requires an extension if Calculated Embedment exceeds 5'.

18", 24", and 36" extensions are available

**Notes:**

The design follows IBC 2003 and ASCE-7-02

Embedment formulas are per IBC 2003 Section 1805.7.2.1, and 1805.7.2.2; Constrained and Non-Constrained conditions

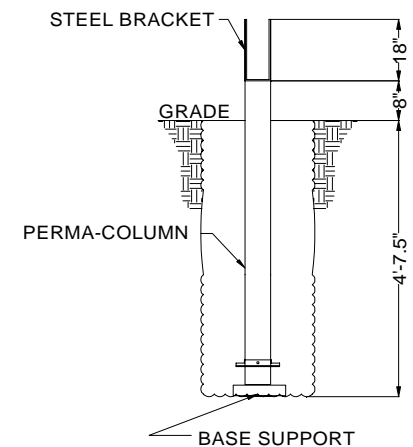
Allowable lateral Soil Bearing Pressure (**S**) is based on assumed depth and IBC Table 1804.2 for Sand, silt, and gravel conditions.

For all other soil conditions, consult with Engineer.

**S** is increased by 33% for wind allowable per IBC Section 1804.

\* **A** is a constant given by the equation  $(2.34 \times \text{Horz. load})/(\mathbf{S} \times \mathbf{b})$

**Fig. E**



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**Table C9: Perma-Column Embedment Depth for Cover-All Legend Building Series (LBS)**

Revised 7/18/06

**LBS-55 Post-Mount Building**

Prepared by: **Mark S. Servinsky, P.E.**

For: **Perma- Column, Inc. Ossian, Indiana**

Cover-All Model No.	Bay Spacing (feet)	Horiz. Load (kips)	Augered hole diameter <b>b</b> (feet)	Assumed Depth (feet)	Allowable lateral Soil Bearing Pressure <b>S</b> (psf)	Post Height Above Grade (feet)	Lever Arm (feet)	<b>A</b> *	Non-Constrained		Constrained	
									Calculated Ground Embedment (feet)	Recommended Perma-Column Length (feet)	Calculated Ground Embedment (feet)	Recommended Perma-Column Length (feet)
LBS-55	16	<b>Bay Spacing Not Allowed, Wind Load Exceeds Frame Rating</b>										
	14	<b>Bay Spacing Not Allowed, Wind Load Exceeds Frame Rating</b>										
	12	<b>Bay Spacing Not Allowed, Wind Load Exceeds Frame Rating</b>										
	10	<b>Bay Spacing Not Allowed, Wind Load Exceeds Frame Rating</b>										
	8	1.3	2	5	798	8	6.5	1.91	4.7	Standard	4.7	Standard
	6	1.0	2	5	798	8	6.5	1.47	4.0	Standard	4.2	Standard
	5	0.8	2	5	798	8	6.5	1.17	4	Standard	4	Standard

**Design Criteria:**

Loads based on LBS Cover-All building with both ends enclosed.

Wind Speed: 90 mph, Exposure C

Ground Snow Load 25 psf

Thermal Factor  $C_t = 1.0$

Table is for Class A-4 Assembly Arenas, and Storage/Agriculture Buildings. For other Building types consult Cover-All Engineer

Minimum hole diameter is 24 inches.

Minimum Ground Embedment should be no less than 4 feet unless otherwise specified.

Standard Perma-Column length is 5' plus 3/2" concrete base.

Recommended Column length is based on standard Perma-Column with 8" above grade and a 4'-7 1/2" embedment (including base). See Figure E.

Perma-Column requires an extension if Calculated Embedment exceeds 5'.

18", 24", and 36" extensions are available

**Notes:**

The design follows IBC 2003 and ASCE-7-02

Embedment formulas are per IBC 2003 Section 1805.7.2.1, and 1805.7.2.2; Constrained and Non-Constrained conditions

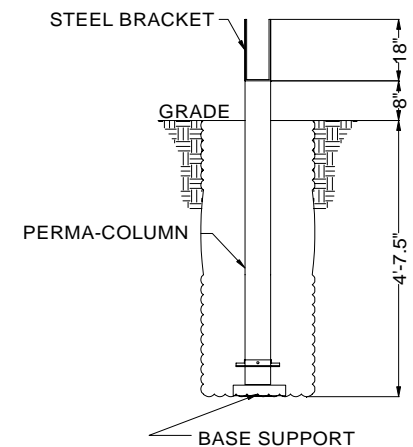
Allowable lateral Soil Bearing Pressure (**S**) is based on assumed depth and IBC Table 1804.2 for Sand, silt, and gravel conditions.

For all other soil conditions, consult with Engineer.

**S** is increased by 33% for wind allowable per IBC Section 1804.

\* **A** is a constant given by the equation  $(2.34 \times \text{Horz. load}) / (\mathbf{S} \times \mathbf{b})$

**Fig. E**



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**Table C10: Perma-Column Embedment Depth for Cover-All Legend Building Series (LBS)**

Revised 7/18/06

**LBS-62 Post-Mount Building**

Prepared by: Mark S. Servinsky, P.E.

For: Perma- Column, Inc. Ossian, Indiana

Cover-All Model No.	Bay Spacing (feet)	Horiz. Load (kips)	Augered hole diameter <b>b</b> (feet)	Assumed Depth (feet)	Allowable lateral Soil Bearing Pressure <b>S</b> (psf)	Post Height Above Grade (feet)	Lever Arm (feet)	<b>A</b> *	Non-Constrained		Constrained	
									Calculated Ground Embedment (feet)	Recommended Perma-Column Length (feet)	Calculated Ground Embedment (feet)	Recommended Perma-Column Length (feet)
LBS-62	16	<b>Bay Spacing Not Allowed, Wind Load Exceeds Frame Rating</b>										
	14	<b>Bay Spacing Not Allowed, Wind Load Exceeds Frame Rating</b>										
	12	<b>Bay Spacing Not Allowed, Wind Load Exceeds Frame Rating</b>										
	10	2.4	2	6	931	8	6.5	3.02	6.4	Standard + 18" Ext	6.0	Standard + 18" Ext
	8	1.9	2	5	798	8	6.5	2.79	6.0	Standard + 18" Ext	5.7	Standard + 18" Ext
	6	1.4	2	5	798	8	6.5	2.05	5.0	Standard + 18" Ext	4.9	Standard + 18" Ext
	5	1.2	2	5	798	8	6.5	1.76	4.5	Standard	4.6	Standard

**Design Criteria:**

Loads based on LBS Cover-All building with both ends enclosed.

Wind Speed: 90 mph, Exposure C

Ground Snow Load 25 psf

Thermal Factor Ct= 1.0

Table is for Class A-4 Assembly Arenas, and Storage/Agriculture Buildings. For other Building types consult Cover-All Engineer

Minimum hole diameter is 24 inches.

Minimum Ground Embedment should be no less than 4 feet unless otherwise specified.

Standard Perma-Column length is 5' plus 3½" concrete base.

Recommended Column length is based on standard Perma-Column with 8" above grade and a 4'-7½" embedment (including base). See Figure E.

Perma-Column requires an extension if Calculated Embedment exceeds 5'.

18", 24", and 36" extensions are available

**Notes:**

The design follows IBC 2003 and ASCE-7-02

Embedment formulas are per IBC 2003 Section 1805.7.2.1, and 1805.7.2.2; Constrained and Non-Constrained conditions

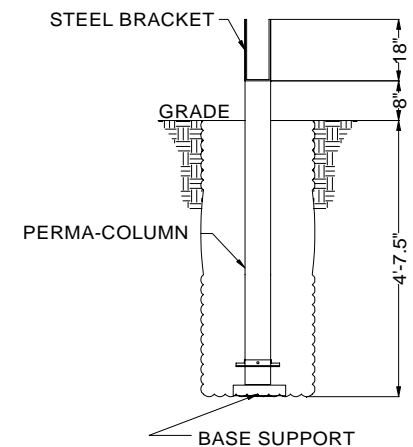
Allowable lateral Soil Bearing Pressure (**S**) is based on assumed depth and IBC Table 1804.2 for Sand, silt, and gravel conditions.

For all other soil conditions, consult with Engineer.

**S** is increased by 33% for wind allowable per IBC Section 1804.

\* **A** is a constant given by the equation  $(2.34 \times \text{Horz. load}) / (\mathbf{S} \times \mathbf{b})$

**Fig. E**



**FOR ESTIMATING ONLY-NOT FOR FINAL DESIGN**

**Servinsky Engineering PLLC Holland, MI is not the Engineer of record unless contracted for a specific project.**