Prepared by TimberLogic LLC for:

Honest Abe Log Homes, Inc.

9995 Clay County Hwy., Moss, TN 17837

931-258-3648, www.honestabe.com

See Disclaimer, page 2

Contents (pgs):

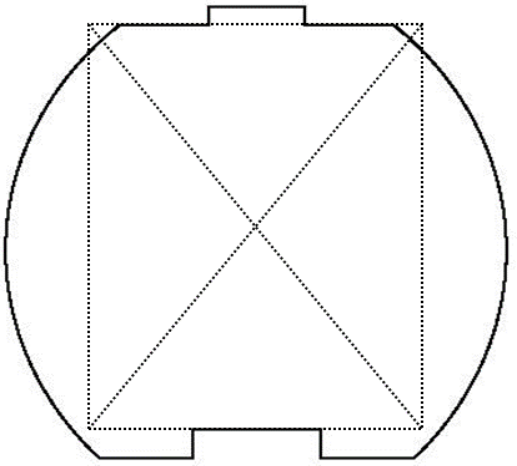
8x8 Round: 8x8 (Nominal) Tongue & Groove (T&G) Round-Round Wall-Log

The purpose of this report is to define the log wall system according to ICC400-2012 *Standard on the Design and Construction of Log Structures* .

1.1 Wall-Log Summary

Ref. 2.3

Variable		ICC400	U/M	Vertical	Horizontal
	Wood species	302.2.1.2		Eastern White Pine	
	Log Profile	302.2.1.4			
Wn	Least width dimension		in.		4- 1/4
B_{LP}	Profile bearing width		in.		2- 1/4
IR	Inscribed Rectangle		in.	7	5
H_L	Stack height	302.2.3.5	in.	7- 1/2	
	Section Properties	302.2.3.4			
A	Area of cross-section		$in.^2$	48.904	
S	Section modulus		$in.^3$	55.059	49.529
I	Moment of inertia		$in.^4$	206.472	161.356
W_L	Average width (A/H_L)	302.2.3.6	in.		6-33/64
Calculated fire-resistance rating:		303.2.2	Ref. 1.8		0.8-hr.



MC	**Moisture Content**	302.2.2		Climate Zone:	Initial	Dry	Moist	Warm-Humid	Marine
MC_D	Design MC	302.2.2.1		%	18				
MCs	Service MC = EMC	302.2.2.2	Ref. 2.41			10	13	14	15
G	Specific Gravity @ MCs	302.2.3.3			0.363	0.373	0.369	0.368	0.367
	Wall mass	302.2.3.7		psf	14.51	13.9	14.13	14.22	14.3
Weight	Log weight	302.2.3.8	Ref. 2.42	plf	9.07	8.69	8.83	8.89	8.94
	Estimated Settling	304							
Δ_{SL}	Due to slumping	304.2.2.1	Ref. 2.54	in./course	NA	NA	NA	NA	NA
Δc	Due to compaction	304.2.2.2	Ref. 2.53	in./course	NA	NA	NA	NA	NA
Δs	Due to shrinkage	304.2.2.3	Ref. 2.52	in./course	0	-0.043	-0.027	-0.021	-0.016
ΔT	Total settling, typ. wall	304.2	Hw=8.125 ft	in./%	0"/0%	0.56"/0.6%	0.34"/0.4%	0.27"/0.3%	0.2"/0.2%
	Thermal Properties	305.3.3							
k	thermal transmittance			$Btu{\cdot}in/(h{\cdot}ft^2{\cdot}{}^oF)$	0.798372	0.73326	0.757776	0.766376	0.77492
R	Eastern White Pine		Ref. 2.43	R/in.	1.253	1.364	1.32	1.305	1.29
R_L		Avg. Log Thickness x R-value/inch			8.16	8.89	8.6	8.5	8.41
HC	Heat Capacity	305.4.3.2		$Btu/ft^2{\cdot}{}^oF$	6.1	5.1	5.5	5.5	5.7
				Climate Zone:		CZ-5	CZ-6	CZ1-3	CZ-4C
Um	Mass Enhanced U-Factor		Ref. 1.32		0.110	0.093	0.093	0.093	0.093

	Design Values	302.2.1	Grading Program:	Timber Products Inspection Grading Rules				
		302.2.3	Ref. 2.11	Grade	Premium	Select	Rustic	Wall40
Fb	bending, adj. for size	*Note: Size Factor (Cs) has been applied*		psi	1075	965	825	635
Fb	bending, adj. for size	*to Fb, bending stress value*		psi	1035	930	795	610
Ft	tension			psi	675	575	500	375
Fv	shear			psi	125	125	125	125
Fc, perp.	Compression perp. to grain	Mean Stress at 0.04 in. Deformation		psi	350	350	350	350
Fc, para.	compression parallel to grain			psi	675	600	525	400
E	modulus of elasticity			psi	1,100,000	1,100,000	1,000,000	800,000
C_F	Size Factor (applicable to Fb, bending stress value)		1.062	1.102	*For SI: 1 $lbf.in^2$ (psi) =*			*6.894 kPa*
	Visual Grading Criteria		Ref. 2.2	Category	Beams & Stringers		Posts & Timbers	
SOG	Slope of Grain				1 in 12	1 in 10	1 in 8	1 in 6
	Maximum allowable knot size			5" Narrow Face	1-3/4"	2 "	2-1/2"	3 "
	Unless otherwise noted, log			7" Wide Face	2 "	2-1/2"	3-1/4"	4-1/4"
	grade is Wall40			Kerfed Face	NA	NA	NA	NA

	Fasteners	302.3				
	OlyLog	x 10-in.	24" o/c	Countersink	5/16"	to conceal fastener head
S	Spacing	from end: 4"	from edge: 2"		from edge in 1-hr rated wall: 1.5"	

Prepared by TimberLogic LLC for:

Honest Abe Log Homes, Inc.

9995 Clay County Hwy., Moss, TN 17837

931-258-3648, www.honestabe.com

See Disclaimer, page 2

8x8 Round: 8x8 (Nominal) Tongue & Groove (T&G) Round-Round Wall-Log

Wall-Log Summary

NOTICE TO USER:

The calculations and references used in this estimate are from the Wood Handbook (Forest Products Lab), ASTM Standards, and other sources. The reference material is based on averages from physical testing, and the actual results are likely to vary from those estimated here. To gain accuracy, sample measurements of specific gravity and moisture content would be required from the actual logs used. This estimate is intended as a guide for construction allowances and not a specification of performance.

The tables that follow are intended as guidelines for the specification of logs and timbers used in the design and construction of a log structure. The calculations provided are for information purposes only and have not been engineered for specific use. The individual using these tables (User) is solely responsible for specifying the appropriate timber. User recognizes that TimberLogic LLC (TL) is not responsible to the specification or performance of any product as specified by User. By using the information presented herein, User agrees to indemnify and hold harmless TL their agents, employees, representatives, and assigns from any and all claims (including attorney fees), demands, actions, damages, losses, costs, liabilities, and judgments asserted against them arising or alleged to have arisen out of the use of this information. TL does not warrant compliance with all state or local building codes and ordinances, as these codes can vary significantly from the guidelines contained herein. It is recommended that a licensed structural engineer be consulted to review specific building designs for conditions specific to the intended building site before undertaking any construction.

TL reserves the right to update and/or modify this analysis without notice.

Definitions: **ICC400 202**

ICC400	*LOG WALL* . An assembly of individual structural logs for use as an exterior or interior load bearing wall, shear wall, or non-load bearing wall. *LOG*. Wood member that has been stress graded and grade marked or grade certified using rules of an accredited inspections agency in accordance with ASTM D 3957, ASTM D 3737, or ASTM D 245 and is incorporated into a structure.
ASTM D3957	*WALL-LOG*. Wood members which are normally stacked horizontally or laid-up vertically to form a load-bearing, solid-wood wall, in any building.

1.2 Wall-Log Capacities

Analysis in Horizontal Plane - Lateral Loads

Variable	Premium	Select	Rustic	Wall40
FvA	6113	6113	6113	6113
FbS	53244	47795	40861	31451
EI	177491600	177491600	161356000	129084800
$B_{LP}xFc_{perp}$	Bearing capacity			9450 plf

Analysis in Vertical Plane - Gravity Loads

Premium	Select	Rustic	Wall40
6113	6113	6113	6113
56986	51205	43772	33586
227119200	227119200	206472000	165177600

1.21 Maximum Allowable Loading (plf) on a Single Wall-Log, by Span

- The maximum allowable loads calculated below are for a single log. For multiple log course acting independently but collectively, multiply these loads by the number of logs involved.

Span (ft.)	Allowable loading (plf), horizontal (lateral)					Allowable loading (plf), vertical (gravity)				
3	shear*	***1358***	***1358***	***1358***	***1358***	shear*	***1358***	***1358***	***1358***	***1358***
	bending	3944	3540	3027	2330	bending	4221	3793	3242	2488
	l/240	14608	14608	13280	10624	l/240	18693	18693	16994	13595
	l/360	9739	9739	8854	7083	l/360	12462	12462	11329	9063
4.5	shear*	***906***	***906***	***906***	***906***	shear*	***906***	***906***	***906***	***906***
	bending	1753	1574	1345	1035	bending	1876	1686	1441	1106
	l/240	4328	4328	3935	3148	l/240	5539	5539	5035	4028
	l/360	2886	2886	2623	2099	l/360	3692	3692	3357	2685
6	shear*	***679***	***679***	***679***	679	shear*	***679***	***679***	***679***	679
	bending	986	885	757	***582***	bending	1055	948	811	***622***
	l/240	1826	1826	1660	1328	l/240	2337	2337	2124	1699
	l/360	1217	1217	1107	885	l/360	1558	1558	1416	1133
8	shear*	***509***	509	509	509	shear*	***509***	***509***	509	509
	bending	555	***498***	***426***	***328***	bending	594	533	***456***	***350***
	l/240	770	770	700	560	l/240	986	986	896	717
	l/360	514	514	467	374	l/360	657	657	597	478
12	shear*	340	340	340	340	shear*	340	340	340	340
	bending	246	**221**	**189**	**146**	bending	**264**	**237**	**203**	**155**
	l/240	**228**	228	208	166	l/240	292	292	266	212
	l/360	***152***	***152***	***138***	***111***	l/360	***195***	***195***	***177***	***142***
13.5	shear*	302	302	302	302	shear*	302	302	302	302
	bending	195	175	149	**115**	bending	208	**187**	**160**	**123**
	l/240	**160**	**160**	**146**	117	l/240	**205**	205	186	149
	l/360	***107***	***107***	***97***	***78***	l/360	***137***	***137***	***124***	***99***

* Where shear determines the maximum allowable load, the load may be a single point load at midspan or a uniform load along its length.

Prepared by TimberLogic LLC for:
Honest Abe Log Homes, Inc.
9995 Clay County Hwy., Moss, TN 17837
931-258-3648, www.honestabe.com
See Disclaimer, page 2

8x8 Round: 8x8 (Nominal) Tongue & Groove (T&G) Round-Round Wall-Log

Wall-Log Summary

1.3 Thermal Properties of Wall Assembly

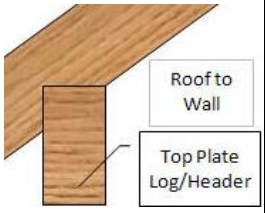
ICC400-2012 Section 305

1.31 Wall Assembly R-Value

1.311 Log Wall Configuration (clear, or opaque, wall area)

Height	Courses	Opaque Wall Section	% of assembly	Thickness (inches)	R-value/inch thickness (1/k)	For listed thickness (1/C)
		Air film-moving, outside at wall	100%			0.25
7.5 in.	13	Log wall: Avg. across climates zones	100%	6.515625	1.32	8.6
		Air film-vert.,still,horiz. heat flow	100%			0.69
97.5 in.		**U-Factor for opaque wall (Uw) is**	**0.1048**	**Rw: R-value of log wall**		**9.54**

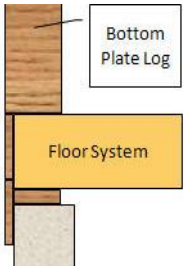
1.312 Roof to Wall Connection (Birdblock Course)



		Air film-moving, outside at wall	100%			0.25
		Exterior: Wood siding, Log Siding	100%	1.5	1.09	1.64
7 in.	1	Rigid Insul. - Foil faced polyurethane	100%	6	7.2	43.2
		Interior: Wood Paneling, 3/4" (softwd)	100%	0.75	0.94	0.71
		Air film-vert.,still,horiz. heat flow	100%			0.69
7 in.		**U-Factor for Birdblock =**	**0.0215**	**R-value of Birdblock =**		**46.49**

1.313 Bottom of Wall (Plate Log to floor or Sill Log to foundation)

Bottom log course is a Plate



		Air film-moving, outside at wall	100%			0.25
0.75 in.	1	Plywood (DF), 3/4" CDX	6.52%	5.5	0.94	0.34
9.25 in.	1	2x10, 16" oc	80.43%	3		0
9.25 in.	1	High performance fiber glass blanket or batt	80.43%	10	3.8	30.57
11.5 in.	1	Wood siding, Log Siding	100.00%	1.5	1.09	1.64
1.5 in.	1	Sill Plate: Softwood	13.04%	5.5	1.88	1.35
		Air film-vert.,still,horiz. heat flow	100%			0.55
11.5 in.	Floor depth	**U-Factor for floor perimeter =**	**0.0288**	**R-value at floor =**		**34.7**

1.32 Mass-enhanced U-Factors

1.321 REScheck: Input wall assembly as "Other"; enter U-factor.

	Assembly wall height	Assembly U-Factor	Assembly R-Value
■ Wall defined as sill plate to roof deck aligned with wall. Weighted average for eave walls	116 in.	0.070	14.26
Weighted average for rake walls	114 in.	0.086	11.66

■ 2003 & 2015 IECC: Mass wall defined as having a heat capacity of 6 Btu/ft^2-^{o}F or greater.

ICC400-2012 Section 305.4.3.2

	Climate Zones (CZ)	Net (frame) whole-wall U-factor	Net (frame) whole-wall R-value	Mass wall U-factor	Mass wall R-value	Mass factor	Mass-enhanced R-W_L	Mass-enhanced U-Factor
14% EMC (warm-humid climate)	CZ 1	0.082	12.20	0.197	5.08	1.00	10.75	0.093
14% EMC (warm-humid climate)	CZ 2	0.082	12.20	0.165	6.06	1.00	10.75	0.093
14% EMC (warm-humid climate)	CZ 3	0.057	17.54	0.098	10.20	1.00	10.75	0.093
13% EMC (moist climate)	CZ 4	0.057	17.54	0.098	10.20	1.00	10.75	0.093
15% EMC (marine)	CZ 4C	0.057	17.54	0.082	12.20	1.00	10.75	0.093
10% EMC (dry)	CZ 5	0.057	17.54	0.082	12.20	1.00	10.75	0.093
13% EMC (moist climate)	CZ 6	0.048	20.83	0.06	16.67	1.00	10.75	0.093
13% EMC (moist climate)	CZ 7+8	0.048	20.83	0.057	17.54	1.00	10.75	0.093

1.33 Calculation of Thermal Envelope

1.331 Prescriptive Requirements of the ICC 2015 IECC

IECC=International Energy Conservation Code®

Required U-Factor, IECC Table 402.1.3

Climate Zones	1	2	3	4 exc. Mar.	5 & Mar.	6	7 & 8
Mass Wall U-Factor	0.75	0.5	0.45	0.35	0.35	0.35	0.35
Wood Frame Wall U-Factor	0.064	0.064	0.047	0.047	0.033	0.033	0.028
Ceiling U-Factor	0.035	0.035	0.035	0.03	0.03	0.026	0.026
Floor U-Factor	0.035	0.03	0.03	0.026	0.026	0.026	0.026
Fenestration U-Factor	0.5	0.4	0.35	0.35	0.32	0.32	0.32

Prepared by TimberLogic LLC for:
Honest Abe Log Homes, Inc.
9995 Clay County Hwy., Moss, TN 17837
931-258-3648, www.honestabe.com
See Disclaimer, page 2

8x8 Round: 8x8 (Nominal) Tongue & Groove (T&G) Round-Round Wall-Log

Wall-Log Summary

1.332 Example Building

■ **Sample building:**

			Area (sf)
Log walls	*28 ft. wide*	*48 ft. long*	1470
Log walls		*w/2-10:12 gables*	327
Roof area		*@ 10:12 roof pitch*	1750
Floor area			1344

Fenestration options in log wall

Rate	Area (sf)
10%	147
15%	220.5
18%	264.6

■ The standard U-factor for fenestration is 0.32

1.333 Sample U-Factor Packages

Climate Zones	1	2	3	4 exc. Mar.	5 & Mar.	6	7 & 8
Mass-enhanced Wall U-Factor	0.093	0.093	0.093	0.093	0.093	0.093	0.093
Max. Glazing U-Factor @ 10%	0.5	0.4	0.35	0.35	0.32	0.32	0.32
Max. Glazing U-Factor @ 15%	0.5	0.4	0.35	0.35	0.32	0.32	0.32
Max. Glazing U-Factor @ 18%	0.5	0.4	0.35	0.35	0.32	0.32	0.32
Ceiling U-Factor	0.035	0.035	0.035	0.03	0.03	0.026	0.026
Floor U-Factor	0.035	0.03	0.03	0.026	0.026	0.026	0.026
Wood Frame Wall U-Factor	0.064	0.064	0.047	0.047	0.033	0.033	0.028

1.34 Infiltration — ICC400-2012 Section 306

1.341 Horizontal Joint:

Joint Dimensions:	Width	Height	
Sealant dimensions	0.625	0.325	in.
Top/tongue:	1.5	0.3125	in.
Bottom/groove:	2	0.5	in.
Initial Joint:		0.1875	in.
Initial sealant compression:		42.30%	%

Sealant: Norseal V790 Log home foam

Test results reported by mfr.

% of height	Force
10%	1.8 psi
25%	3.4 psi
50%	6.3 psi
65%	14.9 psi
75%	37.3 psi
Recovery Rate	75%

1.342 Accomodating Settling

MC	Joint Hgt. (in.)	Sealant Compression (%)
Initial	0.1875	42.30%
Dry	0.2305	29.10%
Moist	0.2145	34.00%
Hot-Humid	0.2085	35.80%
Marine	0.2035	37.40%

Horizontal joint design tolerance in service (worst case, Dry climate), 2 x [radial shrinkage+slumping-compaction]: 3/32 in.

Fastening force required initially to compress gasket: 3.4 psi, 25.5 plf

Std. log fastener: 10-in. OlyLog

Fastening schedule to initially compress gasket: 24 in. o/c

Head of fastener to be set below log surface no less than 1/16 in.

1.342 Vertical Joint:

Vertical joint design tolerance for longitudinal shrinkage for Splined butt joints. 3/16 in.

1.4 Roof Overhang — ICC400-2012 Section 302.4

1.41 Calculate Roof Overhang Dimension

Fig. 1.41

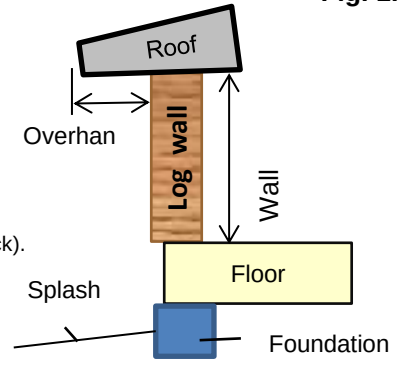
■ Per requirements of ICC400-2012 Section 302.4, the overhang is used to limit potential backsplash from roof run-off to improve durability of lower log courses.

■ Overhang: Wall surface to drip edge (or edge of gutter)

■ Wall Height: Eave to bottom plate or sill log

■ **Exceptions:** A 12" minimum overhang is allowable if one of the following apply.

1. Logs within 24" of a splash surface comply with Section 302.2.5 for preservative treating.
2. Gutters are installed and the lowest log is 18" above a splash surface.
3. The splash surface permits roof runoff to pass unimpeded to finish grade (e.g., grating in deck).



Wall Height, O_H

13 log courses x Stack height, HL = Hw = 97.5 in.

Prepared by TimberLogic LLC for:
Honest Abe Log Homes, Inc.
9995 Clay County Hwy., Moss, TN 17837
931-258-3648, www.honestabe.com
See Disclaimer, page 2

8x8 Round: 8x8 (Nominal) Tongue & Groove (T&G) Round-Round Wall-Log

Wall-Log Summary

1.5 Maximum Allowable Simple Spans for Wall-Logs Supporting Vertical Load

- Header spans that follow are calculated based on uniform roof and floor loads.
- "Tributary Area" is the clear span that is bearing on headers over openings in loadbearing walls.
- A roof dead load of 15 psf has been included in all span
- Deflection is calculated at l/360.

1.51 Wall-logs Acting Independently Supporting Roof Load Only

	End Bearing	Tributary Area	Snow Load 100#LL	90#LL	80#LL	60#LL	50#LL
8x8 Round 1 -ply Eastern White Pine Wall40	3 "	12 feet	5 ft - 4 in	5 ft - 7 in	5 ft - 10 in	6 ft - 7 in	7 ft - 1 in
	3 "	13 feet	5 ft - 1 in	5 ft - 4 in	5 ft - 8 in	6 ft - 4 in	6 ft - 10 in
	3 "	14 feet	4 ft - 11 in	5 ft - 2 in	5 ft - 5 in	6 ft - 2 in	6 ft - 7 in
	3 "	16 feet	4 ft - 7 in	4 ft - 10 in	5 ft - 1 in	5 ft - 9 in	6 ft - 2 in
	3 "	18 feet	4 ft - 4 in	4 ft - 6 in	4 ft - 9 in	5 ft - 5 in	5 ft - 10 in
1 -ply Rustic	3 "	12 feet	6 ft - 1 in	6 ft - 4 in	6 ft - 8 in	7 ft - 7 in	8 ft - 1 in
	3 "	13 feet	5 ft - 10 in	6 ft - 1 in	6 ft - 5 in	7 ft - 3 in	7 ft - 10 in
	3 "	14 feet	5 ft - 7 in	5 ft - 11 in	6 ft - 2 in	7 ft - 0 in	7 ft - 6 in
	3 "	16 feet	5 ft - 3 in	5 ft - 6 in	5 ft - 10 in	6 ft - 7 in	7 ft - 0 in
	3 "	18 feet	4 ft - 11 in	5 ft - 2 in	5 ft - 6 in	6 ft - 2 in	6 ft - 7 in
1 -ply Premium	3 "	12 feet	6 ft - 11 in	7 ft - 3 in	7 ft - 8 in	8 ft - 8 in	9 ft - 1 in
	3 "	13 feet	6 ft - 8 in	7 ft - 0 in	7 ft - 4 in	8 ft - 4 in	8 ft - 11 in
	3 "	14 feet	6 ft - 5 in	6 ft - 9 in	7 ft - 1 in	8 ft - 0 in	8 ft - 7 in
	3 "	16 feet	6 ft - 0 in	6 ft - 3 in	6 ft - 7 in	7 ft - 6 in	8 ft - 0 in
	3 "	18 feet	5 ft - 8 in	5 ft - 11 in	6 ft - 3 in	7 ft - 1 in	7 ft - 7 in
8x8 Round 2 -ply Wall40	3 "	12 feet	7 ft - 6 in	7 ft - 11 in	8 ft - 4 in	9 ft - 5 in	10 ft - 1 in
	3 "	13 feet	7 ft - 3 in	7 ft - 7 in	8 ft - 0 in	9 ft - 0 in	9 ft - 8 in
	3 "	14 feet	6 ft - 11 in	7 ft - 3 in	7 ft - 8 in	8 ft - 8 in	9 ft - 4 in
	3 "	16 feet	6 ft - 6 in	6 ft - 10 in	7 ft - 2 in	8 ft - 1 in	8 ft - 9 in
	3 "	18 feet	6 ft - 1 in	6 ft - 5 in	6 ft - 9 in	7 ft - 8 in	8 ft - 3 in
2 -ply Rustic	3 "	12 feet	8 ft - 7 in	9 ft - 0 in	9 ft - 6 in	10 ft - 8 in	11 ft - 2 in
	3 "	13 feet	8 ft - 3 in	8 ft - 8 in	9 ft - 1 in	10 ft - 4 in	10 ft - 10 in
	3 "	14 feet	7 ft - 11 in	8 ft - 4 in	8 ft - 9 in	9 ft - 11 in	10 ft - 7 in
	3 "	16 feet	7 ft - 5 in	7 ft - 9 in	8 ft - 3 in	9 ft - 3 in	9 ft - 11 in
	3 "	18 feet	7 ft - 0 in	7 ft - 4 in	7 ft - 9 in	8 ft - 9 in	9 ft - 5 in
2 -ply Premium	3 "	12 feet	9 ft - 5 in	9 ft - 9 in	10 ft - 1 in	11 ft - 0 in	11 ft - 6 in
	3 "	13 feet	9 ft - 2 in	9 ft - 6 in	9 ft - 10 in	10 ft - 8 in	11 ft - 2 in
	3 "	14 feet	9 ft - 0 in	9 ft - 3 in	9 ft - 7 in	10 ft - 5 in	10 ft - 11 in
	3 "	16 feet	8 ft - 6 in	8 ft - 10 in	9 ft - 2 in	10 ft - 0 in	10 ft - 5 in
	3 "	18 feet	8 ft - 0 in	8 ft - 5 in	8 ft - 10 in	9 ft - 7 in	10 ft - 0 in
8x8 Round 3 -ply Wall40	3 "	12 feet	9 ft - 2 in	9 ft - 8 in	10 ft - 2 in	11 ft - 4 in	11 ft - 10 in
	3 "	13 feet	8 ft - 10 in	9 ft - 3 in	9 ft - 9 in	11 ft - 0 in	11 ft - 6 in
	3 "	14 feet	8 ft - 6 in	8 ft - 11 in	9 ft - 5 in	10 ft - 8 in	11 ft - 3 in
	3 "	16 feet	8 ft - 0 in	8 ft - 4 in	8 ft - 10 in	9 ft - 11 in	10 ft - 8 in
	3 "	18 feet	7 ft - 6 in	7 ft - 11 in	8 ft - 4 in	9 ft - 5 in	10 ft - 1 in
3 -ply Rustic	3 "	12 feet	10 ft - 6 in	10 ft - 10 in	11 ft - 3 in	12 ft - 2 in	12 ft - 9 in
	3 "	13 feet	10 ft - 1 in	10 ft - 7 in	10 ft - 11 in	11 ft - 10 in	12 ft - 5 in
	3 "	14 feet	9 ft - 9 in	10 ft - 3 in	10 ft - 8 in	11 ft - 7 in	12 ft - 1 in
	3 "	16 feet	9 ft - 1 in	9 ft - 7 in	10 ft - 1 in	11 ft - 1 in	11 ft - 7 in
	3 "	18 feet	8 ft - 7 in	9 ft - 0 in	9 ft - 6 in	10 ft - 8 in	11 ft - 2 in
3 -ply Premium	3 "	12 feet	10 ft - 10 in	11 ft - 2 in	11 ft - 7 in	12 ft - 7 in	13 ft - 2 in
	3 "	13 feet	10 ft - 7 in	10 ft - 11 in	11 ft - 3 in	12 ft - 3 in	12 ft - 10 in
	3 "	14 feet	10 ft - 3 in	10 ft - 7 in	11 ft - 0 in	11 ft - 11 in	12 ft - 6 in
	3 "	14 feet	10 ft - 3 in	10 ft - 7 in	11 ft - 0 in	11 ft - 11 in	12 ft - 6 in
	3-1/4"	18 feet	9 ft - 5 in	9 ft - 9 in	10 ft - 1 in	11 ft - 0 in	11 ft - 6 in

Prepared by TimberLogic LLC for:
Honest Abe Log Homes, Inc.
9995 Clay County Hwy., Moss, TN 17837
931-258-3648, www.honestabe.com
See Disclaimer, page 2

8x8 Round: 8x8 (Nominal) Tongue & Groove (T&G) Round-Round Wall-Log

Wall-Log Summary

1.52 Wall-logs Acting Independently Supporting Roof & Floor Load

■ Floor live load (FL): 40 psf

	End Bearing	Tributary Area	Snow Load 100#LL	90#LL	80#LL	60#LL	50#LL
8x8 Round 1 -ply Eastern White Pine Wall40	3 "	12 feet	4 ft - 8 in	4 ft - 10 in	5 ft - 0 in	5 ft - 5 in	5 ft - 8 in
	3 "	13 feet	4 ft - 5 in	4 ft - 7 in	4 ft - 10 in	5 ft - 3 in	5 ft - 6 in
	3 "	14 feet	4 ft - 3 in	4 ft - 5 in	4 ft - 7 in	5 ft - 0 in	5 ft - 3 in
	3 "	16 feet	4 ft - 0 in	4 ft - 2 in	4 ft - 4 in	4 ft - 9 in	4 ft - 11 in
	3 "	18 feet	3 ft - 9 in	3 ft - 11 in	4 ft - 1 in	4 ft - 5 in	4 ft - 8 in
1 -ply Rustic	3 "	12 feet	5 ft - 3 in	5 ft - 6 in	5 ft - 9 in	6 ft - 3 in	6 ft - 6 in
	3 "	13 feet	5 ft - 1 in	5 ft - 3 in	5 ft - 6 in	6 ft - 0 in	6 ft - 3 in
	3 "	14 feet	4 ft - 11 in	5 ft - 1 in	5 ft - 3 in	5 ft - 9 in	6 ft - 0 in
	3 "	16 feet	4 ft - 7 in	4 ft - 9 in	4 ft - 11 in	5 ft - 5 in	5 ft - 8 in
	3 "	18 feet	4 ft - 4 in	4 ft - 6 in	4 ft - 8 in	5 ft - 1 in	5 ft - 4 in
1 -ply Premium	3 "	12 feet	6 ft - 1 in	6 ft - 3 in	6 ft - 6 in	7 ft - 1 in	7 ft - 5 in
	3 "	13 feet	5 ft - 10 in	6 ft - 0 in	6 ft - 3 in	6 ft - 10 in	7 ft - 2 in
	3 "	14 feet	5 ft - 7 in	5 ft - 10 in	6 ft - 0 in	6 ft - 7 in	6 ft - 11 in
	3 "	16 feet	5 ft - 3 in	5 ft - 5 in	5 ft - 8 in	6 ft - 2 in	6 ft - 5 in
	3 "	18 feet	4 ft - 11 in	5 ft - 1 in	5 ft - 4 in	5 ft - 10 in	6 ft - 1 in
8x8 Round 2 -ply Wall40	3 "	12 feet	6 ft - 7 in	6 ft - 10 in	7 ft - 1 in	7 ft - 9 in	8 ft - 1 in
	3 "	13 feet	6 ft - 4 in	6 ft - 6 in	6 ft - 10 in	7 ft - 5 in	7 ft - 9 in
	3 "	14 feet	6 ft - 1 in	6 ft - 4 in	6 ft - 7 in	7 ft - 2 in	7 ft - 6 in
	3 "	16 feet	5 ft - 8 in	5 ft - 11 in	6 ft - 2 in	6 ft - 8 in	7 ft - 0 in
	3 "	18 feet	5 ft - 4 in	5 ft - 7 in	5 ft - 9 in	6 ft - 4 in	6 ft - 7 in
2 -ply Rustic	3 "	12 feet	7 ft - 6 in	7 ft - 9 in	8 ft - 1 in	8 ft - 10 in	9 ft - 3 in
	3 "	13 feet	7 ft - 2 in	7 ft - 6 in	7 ft - 9 in	8 ft - 6 in	8 ft - 10 in
	3 "	14 feet	6 ft - 11 in	7 ft - 2 in	7 ft - 6 in	8 ft - 2 in	8 ft - 7 in
	3 "	16 feet	6 ft - 6 in	6 ft - 9 in	7 ft - 0 in	7 ft - 8 in	8 ft - 0 in
	3 "	18 feet	6 ft - 1 in	6 ft - 4 in	6 ft - 7 in	7 ft - 2 in	7 ft - 6 in
2 -ply Premium	3 "	12 feet	8 ft - 7 in	8 ft - 10 in	9 ft - 1 in	9 ft - 8 in	9 ft - 11 in
	3 "	13 feet	8 ft - 3 in	8 ft - 6 in	8 ft - 10 in	9 ft - 4 in	9 ft - 8 in
	3 "	14 feet	7 ft - 11 in	8 ft - 3 in	8 ft - 7 in	9 ft - 2 in	9 ft - 5 in
	3 "	16 feet	7 ft - 5 in	7 ft - 8 in	8 ft - 0 in	8 ft - 9 in	9 ft - 0 in
	3 "	18 feet	7 ft - 0 in	7 ft - 3 in	7 ft - 6 in	8 ft - 3 in	8 ft - 7 in
8x8 Round 3 -ply Wall40	3 "	12 feet	8 ft - 1 in	8 ft - 4 in	8 ft - 8 in	9 ft - 6 in	9 ft - 11 in
	3 "	13 feet	7 ft - 9 in	8 ft - 0 in	8 ft - 4 in	9 ft - 1 in	9 ft - 6 in
	3 "	14 feet	7 ft - 5 in	7 ft - 9 in	8 ft - 0 in	8 ft - 9 in	9 ft - 2 in
	3 "	16 feet	7 ft - 0 in	7 ft - 3 in	7 ft - 6 in	8 ft - 2 in	8 ft - 7 in
	3 "	18 feet	6 ft - 7 in	6 ft - 10 in	7 ft - 1 in	7 ft - 9 in	8 ft - 1 in
3 -ply Rustic	3 "	12 feet	9 ft - 2 in	9 ft - 6 in	9 ft - 11 in	10 ft - 8 in	11 ft - 0 in
	3 "	13 feet	8 ft - 10 in	9 ft - 2 in	9 ft - 6 in	10 ft - 5 in	10 ft - 9 in
	3 "	14 feet	8 ft - 6 in	8 ft - 10 in	9 ft - 2 in	10 ft - 0 in	10 ft - 6 in
	3 "	16 feet	7 ft - 11 in	8 ft - 3 in	8 ft - 7 in	9 ft - 4 in	9 ft - 10 in
	3 "	18 feet	7 ft - 6 in	7 ft - 9 in	8 ft - 1 in	8 ft - 10 in	9 ft - 3 in
3 -ply Premium	3 "	12 feet	9 ft - 11 in	10 ft - 2 in	10 ft - 5 in	11 ft - 0 in	11 ft - 5 in
	3 "	13 feet	9 ft - 8 in	9 ft - 11 in	10 ft - 2 in	10 ft - 9 in	11 ft - 1 in
	3 "	14 feet	9 ft - 5 in	9 ft - 8 in	9 ft - 11 in	10 ft - 6 in	10 ft - 10 in
	3 "	16 feet	9 ft - 0 in	9 ft - 3 in	9 ft - 6 in	10 ft - 0 in	10 ft - 4 in
	3 "	18 feet	8 ft - 7 in	8 ft - 10 in	9 ft - 1 in	9 ft - 8 in	9 ft - 11 in

Prepared by TimberLogic LLC for:
Honest Abe Log Homes, Inc.
9995 Clay County Hwy., Moss, TN 17837
931-258-3648, www.honestabe.com
See Disclaimer, page 2

8x8 Round: 8x8 (Nominal) Tongue & Groove (T&G) Round-Round Wall-Log

Wall-Log Summary

1.53 Log Courses for Headers/Girders/Beams with Wall-Logs Acting Independently

- Based on the standard wall height/log coursing, door and window openings will be left with a header consisting of 1.5 log courses.

1.531 Minimum Number of CONTINUOUS Logs over Span (without bolting)

- Wall-logs to be continuous for the calculated span and required end bearing.

		Ground Snow Load, Pg							
Span	**Log Grade**	**100**	**90**	**80**	**70**	**60**	**50**	**20**	psf
Estimated load on header		1570 plf	1460 plf	1350 plf	1250 plf	1150 plf	1050 plf	730 plf	plf
3 ft.	Wall40 & Btr.	1.5	1.5	1	1	1	1	1	logs
4.5 ft.	Wall40 & Btr.	2	2	1.5	1.5	1.5	1.5	1	logs
6 ft.	Select & Btr.	2.5	2.5	2	2	2	2	1.5	logs
8 ft.	Select & Btr.	Use bolted header	Use bolted header	Use bolted header	2.5	2.5	2.5	1.5	logs
10 ft.	Select & Btr.	Use bolted header	Use bolted header	Use bolted header	Use bolted header	Use bolted header	Use bolted header	2.5	logs
12 ft.	Select & Btr.	Use bolted header	Use bolted header	Use bolted header	Use bolted header	Use bolted header	Use bolted header	Use bolted header	logs
13.5 ft.	Select & Btr.	Use bolted header	Use bolted header	Use bolted header	Use bolted header	Use bolted header	Use bolted header	Use bolted header	logs

1.54 Minimum Number of Wall-Logs Acting Collectively as a Beam

- Assume a bolt diameter = 0.75-in. installed in a predrilled hole (0.78125-in.), with first bolt located 5.25-in. from each end and minimum spacing of intermediate bolts (on center) to be 3-in.
- All wall-logs in bolted header to be Grade: Select & better and continuous full length.
- All logs in a 2-course header must be full length. For headers with more log courses, the top log course and all courses in the bottom half of the header must be full length. Only one log course in the top half of the header may have a butt joint.

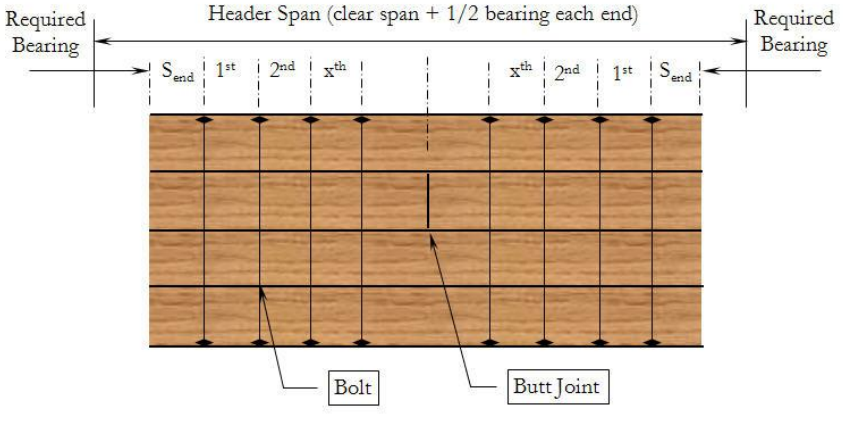
Minimum Number of Bolted Logs in Header

Ground Snow Load, Pg		**100**	**90**	**80**	**70**	**60**	**50**	**20**	psf
Estimated load on header		1570 plf	1460 plf	1350 plf	1250 plf	1150 plf	1050 plf	730 plf	plf
Header Span	3 ft.	--	--	--	--	--	--	--	logs
	4.5 ft.	2	2	--	--	--	--	--	logs
	6 ft.	2	2	2	2	2	2	--	logs
	8 ft.	3	3	3	2	2	2	--	logs
	10 ft.	3	3	3	3	3	2	2	logs
	12 ft.	4	4	4	3	3	3	2	logs
	13.5 ft.	4	4	4	4	3	3	2	logs

NDS: Bolts must meet or exceed structural quality, ASTM Standard A307, Grade A. **Ref. 5.32**

- S_{end} illustrated below is to the first bolt required at each end of the bolted header. Additional bolting shall be per Table 1.541.

Fig. 1.541 Bolting Pattern for Composite Log Headers



Prepared by TimberLogic LLC for:
Honest Abe Log Homes, Inc.
9995 Clay County Hwy., Moss, TN 17837
931-258-3648, www.honestabe.com
See Disclaimer, page 2

8x8 Round: 8x8 (Nominal) Tongue & Groove (T&G) Round-Round Wall-Log

Wall-Log Summary

1.541 Required Bolting Patterns for Table 1.531 with a SPLICED Log Course

Ground Snow Load		100	90	80	70	60	50	20	psf
Span	1/3-span	Required bolting in addition to end bolt:							
Based on header loading of:		1570	1460	1350	1250	1150	1050	730	plf
3 ft.	End	--	--	--	--	--	--	--	
	Mid	--	--	--	--	--	--	--	
4.5 ft.	End	1 bolts @ 7-in. o/c	1 bolts @ 7-in. o/c	1 bolts @ 8-in. o/c	--	--	--	--	
	Mid	--	--	--	--	--	--	--	
6 ft.	End	3 bolts @ 5-in. o/c	3 bolts @ 5-in. o/c	2 bolts @ 6-in. o/c	2 bolts @ 6-in. o/c	2 bolts @ 7-in. o/c	1 bolts @ 8-in. o/c	--	
	Mid	1 bolts @ 15-in. o/c	1 bolts @ 16-in. o/c	1 bolts @ 18-in. o/c	1 bolts @ 19-in. o/c	1 bolts @ 21-in. o/c	1 bolts @ 23-in. o/c	--	
8 ft.	End	5 bolts @ 5-in. o/c	5 bolts @ 5-in. o/c	4 bolts @ 6-in. o/c	5 bolts @ 5-in. o/c	5 bolts @ 5-in. o/c	4 bolts @ 6-in. o/c	2 bolts @ 8-in. o/c	
	Mid	2 bolts @ 15-in. o/c	1 bolts @ 16-in. o/c	1 bolts @ 18-in. o/c	2 bolts @ 14-in. o/c	1 bolts @ 16-in. o/c	1 bolts @ 17-in. o/c	1 bolts @ 25-in. o/c	
10 ft.	End	8 bolts @ 4-in. o/c	8 bolts @ 4-in. o/c	6 bolts @ 5-in. o/c	6 bolts @ 5-in. o/c	5 bolts @ 6-in. o/c	6 bolts @ 5-in. o/c	4 bolts @ 7-in. o/c	
	Mid	3 bolts @ 12-in. o/c	3 bolts @ 13-in. o/c	2 bolts @ 14-in. o/c	2 bolts @ 15-in. o/c	2 bolts @ 17-in. o/c	2 bolts @ 14-in. o/c	1 bolts @ 20-in. o/c	
12 ft.	End	10 bolts @ 4-in. o/c	8 bolts @ 5-in. o/c	8 bolts @ 5-in. o/c	10 bolts @ 4-in. o/c	8 bolts @ 5-in. o/c	8 bolts @ 5-in. o/c	8 bolts @ 5-in. o/c	
	Mid	3 bolts @ 13-in. o/c	3 bolts @ 14-in. o/c	3 bolts @ 15-in. o/c	3 bolts @ 13-in. o/c	3 bolts @ 14-in. o/c	3 bolts @ 15-in. o/c	2 bolts @ 16-in. o/c	
13.5 ft.	End	12 bolts @ 4-in. o/c	12 bolts @ 4-in. o/c	12 bolts @ 4-in.	9 bolts @ 5-in. o/c	12 bolts @ 4-in.	9 bolts @ 5-in. o/c	9 bolts @ 5-in. o/c	
	Mid	4 bolts @ 11-in. o/c	4 bolts @ 12-in. o/c	4 bolts @ 13-in. o/c	3 bolts @ 14-in. o/c	4 bolts @ 12-in. o/c	3 bolts @ 14-in. o/c	3 bolts @ 15-in. o/c	

1.6 Maximum Allowable Simple Spans for Wall-Logs Supporting Horizontal Load

- **Compliance with Ch. 6 - Wall Construction, ICC International Residential Code**

  This report provides analysis for log walls comprised of individual logs laid up horizontally. Wall-logs replace wood wall framing recognized in Section R602.

- **Compliance with Section 2304 - Wall Construction, ICC International Building Code**

  Bottom plate requirements are satisfied by the log course that is connected directly to the subfloor or to the sill plate/foundation. Framing over openings is provided by one or more log courses (including allowance for notching into logs above the opening). Floor and roof framing are not addressed in this report and are assumed to be capable of resisting applicable forces. Wall sheathing is not applicable. Code requirements shall apply for protection against decay and termites.

- Loads, connections, or other criteria not described in this report are to be specifically engineered for each design.
- Unless otherwise noted, all calculations in this section are based on Wall40 wall-logs with a stack height of 7.5-in.
- For a complete list of assumptions used to generate the tables in this section, see Section 3.5

1.61 Log Wall Length (Lw) Limited by Wind Loads: Ref. 3.52

- Wind Loads (WL) are calculated on basis of Exposure B, mean roof height = 20-ft., and wind speeds noted below.

Wind	85	90	100	110	120	130	140	150	mph
Design WL	11.26	12.62	15.58	18.85	22.43	26.34	30.53	35.06	psf
WL * H_L	8	8	10	12	15	17	20	22	plf, log
Log Grade	Maximum Allowable Sidewall Span (Lw, max. per Log Grade) per Wind Load								
Premium	65	65	58	53	47	44	41	39	ft.
Select	61	61	55	50	45	42	39	37	ft.
Rustic	57	57	51	46	41	39	36	34	ft.
Wall40	50	50	44	40	36	34	31	30	ft.

Prepared by TimberLogic LLC for:
Honest Abe Log Homes, Inc.
9995 Clay County Hwy., Moss, TN 17837
931-258-3648, www.honestabe.com
See Disclaimer, page 2

8x8 Round: 8x8 (Nominal) Tongue & Groove (T&G) Round-Round Wall-Log

Wall System Summary

1.7 Log Wall Fastening Schedule

- Specified fastener spacings do not account for fastening at or frequency of butt joints within the wall segment.
- The fastening schedule is the standard spacing or the minimum required for the wall span, whichever is less.
- Where results = "Use bolts", standard fasteners are limited by spacing requirements. Case-specific design of the connection will apply loads that may change the fastening schedule, especially at the ends of shear wall segments (T=C).
- vh = wind load (WL) x log wall height (Hw, not including

1.71 Typical Log Wall Fastening Specifications

- Std. log fastener: **OlyLog x 10 in. @ 24-in. o/c** Penetration (p): 2 in.
- Fastener design values:

Z, parallel	Z, perpendicular	W, direct withdrawal	
173	173	216	lbs.
138	138	NA	plf per log course

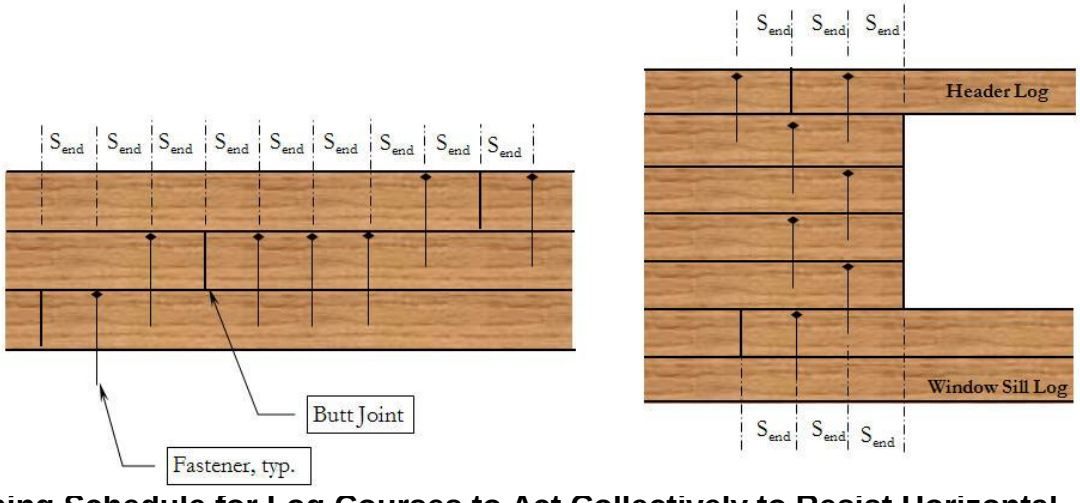
Fastening schedule to initially compress gasket: 24 in. o/c

1.711 End, Edge, and Spacing Requirements for Log Wall Fasteners: Ref. Fig.1.711

- The following minimum requirements are in accordance with the NDS.

Minimum	Requirements / Limitations	
2 in.	Edge distance, loaded edge (edge of inscribed rectangle to centerline of fastener)	
	2 Maximum allowable number of fasteners aligned in width of wall; otherw	
4 in.	S_{end} = End distance (end of log to first fastener, e.g., either side of a butt joint) and sp	
12 in.	Log length controlled by fastening (a fastener is required at each end to eliminate pote	
8 in.	Log header length beyond edge of opening (required bearing due to	1 fastener(s)
12 in.	the number of fasteners required at endwall/openings to resist	2 fastener(s)
16 in.	overturning, Fig. 1.73 and 1.742).	3 fastener(s)
12 in.	Distance between butt joints in consecutive rows	
8 in.	Distance to either side to next fastener in log directly above and below a butt joint	

Fig. 1.711 Fastener Spacing at Butt Joints, Openings / Minimum Overlap of Logs



1.72 Fastening Schedule for Log Courses to Act Collectively to Resist Horizontal Lateral Loads

- Fastener lateral design values (Z) for single shear are used to resist the horizontal lateral load; C_D x Z,perpendicular for sidewalls.
- Reported spacing is the minimum of standard fastener spacing, withdrawal capacity, or shear resistance.

Minimum fastening schedule along Sidewalls

Wind	85	90	100	110	120	130	140	150	mph
	24	24	24	24	24	24	24	24	in. o/c

- Based on the analysis taken for log shear walls, the seismic response modification coefficient is at least equal to the highest value given to any wood assembly by codes and standards (R=4.5).

Prepared by TimberLogic LLC for:
Honest Abe Log Homes, Inc.
9995 Clay County Hwy., Moss, TN 17837
931-258-3648, www.honestabe.com
See Disclaimer, page 2

8x8 Round: 8x8 (Nominal) Tongue & Groove (T&G) Round-Round Wall-Log

Wall System Summary

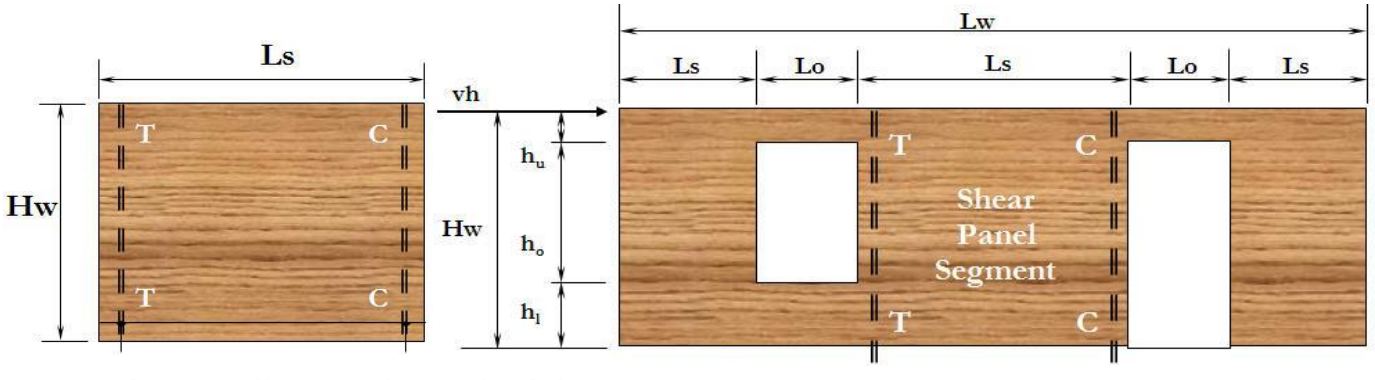
1.73 Fastening Schedule for Log Courses to Act Collectively to Resist Horizontal Lateral Loads

Assumptions and notes below correspond to Fig. 1.73:

- **Log walls are bearing walls that act as part of the Lateral Force Resisting System** (LFRS). Sidewalls resist lateral loads placed perpendicular to them with the horizontal members acting as a beam over a single span, simply supported with reaction points at shear wall locations. Log shear walls resist loads parallel to them, or in line with the logs.
- The maximum allowable log wall span equals that of an individual log acting as a beam, with maximum deflection set at l/360.
- Neither wind loading on the roof or dead load resisting an overturning force has been accounted for in this analysis.
- Neither friction or horizontal joinery connecting the consecutive logs has been included in this analysis.
- Log shear wa
  - 1 -- Continuous log courses above (header) and below (sill) wall openings act as boundary elements (drag struts) to distribute the horizontal shear force to shear elements within the wall. In multiple course headers/sills, the fastening schedule shall be determined by the horizontal shear so that log courses act collectively.
  - 2 -- Each log course has a shear capacity perpendicular to grain (vertical shear in a log wall) of 6113 lbs. per log.
  - 3 -- The shear wall segment beside a wall opening and between the header and sill log courses defines the aspect ratio for that segment. Therefore, the shear wall height is equal to the wall opening height; the width is a factor of the compressive capacity of the wood and the withdrawal capacity of the tensile connections.
  - 4 -- The tensile force at the corners of a wall opening is resisted by the withdrawal capacity of mechanical fastening and extends from the header to sill logs.
  - 5 -- The compressive force at the corners of a wall opening is resisted by the perpendicular to grain bearing capacity of the header/sill log.
  - 6 -- Gable end wall area above the log header is not used to resist shear loads.
- 2006 IBC 2305.1.1 Shear resistance based on principles of mechanics. -- Fastener lateral design values (Z) for single shear are used to resist the shear load; C_D x Z,parallel for shear walls or Z,perpendicular for sidewalls. Fastening schedules are uniformly applied without considering additional fasteners occurring due to other assembly requirements (e.g., restraint of log ends at butt
- Wind loads are horizontal and acting perpendicular to the loaded wall (topography and wind directionality factors =1).
- **Aspect Ratio** = Wall Height (H_w) to Wall Length (Ls with openings, Lw without openings) H_w for the standard log wall = 8.125 ft.
- **Ls = Length of log wall used as a shear panel.**
  T = Tension chord force, lbs.; C= Compression chord force, lbs.; v = Induced unit shear, lbs./ft.; h = Shear wall height, ft.
- For wind/seismic loading, OlyLog design values = Direct withdrawal, WxPxCD = 346 lbs.
- The shear force (vh) is distributed within the first wall segment (L1) from the corner to the first wall opening or shear wall. Where the aspect ratio of L1 is insufficient to distribute the shear force, the next panel after the wall opening is assumed to do so.
- Based on column analysis (Ref. 3.55), the minimum wall length is assumed to be 2-feet.

Fig. 1.73 Shear Wall Fastening Zones

- The fastening schedule presented in this section provides the most stringent criteria developed in tables **3.53 and 3.54.**



1.74 Shear Wall Fastening Schedule

- Wall Height = Log stack 7-1/2 " x log courses 13 wall height (H_w) of 97.5 in. or 8'-1.5" (8.125-ft.)

Wind	85	90	100	110	120	130	140	150	mph
Lw, max.	50 ft.	50 ft.	44 ft.	40 ft.	36 ft.	34 ft.	31 ft.	30 ft.	**Ref. 1.61**

Prepared by TimberLogic LLC for:
Honest Abe Log Homes, Inc.
9995 Clay County Hwy., Moss, TN 17837
931-258-3648, www.honestabe.com
See Disclaimer, page 2

8x8 Round: 8x8 (Nominal) Tongue & Groove (T&G) Round-Round Wall-Log

Wall System Summary

1.741 Fastening Schedule Required to Resist Horizontal Loading

for Wall40 grade wall-logs.
Ref. 3.53

- Fastener spacing for log walls of lengths (Ls) at wall height (Hw)
- OlyLog fasteners

Wind	85	90	100	110	120	130	140	150	mph
Ls = Lw	24	24	24	24	24	24	24	24	in. o/c
16.25 ft.	24	24	24	24	24	24	24	24	in. o/c
8.13 ft.	19	19	16	16	16	13	13	12	in. o/c
6.5 ft.	15	15	13	13	13	11	11	9	in. o/c
4.06 ft.	9	9	8	8	8	6	6	6	in. o/c
2.71 ft.	6	6	5	5	5	4	4	4	in. o/c
2.03 ft.	4	4	4	4	4	Use bolts	Use bolts	Use bolts	in. o/c

1.742 Fastening Schedule for Endwall Conditions: T_{OT} & C_{OT} (column at each end of Shear Walls)

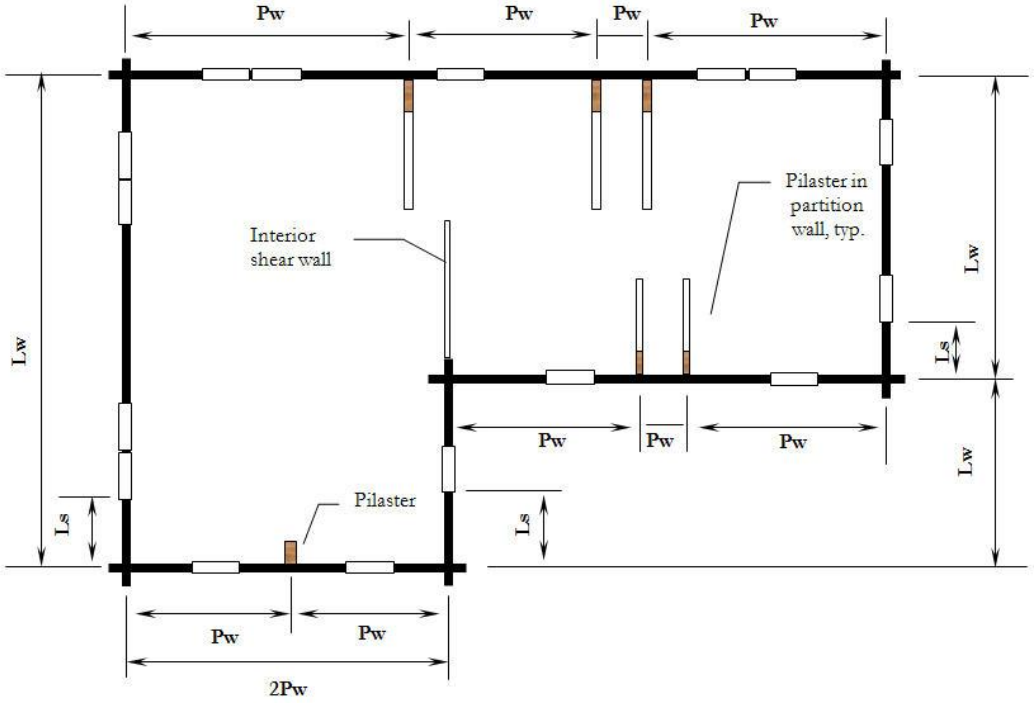
- The number of fasteners refers to quantity repeated at each end of each log in the wall, effectively forming a column.

Hw : Ls	Ls = Lw	Shear Wall fastening controls over Segment fastening at end of wall.								
Hw : Ls	Ls = Lw	1	1	1	1	1	1	1	1	fasteners
1:2	16.25 ft.	2	2	2	2	2	3	3	3	fasteners
1:1	8.13 ft.	4	4	4	5	5	5	6	6	fasteners
1.3 : 1	6.5 ft.	4	5	5	6	6	Use bolts	Use bolts	Use bolts	fasteners
	4.06 ft.	Use bolts	Use bolts	Use bolts	Use bolts	Use bolts	Use bolts	Use bolts	Use bolts	fasteners
	2.71 ft.	Use bolts	Use bolts	Use bolts	Use bolts	Use bolts	Use bolts	Use bolts	Use bolts	fasteners
2:1	2.03 ft.	Use bolts	Use bolts	Use bolts	Use bolts	Use bolts	Use bolts	Use bolts	Use bolts	fasteners
Through-bolt connections: 36000 psi tensile strength	4.06 ft.	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	bolt dia.
		3.5 sq.in.	4 sq.in.	4.25 sq.in.	4.75 sq.in.	5 sq.in.	5.5 sq.in.	5.75 sq.in.	6.5 sq.in.	washer
	2.71 ft.	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	bolt dia.
		3.5 sq.in.	4 sq.in.	4.25 sq.in.	4.75 sq.in.	5 sq.in.	5.5 sq.in.	5.75 sq.in.	6.5 sq.in.	washer
	2.03 ft.	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	bolt dia.
		7 sq.in.	7.75 sq.in.	8.5 sq.in.	9.25 sq.in.	9.75 sq.in.	11 sq.in.	11.5 sq.in.	12.75 sq.in.	washer

- Bolts are to be ASTM F1554 Grade 36 All Thread Rod or better.
- At sides of openings not in shear panel segments, ends of log shall be fastened as follows:

2	2	2	3	3	3	3	4	fasteners

Fig. 1.73 **Lw = the maximum allowable distance between supports (e.g., log corner, shear wall).**
Pw = the maximum allowable distance between pilasters/posts in the ends of partitions.
Ls = the distance from a support (e.g., log corner, shear wall) to an opening.



Prepared by TimberLogic LLC for:

Honest Abe Log Homes, Inc.

9995 Clay County Hwy., Moss, TN 17837

931-258-3648, www.honestabe.com

See Disclaimer, page 2

Contents (pgs):

8x8 Round: 8x8 (Nominal) Tongue & Groove (T&G) Round-Round Wall-Log

Wall System Summary

1.75 Effect of Stiffeners (Pilasters) on Wall Span

Ref. 3.56

- Stiffeners may be in the form of pilasters (vertical beams) or posts embedded in partition walls. The pilaster spacing shown (Pw) is equivalent to the maximum allowable tributary wall area, limited by maximum wall span per 3.52.
- For fastening of pilaster to log wall, see **1.751**
- Lumber is Spruce-Pine-Fir #1, timber is Eastern White Pine, Rustic Grade & Btr.
- Shear panels include 2-2x pilaster at connection to log wall. Design values for wood-frame shear panels are taken from Table 4.3A, page 31, ANSI/AF&PA SDPWS-2008 Special Design Provisions for Wind and Seismic. **Ref. 3.57**

		85	90	100	110	120	130	140	150	mph
Design Wind Load		11.26	12.62	15.58	18.85	22.43	26.34	30.53	35.06	psf
Lw		50 ft.	50 ft.	44 ft.	40 ft.	36 ft.	34 ft.	31 ft.	30 ft.	**Ref. 1.61**
Pilaster, Capacity		Maximum spacing of Pilaster = Wall span supported by pilaster (Pw)							Vert. span =	8.13 ft.
2-2x6	133 plf	11.5	10.5	8.5	7	5.5	5	4	3.5	ft.
2-2x6 w/2-ft. shear panel	269 plf	23.5	21	17	14	11.5	10	8.5	7.5	ft.
2-2x6 w/4-ft. shear panel	404 plf	35.5	32	25.5	21	18	15	13	11.5	ft.
4x8	309 plf	27	24	19.5	16	13.5	11.5	10	8.5	ft.
6x6	270 plf	23.5	21	17	14	12	10	8.5	7.5	ft.
6x8	485 plf	43	38	31	25.5	21.5	18	15.5	13.5	ft.
8x8	662 plf	50	50	42	35	29.5	25	21.5	18.5	ft.
6.75x7.5 GLB	1532 plf	50	50	44	40	36	34	31	30	ft.
6.75x10.5 GLB	2790 plf	50	50	44	40	36	34	31	30	ft.
			Vert. span =	19.8 ft.						
8x8	79 plf	7	6	5	4	3.5	2.5	2.5	2	ft.
6.75x7.5 GLB	122 plf	10.5	9.5	7.5	6	5	4.5	3.5	3	ft.
6.75x10.5 GLB	336 plf	29.5	26.5	21.5	17.5	14.5	12.5	11	9.5	ft.

1.751 Pilaster Connection to Log Wall

- # Fasteners: Based on pilaster design capacity, this is the number of fasteners to be installed per pilaster.
- Minimum installation of fasteners shall be at top, midpoint and base log courses. Vertical spacing (courses o/c) in table below indicates equal spacing of fasteners along height of pilaster.
- Connection of pilaster to log wall with 1/2" lag 3-7/8 " into log wall W= 934 lbs./fastener

Pilaster:	2-2x6	2-2x6 w/2-ft. shear panel	2-2x6 w/4-ft. shear panel	4x8	6x6	6x8	8x8	6.75x7.5 GLB	6.75x10.5 GLB	
Fastener Lgth:	10	10	10	12	10	12	12	12	15	in.
Recommended Fastening:				Vert. span =	8.13 ft.					
# Fasteners:	3	3	3	3	3	4	6	9	9	per pilaster
Vert. spacing	4	4	4	4	4	3	2	1	1	courses o/c
				Vert. span =	19.8 ft.					
# Fasteners:	3	3	3	3	3	3	3	3	7	per pilaster
Vert. spacing	4	4	4	4	4	4	4	4	1	courses o/c

1.752 Force at Ends of Pilaster to be Resisted by Floor and Roof at Pilaster Spacing above.

Pilaster:	2-2x6	2-2x6 w/2-ft. shear panel	2-2x6 w/4-ft. shear panel	4x8	6x6	6x8	8x8	6.75x7.5 GLB	6.75x10.5 GLB	
8.13 ft.	543	543	543	1255	1097	1973	2690	4276	4276	lbs.
19.8 ft.	141	NA	NA	365	238	573	782	1211	3322	lbs.

If connected only to log wall, fastening to top/bottom log and to floor/roof diaphragms:

8.13 ft.	1	1	1	2	2	3	3	5	5	fasteners
19.8 ft.	1	NA	NA	1	1	1	1	2	4	fasteners

Prepared by TimberLogic LLC for:
Honest Abe Log Homes, Inc.
9995 Clay County Hwy., Moss, TN 17837
931-258-3648, www.honestabe.com
See Disclaimer, page 2

8x8 Round: 8x8 (Nominal) Tongue & Groove (T&G) Round-Round Wall-Log

Wall System Summary

1.752 Interior Shear Wall Construction — Ref. 3.57

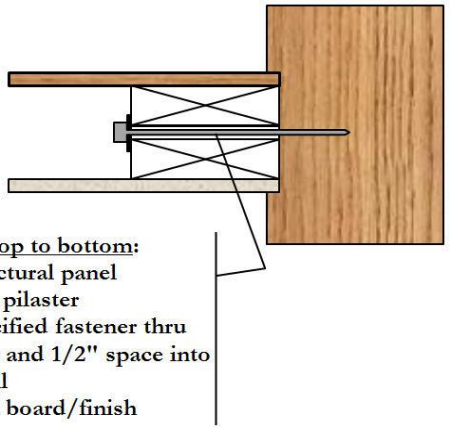
- This analysis follows the specifications set forth in ANSI/AF&PA SDPWS-2008 Special Design Provisions for Wind and Seismic. Unadjusted design values for wood-frame shear panels are taken from Table 4.3A, page 31.
- Shear walls include the specified 2-2x pilaster as end post connection to log wall.
- 15/32" minimum nominal thickness, OSB or 3-ply plywood structural panels conforming to std. PS1 or PS2.
- Values are based on stud spacing of 16" o/c and panel installed with long dimension vertical.
- Double top and bottom plates required, with specified sheathing overlapping both plates top and bottom. Specified nailing pattern is required into each plate.
- Min. 8d nails penetrating minimum 1-3/8" into framing member or blocking, 6" o/c on edge and in field. Minimum 3/8" edge distance required. Adhesive attachment of shear wall sheathing is not considered part of this report
- Options for Providing Support for Shear Wall
  - Option 1: Install foundation wall full length of shear wall
  - Option 2: Install post to footing beneath end post of shear wall
  - Option 3: Install beam in floor under shear wall

2-ft panel	4-ft. panel
2-2x10	2-LVL 9.25
1	2

fasteners

- Connection to floor: No deadload assumed to be imposed on shear wall. Recommended fastener:
  1/2" lag x 6-in. length
  through 2-2x bottom plate at ends into floor beam
  with a minimu

Fig. 1.73 Pilaster to log wall connection



1.8 Calculation of Fire-Resistance Rating — ICC400-2012 Section 303.2.2

Variable	At maximum burn, the cross-section less char suggests a design fire-rating of		0.8	hour(s)
d	Log wall height =	13 log courses x stack height of 7.5 in.	97.5	in.
Wa	average width (from log properties calculations = 5.982-in.)		6.515625	in.
b, Wn	narrowest dimension (from log properties calculations = 4.125-in.)		4.25	in.
Z	load factor		1.5	
2.54 Zb [4-(b/d)]		Calculation of fire-resistance ratings for minimum log width:	64	min.
t	exposure time	Estimated maximum length of burn, one face:	1	hour(s)
1.2 x 1.5	nominal char rate assumed for softwood timbers and glu-lams		1.8	
t^0.187			1	
CR	$=(1.2x1.5)/t^{0.187}$	Calculation of effective char rate	1.8	in./hr.
CL	= CR x t	Calculation of effective char layer thickness	1.8	in.
		Percentage Reduction in Width due to Charring:	42.35%	
t-Wa		Calculation of fire-resistance ratings for average log width:	98	min.
		Calculation of effective char layer thickness if burned for time (t-Wa):	2.94	in.
Wmin		minimum log width less associated char layer =	2.45	in.
Wavg		average log width less associated char layer =	3.575625	in.
2.54 Z b [4-(b/d)]	Calculation of fire-resistance ratings for the average of Wmin and Wavg:		46	min.

NDS CH.16 Fire Design of Wood Members: **NDS Table 16.2.2** **1.81 Fire Resistance Summary:**

Req'd. Fire Endurance	Effective Char Rate (in/hr)	Layer Thickness
1 hrs.	1.8	1.8 in.
1.5 hrs.	1.67	2.5 in.
2 hrs.	1.58	3.2 in.

	Adj. Factors
bending, Fb	2.85
tensile, Ft	2.85
comp., Fc	2.58

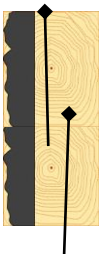
Min. dimension across log profile:	4.25	in.
Calculated fire-resistance rating:	0.8	hrs.
Char layer thickness at rated burn:	2.94	in.

Per ICC400: Log walls are 1-hr. rated when the least horizontal dimension is 6".

1.81 Fastener Protection

Fasteners shall be protected by 1-1/2" (38mm) of wood or other approved covering.

Required Edge Distance becomes the greater of fire or splitting (2.6) requirement:	2	in.
Maximum allowable number of fasteners across width of wall otherwise use staggered pattern.	1	fasteners



Prepared by TimberLogic LLC for:
Honest Abe Log Homes, Inc.
9995 Clay County Hwy., Moss, TN 17837
931-258-3648, www.honestabe.com
See Disclaimer, page 2

8x8 Round: 8x8 (Nominal) Tongue & Groove (T&G) Round-Round Wall-Log

Physical Properties of Wall-Logs

2.1 Design Stress Values are per Timber Products Inspection Grading Rules

2.11 Calculation of Wall-Log Design Stress Values per ASTM D3957

Strength Ratios (ASTM D245, Table 1), Quality Factors (ASTM D245, Table 5)				ASTM D2555 clear woo						
				4972	4972	4972	598	459	2206	1328
				adj. for size	adj. for size	Per Timber Products Inspection Grading Rules				
Slope of Grain	Bending/ Tension (%)	Fc, para. Adjust (%)	E Adjust	1	1	Cf is incorporated in design value				
				Fb, Ft	Fb, Ft	Ft	Fv	Fc, perp.**	Fc, para.	E
1 in 4	27	50	0.8	0	0	0	0	0	0	0
1 in 5	30	50	0.8	0	0	0	0	0	0	0
1 in 6	40	56	0.8	575	575	375	125	400	350	800000
1 in 8	53	66	0.9	750	750	500	125	525	350	1000000
1 in 10	61	74	1	875	875	575	125	600	350	1100000
1 in 12	69	82	1	975	975	675	125	675	350	1100000
1 in 14	74	87	1	0	0	0	0	0	0	0
1 in 15	76	100	1	0	0	0	0	0	0	0
1 in 16	80	100	1	0	0	0	0	0	0	0
1 in 18	85	100	1	0	0	0	0	0	0	0
1 in 20	100	100	1	0	0	0	0	0	0	0
Wall30	30	50	0.8	425	425	275	125	350	300	800000
Wall40	40	56	0.8	575	575	375	125	350	400	800000
Rustic	53	66	0.9	750	750	500	125	350	525	1000000
Select	61	74	1	875	875	575	125	350	600	1100000
Premium	69	82	1	975	975	675	125	350	675	1100000

Design Value Adjustment Factors	Fb	Ft	Fv	Fc, perp.	Fc, para.	E X 10^6
Wall-Log Softwood Factors (ASTM D245 Table 8)	2.1	2.1	2.1	1.67	1.9	NA
SRTB Softwood Factors (ASTM D245 Table 8)	2.1	2.1	2.1	1.67	1.9	NA
Density Factors (ASTM D245 Table 6)	1.17	1.17	1	1.13	1.17	1.05
SRTB Adjustment	0.91	0.5005	0.99	1.5	1.001	1.06
Fv Strength Ratio = 0.5 Wall-Log Adjustment	1	0.55	1	1.5	1.1	1.06

2.12 Calculation of Sawn Round Timber Beam Design Stress Values per ASTM D3957

Slope of Grain	Bending/ Tension	Fc, para. Adjust	E Adjust
1 in 14	73	73	1
1 in 10	61	61	1
Unsawn	73	73	1

Form Factor 1.18

The adjustment factor for Fv = 0.5

ASTM D2555 clear wood values		0.38		1	
4823	4823	592	440	2164	1167
Fb, Ft	Ft	Fv	Fc, perp.**	Fc, para.	E
1350	750	115	350	800	1100000
1100	600	115	350	650	1100000
925	500	115	350	550	1100000

**Fc, perp. Values taken as Mean Stress at 0.04 in. Deformation, psi

2.2 Calculation of Allowable Knot Sizes for Wall-Logs (ASTM D245)

- Vertical loads rotate around x-axis. Horizontal loads rotate around y-axis.

Calculations are accurate for face width down to 3-1/4 inches using the X1.1 version.

For 2.75 smaller than 3-1/4 inches, the X1.3 version controls, as it does for 4.5 on a 2-in face.

Strength Ratios	X1.3 version 69	61	X1.1 version 69	61	53	40	X1.2 Version 69	61	X1.3 version 61
Inscribed Rectangle	Premium	Select	Max. Allowable Knot in Narrow Face Premium	Select	Rustic	Wall40	Premium	Select	Select
5 "	2 3/4	4 1/2	1 3/4	2	2 1/2	3	1 3/4	2	4 1/2
7 "	5 1/2	8 3/4	2	2 1/2	3 1/4	4 1/4	2 1/4	3	8 3/4

Prepared by TimberLogic LLC for:
Honest Abe Log Homes, Inc.
9995 Clay County Hwy., Moss, TN 17837
931-258-3648, www.honestabe.com
See Disclaimer, page 2

8x8 Round: 8x8 (Nominal) Tongue & Groove (T&G) Round-Round Wall-Log

Physical Properties of Wall-Logs

2.3 Section Properties for Wall-Logs

Variable	H = lesser of (IRvert+groove) or Hlog.		loaded face:	vertical	horizontal	
A	area	BH+profile area		48.904		in.^{2}
S	section modulus	BH^2/6		55.059	49.529	in.^{3}
I	moment of inertia	BH^3/12		206.472	161.356	in.^{4}

Log Height: Actual overall (H): 7.8125 in.

Log Course Height (H_L): 7.5 in.

SF Conversion: 1.6 LF of log per SF wall

Log Width: Actual overall (B or D): 7.75 in.

Shape Factor: 0.764 x nominal callout

2.31 Analysis of Profiled Sections

	Exterior Reductions		Bearing		Joinery		Interior Reductions		
Pattern @ Top	Width	1.75	Width	2.75	Width	1.5	Width	1.75	in.
	Height	3.75			Height	0.3125	Height	3.75	in.
	Area	-2.172438			Area	0.46875	Area	-2.172399	in.^{2}
Core section	Width	1.65625	Width	2.6875	Width	1.75	Width	1.65625	in.
	Stack Hgt.	7.5	Stack Hgt.	7.5	Stack Hgt.	7.5	Stack Hgt.	7.5	in.
	Area	12.4219		20.1563		13.1250		12.4219	in.^{2}
Pattern @ Bottom	Width	1.5625	Width	2.625	Width	2	Width	1.5625	in.
	Height	3.35			Height	0.5	Height	3.35	in.
	Area	-2.172438			Area	-1	Area	-2.172399	in.^{2}
A	48.904	8.077	+	20.156	+	12.594	+	8.077	in^2
I-vert	206.472	27.483	+	94.482	+	57.024	+	27.483	in.^{4}
I-horiz	based on W_L (avg. log width) and stack height less depth of joinery							161.356	in.^{4}
S-vert	55.059								in.^{3}
S-horiz								49.529	in.^{3}
IRvert	vertical dimension of the inscribed rectangle							7	in.
IRhoriz	horizontal dimension of the inscribed rectangle							5	in.
W_L	average width				Area (A = 48.904 sq. in.) / stack height (7.5-in)			6.515625	in.
Wn	narrowest width							4.25	in.

2.32 Analysis of Circular Sections

- Grading criteria: Inscribed Square: NA Bearing area+2*0.5

NA Max. profiling into log without affecting the inscribed square
NA Limited by maximum sawing depth (0.3r) for sawn round timber beams NA

- For a round log with a notch or cope removed, the horizontal axis is referenced as x; vertical as y.

Variables	Full Circle		- Segment	= SRTB	- Notch	= Log	- Cope	= Log	Wall-Log	
Geometries:	chord, c = width of seat =		NA		NA		NA			in.
height	h = r - sqrt(r^2 - c/2^2) =		NA		NA		NA	=r-sqrt(r^2-(c/2)^2)		
angle			NA		NA		NA			degrees
			A, Segment =		Cos A =	NA				
radius		NA	PI()r^2(angle/360)-(c(r-h)/2)		r, hypot.	NA	0	*cope*		
Area (A)	**PI*D^2/4**				*A, Cope=PI*r^2 (angle/360)-(c(r-h)/2)*					
	A	NA	0	**NA**	0	**NA**	0	**NA**	NA	in.^{2}
Centroid (x,y)	d/2	NA	--	--	--	--	--	--		
	c/2	--	NA	--	NA	--	NA	--		
	rh/c	--	--	--	--	--	NA	--		
	y=0.425r	--	--	--	--	--	NA	--		
	Ax	NA	NA	NA	NA	NA	NA	NA		
	Ay	NA	NA	NA	NA	NA	NA	NA		
	h/3	--	NA		NA		NA	NA		
	Ax/A	NA	NA	NA	NA	NA	NA	NA		
	Ay/A	NA	NA	NA	NA	NA	NA	NA		
Moment (I)	**PI*D^4/64**		**I, segment**							
Ix	I, vert.	NA	0	NA	0	NA	0	NA	NA	in.^{4}
		--	**PI*c^4/128**	--	**PI*c^4/128**	--	**PI*c^4/128**	--		
Iy	I, horiz.	NA	0	NA	0	NA	0	NA	NA	in.^{4}
Section (S)	**PI*D^3/32**		**I / (Ax/A)**		**I / (Ax/A)**		**I / (Ax/A)**			
Sx	S, vert.	NA	NA	NA	0	NA	0	NA	NA	in.^{3}
Sy	S, horiz.	NA	NA	NA	0	NA	0	NA	NA	in.^{3}

Prepared by TimberLogic LLC for:
Honest Abe Log Homes, Inc.
9995 Clay County Hwy., Moss, TN 17837
931-258-3648, www.honestabe.com
See Disclaimer, page 2

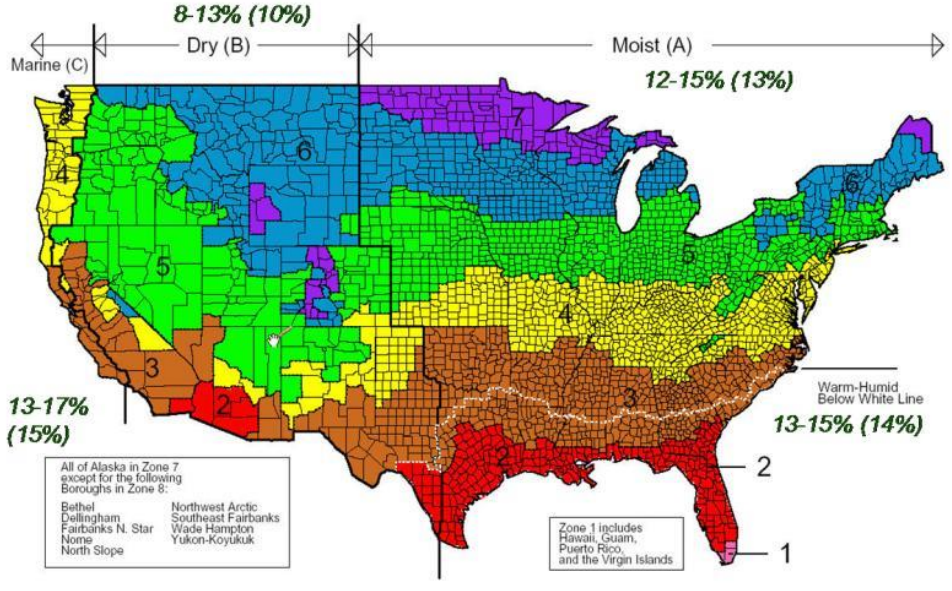
8x8 Round: 8x8 (Nominal) Tongue & Groove (T&G) Round-Round Wall-Log

Physical Properties of Wall-Logs

2.4 Calculation of Log Characteristics Relating to Moisture Content

*Calculated using methods described in FPL-RN-0268, *Equilibrium Moisture Content of Woods in Outdoor Locations in the United States and Worldwide* , William T. Simpson, Aug. 1998, as related to the US DOE climate zone map in the IECC. Equations per Wood Handbook, FPL.

Fig. 2.73 Climate zone map, 2005 ICC International Energy Conservation Code (US DOE).



2.41

Variables								
MC_{FSP}	moisture content at fiber saturation						30	%
M_I	moisture content at time of milling						18	%
	Shrinkage coefficients are per Table 3-5 Wood Handbook:					radial	tangential	volumetric
S	*Shrinkage (%) from green to oven dry moisture content*					2.1	6.1	8.2
Gu	unseasoned specific gravity based on green volume (ASTM D2555)							0.35
Anticipated Equilibrium Moisture Contents (EMC) by Climate Zone*		Climate Zone (ref. Fig.2.73)		Initial	Dry	Moist	Warm-Humid	Marine	
		Exterior	Indoor		6	8	11	11	%
			Minimum		8	12	13	13	%
MC_D	18% MC		Maximum		13	15	15	17	%
MCs	Service Moisture Content = EMC		Average	18	10	13	14	15	%
Gm	ICC400 302.2.3.3.3:	Gu/(1-(0.265 a Gu))		where a=	$(MC_{FSP}-MC_S)/MC_{FSP}$				
G		Specific Gravity at Exterior EMC		0.363	0.373	0.369	0.368	0.367	

2.42 Calculation of Log Weight

	Density at MC_D, per value, G, above			26.71	25.59	26.01	26.17	26.32	pcf
	ICC400 302.2.3.7: Density (lb/ft3) = 62.4 * [G/(1+(0.009*G*MC_S/100))] *(1+MC_S/100)								
	Log weight	Density x A/144		9.07	8.69	8.83	8.89	8.94	plf
w	Wall mass	Log weight * SF conversion		14.51	13.9	14.13	14.22	14.3	psf
Ww	Weight of log wall	13 courses typ.		117.91	112.97	114.79	115.57	116.22	plf

Prepared by TimberLogic LLC for:
Honest Abe Log Homes, Inc.
9995 Clay County Hwy., Moss, TN 17837
931-258-3648, www.honestabe.com
See Disclaimer, page 2

8x8 Round: 8x8 (Nominal) Tongue & Groove (T&G) Round-Round Wall-Log

Physical Properties of Wall-Logs

2.43 Calculation of Thermal Properties

Climate Zone (ref. 2.73) REScheck(R) nominal width = 7-in.

Variables	Coefficients A, B and C are based on SG >0.3, design temperature at 75°F, and MC <25%:	Initial	Dry	Moist	Warm-Humid	Marine	
k	Wood Handbook Eq.3-7: thermal transmittance	0.798372	0.73326	0.757776	0.766376	0.77492	Btu·in / (h·ft$^{2.0}$F)
	Gm[B+ C(EMC)] +A	***A=*** *0.129*	***B=*** *1.34*		***C=*** *0.028*		
R	thermal resistance = 1/k	1.253	1.364	1.32	1.305	1.29	R/in.
R_L	Avg. Log Thickness x R-value/inch	8.16	8.89	8.6	8.5	8.41	
R_S	Logs bear on one another						
Rw	0.17 outside air film+R_L+0.68 inside air film	9.01	9.74	9.45	9.35	9.26	
Uw	u-factor of wall assembly (1/Rw)	0.111	0.103	0.106	0.107	0.108	
t	degrees Fahrenheit	65	65	65	65	65	
c_{p0}	WH Eq.3-8b: $0.2605+0.0005132t$, for EMC=0.	0.294	0.294	0.294	0.294	0.294	
A_c	Eq.3-10: $MCs(b_1+b_2t+b_3MCs)$	0.019	0.013	0.016	0.016	0.017	
	b_1= -4.23x10^{-4}, b_2= 3.12x10^{-5}, b_3= -3.17x10^{-5}						
c_p	WH Eq.3-9: c_{pw} = 1 Specific heat	0.42	0.37	0.39	0.39	0.4	Btu/lb-°F
	$(c_{p0}+0.01MCs*c_{pw})/(1+0.01MCs)+A_c$, for EMC>0.						
HC	Heat Capacity (w,psf x c_p)	6.1	5.1	5.5	5.5	5.7	Btu/ft^2-°F
	2015 IECC compliance for thermal mass	OK	No	No	No	No	

2.5 Settling Properties for Wall-Logs

- In this analysis, the verifiable (repeatable) measurement of wall settling has been found to be significant to 1/16" or 1 mm.

2.51 Estimated Total Settling

			At time of profiling	Dry	Moist	Hot-Humid	Marine	
Δs	**Ref. 2.52**	Estimated settling due to shrinkage	0	-0.043	-0.027	-0.021	-0.016	in.
Δc	**Ref. 2.53**	Estimated settling due to compaction			NA			in.
$Δ_{SL}$	**Ref. 2.54**	Estimated settling due to slumping			NA			in.
		Total estimated settling per log course	0	-0.043	-0.027	-0.021	-0.016	in.
82.5		Above door (height, in.) with 2x buck above	0 "	1/2 "	21/64"	1/4 "	11/64"	in.
N		13 courses Theoretical wall height	8 ft - 2 in					
		Estimated tot	0	-0.5625	-0.34375	-0.265625	-0.203125	in.
		Percentage of final to initial log height:	0	0.6	0.4	0.3	0.2	%
MCs		Service Moisture Content = EMC	18	10	13	14	15	%
MC_D		To minimize settling, MC at time of millng should be	**18% MC**	**18% MC**	**18% MC**	**18% MC**	**18% MC**	

2.52 Calculation of Dimensional Change Due to Seasoning (Ds, inches)

- Boxed heart timbers experience primarily radial shrinkage.

Δs	ICC400 304.2.2.3.4:	$(H_L*(MC_D-MC_S))/(MC_{FSP}*100/S - MC_{FSP}+MC_D)$; H_L = stack height						
S_R	2.1%	Radial change	0	-0.043	-0.027	-0.021	-0.016	in.
		log stack height after seasoning to EMC	7.5	7.457	7.473	7.479	7.484	in.
S_V	8.2%	Volumetric change	0	-0.174	-0.108	-0.086	-0.064	
	Shrinkage coefficients are per Table 3-5 Wood Handbook: Shrinkage (%) from green to oven dry moisture content							
	0.1	Longitudinal shrinkage coefficient		0.096 in.	per mean log length of		8	ft.

2.53 Calculation of Compression in Exterior Wall due to Gravity Loads

Fc, perp.	design stress value for compression perpendicular to grain	350	psi
CL	Compression load from weight of walls + floor + roof	1682	plf
	Required bearing width (load imposed on a log course/12 = lbs./in.; /Fc^ = min. width) =	13/32	in.
B_{LP}	Width of log-to-log bearing	2.25	in.
	Fc,perp. (psi) x log bearing (in.) x 12 Max. Log bearing capacity =	9450	plf

Ref. 3.4

Prepared by TimberLogic LLC for:
Honest Abe Log Homes, Inc.
9995 Clay County Hwy., Moss, TN 17837
931-258-3648, www.honestabe.com
See Disclaimer, page 2

8x8 Round: 8x8 (Nominal) Tongue & Groove (T&G) Round-Round Wall-Log

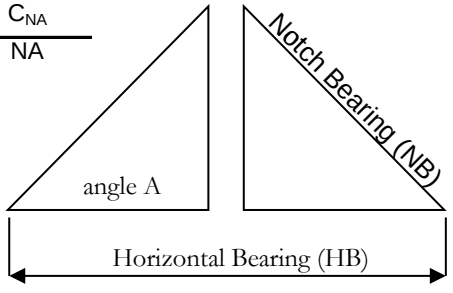
Physical Properties of Wall-Logs

2.531 Calculation of compaction for notched/coped profiles

■ Assumes compaction occurs until sufficient bearing area, normalized to the angle of the notch, is achieved.

	HB/2	H	Angle A	CosA	SinA	NB	C_{NA}	
Cope/notch:	NA	NA	NA	NA	NA	NA	NA	
Log:	NA	NA	NA	NA	NA	NA	in.	
Min. bearing:	1.125	NA	0	NA	NA	NA		

Settling potential due to notch/cope: NA in. per course
Settling potential due to bearing width: NA in. per course
Initial joint - settling due to compaction = NA in. per course



2.54 Calculation of Settlement Due to Slumping

Tests for Slumping Analysis: *Test for slump not required.*

Does the profile provide continuous contact or have horizontal bearing surfaces?	Yes
Is the moisture content at profiling greater than that in service?	Yes
Is a seasoning kerf cut opposite of the cope?	No
Is the kerf depth + the cope height >/= (log height/4)?	NA
Is the kerf depth + cope height > distance between the kerf and cope?	NA
Does $MC_D = MC_{FSP}$?	No
Is the cope width > log diameter x 3/8?	NA
Is the cope height/depth > log height/4?	NA

2.541 Calculating Slump

Slump, per course = Height of void between logs x the slumping coefficient

Variables								
H_{CA}	Height of void in groove	3/16"	less settling due to compression		NA	0	in.
Wc	width of cop					2	in.
p	log circumference = PI x diameter =					NA	in.

			Dry	Moist	Hot-Humid	Marine	
MC_D	To minimize settling, MC at time of millng should be		18% MC	18% MC	18% MC	18% MC	18% MC	
S_T	6.1%	Tangential change	NA	NA	NA	NA	NA	in.
			$(p*(MC_S - MC_D))/((MC_{FSP}*100/S - MC_{FSP}) + MC_D)$					
C_{SL}	Slumping Factor	D/ (p - Wc - ST)	NA	NA	NA	NA	NA	
D_{SL}	$H_{CA} * N * C_{SL}$	Per log course:	NA	NA	NA	NA	NA	in.

Prepared by TimberLogic LLC for:
Honest Abe Log Homes, Inc.
9995 Clay County Hwy., Moss, TN 17837
931-258-3648, www.honestabe.com
See Disclaimer, page 2

8x8 Round: 8x8 (Nominal) Tongue & Groove (T&G) Round-Round Wall-Log

Wall-Log Verification to Codes & Standards

3.1 Design Criteria

Compliance with Ch. 3 - Building Planning, ICC International Residential Code

- Climatic and geographic conditions covered in this report. Conditions beyond those noted require specific engineering.
- Loads (psf) tied to basic wind speed are the greater of the pressures acting toward and away from the building surfaces from Table R301.2(2) of the 2003 IRC, zone 5. Tabulated loads assume a building located in Exposure B with a mean roof height of 30 feet.

3.11 Design Conditions Used for Analysis

Variables The following design conditions are used to model responses to loading in appropriate tables.

		Roofs/Ceilings	Floors	Walls above grade (Log)		
DL	Dead Load	15 psf	10 psf	14.5 psf	(log weight at time of milling)	
	Building width				28	ft.
	Roof pitch				10	:12
	Gable height at endwall				11.667	ft.
Hw	1st floor wall height	13 log crs.	x 7.5-in. log stack height = overall wall height		8.13	ft.
		12 log crs.	required to provide a minimum 7-foot ceiling height.			
Hw_2	2nd floor wall				0	ft.
Hmr	The mean roof height (assumes 10" subfloor, 1.5" sill plate, 12" to grade; rounded up in 5-ft. increments)				20	ft.

3.12 Roof Snow Loads

Pg	Ground Snow Load	100	90	80	70	60	50	20	psf

3.13 Design Wind Pressures for Main Wind-Force Resisting Systems

3.131 ASCE Zone 5 Load Calculations (end zone of wall) Enclosure classification (6.5.9): Partially Enclosed

- Per IRC R301.2.1.1 Design Criteria. Opt. 3 Minimum Design Loads for Buildings and Other Structures (ASCE-7)
- See ASCE 7-05 (IBC 2006) for Basic Wind Speed maps showing nominal design 3-second gust wind speeds (mph) at 33 ft. above ground for Exp. C.
- **Wind Exposure Categories:**

A: Large city centers with at least 50% of buildings with height over 70 ft.

B: Urban/suburban areas, wooded areas, or other terrain with numerous closely spaced obstructions ≥ the size of single-family dwellings.

C: Open terrain with scattered obstructions having heights generally less than 30 feet; includes flat open country and grasslands.

D: Flat, unobstructed areas exposed to wind flowing over large bodies of water.

Variables	Calculation of WL, wind load on the Main Wind Force Resisting Structure (MWFRS)					ASCE 7-05 Section		
V	Basic wind speed	Exposure category (6.5.6):	B			6.5.4		
Kd	Wind Directionality Factor					6.5.4.4, Table 6-4	0.85	
I	Occupancy Importance Factor					6.5.5, Table 6-1	1	
Kz	Velocity Pressure Coefficient for Exposure B and 33-ft. above grade.					6.5.6.6, Table 6-3	0.624	
	Kz=2.01(z/zg)^(2/a)	a=	7	zg=	1200	z=	20	
Kzt	Topographic Factor					6.5.7.2, Fig. 6-2	1	
qz	Effective velocity pressure (psf) = q =0.00256*Kz*Kzt*Kd*I*V^2					6.5.10		psf
G	Gust Effect Factor for Rigid Structures					6.5.8	0.85	
Cp	External pressure coefficient/force coefficient					6.5.11, Fig. 6-6	0.8	
Cpi	Internal pressure coefficient					6.5.11.1, Fig. 6-5	-0.55	
Pe	Design Wind Load	p=qz*G*Cp - qz*GCpi				6.5.12.2		psf

Wind	85	90	100	110	120	130	140	150	mph
qz	9.81	11	13.58	16.43	19.55	22.95	26.61	30.55	mph
Pe	11.26	12.62	15.58	18.85	22.43	26.34	30.53	35.06	psf

3.133 Lateral Loading Use

Design WL	***11.26***	***12.62***	***15.58***	***18.85***	***22.43***	***26.34***	***30.53***	***35.06***	psf

3.14 Seismic Design Category

Calculated S_{DS}:	$S_{DS} \le 0.17g$	$0.17g < S_{DS} \le 0.33g$	$0.17g < S_{DS} \le 0.33g$	$0.83g < S_{DS} \le 1.17g$
	C	D1	D2	E

Note: Detached 1- & 2-family dwellings located in Seismic Design Category C are exempt from seismic requirements.

$0.50g < S_{DS} \le 0.83g$ $1.17g < S_{DS}$

Prepared by TimberLogic LLC for:
Honest Abe Log Homes, Inc.
9995 Clay County Hwy., Moss, TN 17837
931-258-3648, www.honestabe.com
See Disclaimer, page 2

8x8 Round: 8x8 (Nominal) Tongue & Groove (T&G) Round-Round Wall-Log

Wall-Log Verification to Codes & Standards

3.2 Establish Typical Roof Loads

- For gravity loads acting on the roof structure, a simplified approach was used with all loads assumed to be acting on the horizontal projection.

3.21 Load Adjustment Factors

3.211 Snow Load (SL) Development

Variables										
Pg		ASCE Standard: ANSI/ASCE 7-98, Eq. 7-2: $P_s = Cs * P_f$					Eq. 7-1: $P_f = 0.7\ Ce\ Ct\ I\ P_g =$	0.77 *pg		
		Ground Snow Load								
Ce	1	ASCE Table 7-2: Snow Exposure Factor = Terrain categories B-D. For sheltered Exp. A, multiply load by 1.3.								
Ct	1.1	ASCE Table 7-3: Thermal Factor; 1.0=heated, 1.1=kept just above free								
I	1	ASCE Table 7-4: Occupancy Importance Factor for category II							Horiz. To Pitch Conversion Factor	Wind Pressure Coefficient
		Cs, roof slope adjustment factor where: Roof angle<30=1, >70=0, other=(angle-30)/40								
		Roof Pitch	Rise/Run TAN a	Degrees, Angle a	Cos a	COS a ^{2}	Cs * COS a^2	DL / COS a		Cp
Cs	1.00	3:12	0.250	14.04	0.970	0.941	**0.941**	15.46	1.031	-0.9
	1.00	5:12	0.417	22.62	0.923	0.852	0.726	16.25	1.083	-0.75
	0.99	7:12	0.583	30.26	0.864	0.746	0.553	17.37	1.158	-0.2
	0.91	8:12	0.667	33.69	0.832	0.692	0.435	18.03	1.202	-0.2
	0.75	10:12	0.833	39.81	0.768	0.590	0.263	19.53	1.302	-0.2
	0.63	12:12	1.000	45.00	0.707	0.500	0.156	21.21	1.414	0.3
Ps	**0.77**	**Ps = Cs * Pf = Cs*(0.7*Ce*Ct*I) when Cs=1.0 for a pitch of 3:12, and Pg = 1.**								

3.22 Calculation of Total Vertical Load on Horizontal Projection

Variables									
	2000 IBC 1605.3 Load combinations using allowable stress design:								
Cd	**1.15**	2 mo. load duration factor					Design Snow Load (SL) =	$Ps * Cu * Pg / C_D$	
Cu	**1.5**	Unbalanced snow load coefficient (ASCE 7-98 7.2) / Ce							
Pg	**Ground Snow Load**	**100**	**90**	**80**	**70**	**60**	**50**	**20**	psf
SL	Snow Load	115.5	103.95	92.4	80.85	69.3	57.75	23.1	psf
DL	Dead Load	15	15	15	15	15	15	15	psf
LL	Live Load (min. 20 psf)	20	20	20	20	20	20	20	psf
DL + LL		35	35	35	35	35	35	35	psf
DL + SL		130.5	118.95	107.4	95.85	84.3	72.75	38.1	psf
TL	Max. Horiz. Load	131	119	107	96	84	73	38	psf
TL (flat)	Use for bending/shear	131	119	107	96	84	73	38	psf
SL, flat	Use for deflection	116	104	92	81	69	58	23	psf

* Unbalanced snow load factor for slopes exceeding 5^0 (Para. 7.6.1)

3.221 Calculation of Design Load Perpendicular to Roof Structure

- The following is presented for informational and comparative purposes only and is not used elsewhere in this analysis.
- When applying the total load below, the rafter length must be calculated at actual length rather than horizontal span.

Variables	Pitch			3:12	5:12	7:12	8:12	10:12	12:12	
DL	Adjusted dead load	DL/Cos a		15.46	16.25	17.37	18.03	19.53	21.21	psf
Cos a^2	Snow load adjustment			0.941	0.852	0.746	0.692	0.590	0.500	
		Pg	SL	Total Load adjusted to roof pitch:						
TL	Pg =	100	115.5	124.17	114.66	103.55	97.99	87.69	78.96	psf
		90	103.95	113.3	104.82	94.93	90	80.88	73.19	psf
		80	92.4	102.42	94.98	86.31	82	74.06	67.41	psf
		70	80.85	91.55	85.14	77.69	74	67.24	61.64	psf
		60	69.3	80.68	75.3	69.08	66.01	60.43	55.86	psf
		50	57.75	69.81	65.46	60.46	58.01	53.61	50.09	psf

Prepared by TimberLogic LLC for:
Honest Abe Log Homes, Inc.
9995 Clay County Hwy., Moss, TN 17837
931-258-3648, www.honestabe.com
See Disclaimer, page 2

8x8 Round: 8x8 (Nominal) Tongue & Groove (T&G) Round-Round Wall-Log

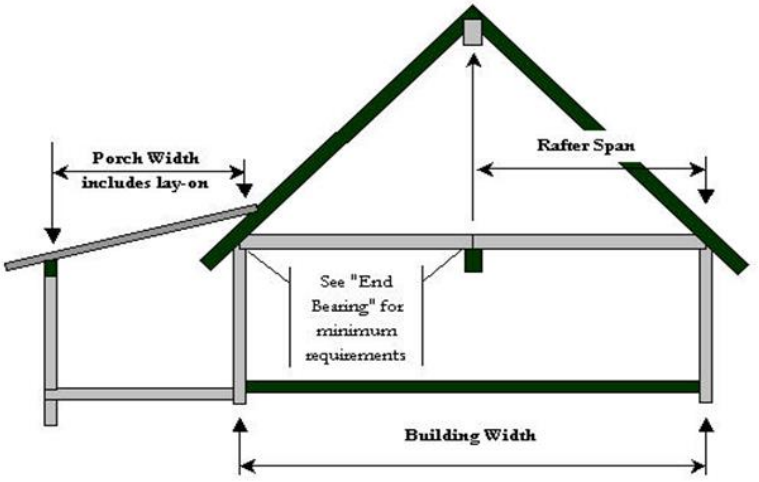
Wall-Log Verification to Codes & Standards

3.23 Effective Roof Load on Log Wall

3.231 Establish Dead Load of Log Gable Endwall

- Assumption: A point load acting on a wall-log is distributed over a wall-log length equal to twice the depth of the wall-log (distributed 45-degrees in each direction in the plane of the wall-log). A point load acting on a log wall is distributed over a wall length equal to twice the height of the wall.

Building width is	28 ft.
and roof pitch is	10:12
gable/ridge height:	11.6667 ft.
gable area:	163 sq.ft.
# of log courses to build gable:	2336 lbs.
total weight of wall:	19 log crs.
Log height*45-deg. Distribution =	15 "
Gable height * 45-deg. distribution =	23.75 ft.
Uniformly distributed gable dead load:	**99 plf**



3.232 Establish roof area contributing load

Contributing roof width:	14 ft.
Roof overhang, at eave:	24"
at rake:	24"
Contributing width	
at eave:	9 ft.
at rake:	14 ft.
Ridge Beam Span:	24 ft.
Purlin Span:	NA

Roof framing type: Rafters/joists with center bearing
Purlin Spacing: NA
Point Loads on Gable: 1

Ground Snow Load	**100**	**90**	**80**	**70**	**60**	**50**	**20**	psf
Rafter/truss load on sidewall:	1179	1071	963	864	756	657	342	plf
Ridge beam, point load on endwall:	25676	23324	20972	18816	16464	14308	7448	lbs.
Purlin, point load on endwall:	0	0	0	0	0	0	0	lbs.

3.233 Estimate Roof Point Load Distribution Down the Endwall

Total weight from ridge + gable =	28012	25660	23308	21152	18800	16644	9784	lbs.
Total weight from purlins + gable =	0	0	0	0	0	0	0	lbs.
Total weight / distributed length =	1179	1080	981	891	792	701	412	plf

3.3 Establish Typical Floor Loads

40	psf, Live load (for this analysis, assumed to apply to all floor areas)		Contributing joist length:	Point Loads on Endwall:	1
			on interior beam(s) 14 ft.	Contributing length:	12 ft.
15	psf, Dead load	Typ. Joist spacing, "o/c	on sidewall 7 ft.	Point load on endwall:	4620 lbs.
55	psf Total Floor Load	24	Load on sidewall: 385 plf	Load on endwall:	250 plf

It is highly recommended that a girder point load be supported by a column of logs or a post.

3.4 Establish Typical Uniform Vertical Loads on the Log Wall

- For calculation of loads summarized in this table, refer to preceeding tables.

	Ground Snow Load	**100**	**90**	**80**	**70**	**60**	**50**	**20**	psf
On Sidewalls	Roof only	1179	1071	963	864	756	657	342	plf
	Roof + Floor framing	1564	1456	1348	1249	1141	1042	727	plf
On Endwalls	Roof + Gable wall	1179	1080	981	891	792	701	412	plf
	Roof + Gable + Floor	1429	1330	1231	1141	1042	951	662	plf
On Headers						2 log course header =		18.14	plf
To Foundation	max. sidewa	1682	1574	1466	1367	1259	1160	845	plf
	max. endwall	1547	1448	1349	1259	1160	1069	780	plf

Prepared by TimberLogic LLC for:
Honest Abe Log Homes, Inc.
9995 Clay County Hwy., Moss, TN 17837
931-258-3648, www.honestabe.com
See Disclaimer, page 2

8x8 Round: 8x8 (Nominal) Tongue & Groove (T&G) Round-Round Wall-Log

Wall-Log Verification to Codes & Standards

3.5 Establish Lateral Load on the Log Wall

3.51 Lateral Load Acting on Log Wall

3.511 Wind Load Applied to the Windward Log Vertical Face

Variables	Wind	85	90	100	110	120	130	140	150	mph
WL	Design wind	11.26	12.62	15.58	18.85	22.43	26.34	30.53	35.06	psf
WL*H_L	H_L=Log hgt.	8	8	10	12	15	17	20	22	plf, log
WL*Hw	wall hgt.=Hw	91.49	102.54	126.59	153.16	182.24	214.01	248.06	284.86	plf, wall

3.512 Seismic Loading

See section 3.14

- Based on the analysis taken for log shear walls, the seismic response modification coefficient is at least equal to the highest value given to any wood assembly by codes and standards (R=4.5).

3.52 Sidewall Analysis

3.521 Reaction at Each End of Each Wall-log at Maximum Log Wall Span (Lw)

V_L = WL * H_L * Lw/2 = reaction at each end of the wall-log

	Wind	85	90	100	110	120	130	140	150	mph
Shear load per log course	Premium	260	260	290	318	353	374	410	429	lbs.
	Select	244	244	275	300	338	357	390	407	lbs.
	Rustic	228	228	255	276	308	332	360	374	lbs.
	Wall40	200	200	220	240	270	289	310	330	lbs.
Log Grade	**Fc, perp.**	**Required bearing area to transfer load from sidewall log to endwall log**								
Premium	350 psi	0.74	0.74	0.83	0.91	1.01	1.07	1.17	1.23	sq. in.
Select	350 psi	0.70	0.70	0.79	0.86	0.97	1.02	1.11	1.16	sq. in.
Rustic	350 psi	0.65	0.65	0.73	0.79	0.88	0.95	1.03	1.07	sq. in.
Wall40	350 psi	0.57	0.57	0.63	0.69	0.77	0.83	0.89	0.94	sq. in.

3.53 Shear Walls without Openings

3.531 Design Shear Force at Each End of the Sidewall

vh = WL * Hw/2 * Lw, max./2 **Hw = 8.125 ft.**

- vh = wind load (WL) x log wall height (Hw, not including gable, 2nd floor, or half of 1st floor) x log wall span (Lw).

	Wind	85	90	100	110	120	130	140	150	mph
vh, per wall-log grade	Premium	1487	1666	1836	2029	2141	2354	2543	2777	lbs.
	Select	1395	1564	1741	1914	2050	2247	2419	2635	lbs.
	Rustic	1304	1461	1614	1761	1868	2087	2233	2421	lbs.
	Wall40	1144	1282	1392	1532	1640	1819	1922	2136	lbs.

3.532 Shear Wall Fastening Schedule (without openings)

- Maximum allowable fastener spacing will insure logs act collectively as a beam, resist shear [Lw,max./(vh/Z)], or default to the company standard fastener spacing.
- Fastener lateral design values (Z) for single shear are used to resist the shear load; C_D x Z,parallel for shear walls

Wind	85	90	100	110	120	130	140	150	mph
Log Grade	Minimum number of fasteners required per log course to resist shear force (vh).								**Ref. 3.52**
Premium	6	7	7	8	8	9	10	11	fasteners
Select	6	6	7	7	8	9	9	10	fasteners
Rustic	5	6	6	7	7	8	9	9	fasteners
Wall40	5	5	6	6	6	7	7	8	fasteners

Fastener Spacing in Header/Sill Log Courses (above and below wall openings) for Wall40 grade wall-logs.

Lw, max.	50 ft.	50 ft.	44 ft.	40 ft.	36 ft.	34 ft.	31 ft.	30 ft.	**Ref. 1.61**
Lw, max.	24	24	24	24	24	24	24	24	in. o/c
16.25 ft.	24	24	24	24	24	24	24	24	in. o/c
8.13 ft.	19	19	16	16	16	13	13	12	in. o/c
6.5 ft.	15	15	13	13	13	11	11	9	in. o/c
4.06 ft.	9	9	8	8	8	6	6	6	in. o/c
2.71 ft.	6	6	5	5	5	4	4	4	in. o/c
2.03 ft.	4	4	4	4	4	Use bolts	Use bolts	Use bolts	in. o/c

Prepared by TimberLogic LLC for:

Honest Abe Log Homes, Inc.

9995 Clay County Hwy., Moss, TN 17837

931-258-3648, www.honestabe.com

See Disclaimer, page 2

8x8 Round: 8x8 (Nominal) Tongue & Groove (T&G) Round-Round Wall-Log

Wall-Log Verification to Codes & Standards

3.533 Overturning Force in Corners of Shear Walls (T_{OT} & C_{OT})

$T_{OT} = C_{OT} = vh * Hw/Lw$, max.

	Wind	85	90	100	110	120	130	140	150	
Wall-Log	Premium	186	208	257	311	370	435	504	579	lbs.
	Select	186	208	257	311	370	435	504	579	lbs.
	Rustic	186	208	257	311	370	435	504	579	lbs.
	Wall40	186	208	257	311	370	435	504	579	lbs.

3.534 Overturning force by wall length for Wall40 grade wall-logs.

In Fig. 3.73, overturning force is denoted as $T_{OT} = C_{OT}$

Hw : Lw	Lw, max.	50 ft.	50 ft.	44 ft.	40 ft.	36 ft.	34 ft.	31 ft.	30 ft.	**Ref. 1.61**
	Lw, max.	186	208	257	311	370	435	504	579	lbs.
1:2	16.25 ft.	572	641	696	766	820	910	961	1068	lbs.
1:1	8.13 ft.	1143	1281	1391	1531	1639	1818	1921	2135	lbs.
1.3 : 1	6.5 ft.	1430	1603	1740	1915	2050	2274	2403	2670	lbs.
2:1	4.06 ft.	2289	2566	2786	3066	3282	3640	3846	4275	lbs.
3:1	2.71 ft.	3430	3844	4173	4593	4917	5454	5762	6404	lbs.
4:1	2.03 ft.	4579	5131	5571	6132	6564	7280	7693	8549	lbs.

3.535 Required Length of Wall-Logs to Resist Compressive Forces (C_{OT})

Fc, perpendicular x Bearing Area = 788 lbs. per sill wall-log.

Lw, max.	15/64	17/64	21/64	25/64	15/32	35/64	41/64	47/64	in.
16.25 ft.	23/32	13/16	57/64	31/32	1- 3/64	1- 5/32	1- 7/32	1-23/64	in.
8.13 ft.	1-29/64	1- 5/8	1-49/64	1-15/16	2- 5/64	2- 5/16	2- 7/16	2-45/64	in.
6.5 ft.	1-13/16	2- 1/32	2-13/64	2- 7/16	2-19/32	2-57/64	3- 3/64	3-25/64	in.
4.06 ft.	2-29/32	3- 1/4	3-17/32	3-57/64	4-11/64	4- 5/8	4- 7/8	5-27/64	in.
2.71 ft.	4-23/64	4- 7/8	5-19/64	5-53/64	6-15/64	6-59/64	7- 5/16	8- 1/8	in.
2.03 ft.	5-13/16	6-33/64	7- 1/16	7-25/32	8-21/64	9-15/64	9-49/64	10-27/32	in.

3.536 Reduction of Overturning Force due to Applied Dead Loads

Ref. 3.4

- Lw,max. is assumed to be taken at 90 mph for Wall40 Grade logs = 50 ft.

Lw	Reduction **25**	Log Gable 100	Floor Only 105	Roof Only 140	Floor+Roof 245	All 345	plf
Lw, max.	625	2500	2625	3500	6125	8625	lbs.
16.25 ft.	203.125	812.5	853.125	1137.5	1990.625	2803.125	lbs.
8.13 ft.	101.625	406.5	426.825	569.1	995.925	1402.425	lbs.
6.5 ft.	81.25	325	341.25	455	796.25	1121.25	lbs.
4.06 ft.	50.75	203	213.15	284.2	497.35	700.35	lbs.
2.71 ft.	33.875	135.5	142.275	189.7	331.975	467.475	lbs.
2.03 ft.	25.375	101.5	106.575	142.1	248.675	350.175	lbs.

3.537 Fastening Schedule for T_{OT} & C_{OT} (column at each end of Shear Walls)

- Overturning force is permitted to be reduced based on 25 pound per lineal foot dead load.
- The number of fasteners refers to quantity repeated at each end of each log in the wall, effectively forming a column.
- For wind/seismic loading, OlyLog design values = Direct withdrawal, $WxPxC_D$ = 346 lbs.

Wind	85	90	100	110	120	130	140	150	mph
Lw	**50 ft.**	**50 ft.**	**44 ft.**	**40 ft.**	**36 ft.**	**34 ft.**	**31 ft.**	**30 ft.**	**Ref. 1.61**
Lw, max.	1	1	1	1	1	1	1	1	fasteners
16.25 ft.	2	2	2	2	2	3	3	3	fasteners
8.13 ft.	4	4	4	5	5	5	6	6	fasteners
6.5 ft.	4	5	5	6	6	Use bolts	Use bolts	Use bolts	fasteners
4.06 ft.	Use bolts	Use bolts	Use bolts	Use bolts	Use bolts	Use bolts	Use bolts	Use bolts	fasteners
2.71 ft.	Use bolts	Use bolts	Use bolts	Use bolts	Use bolts	Use bolts	Use bolts	Use bolts	fasteners
2.03 ft.	Use bolts	Use bolts	Use bolts	Use bolts	Use bolts	Use bolts	Use bolts	Use bolts	fasteners
4.06 ft.	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	bolt dia.
	3.5 sq.in.	4 sq.in.	4.25 sq.in.	4.75 sq.in.	5 sq.in.	5.5 sq.in.	5.75 sq.in.	6.5 sq.in.	washer
2.71 ft.	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	bolt dia.
	3.5 sq.in.	4 sq.in.	4.25 sq.in.	4.75 sq.in.	5 sq.in.	5.5 sq.in.	5.75 sq.in.	6.5 sq.in.	washer
2.03 ft.	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	bolt dia.
	7 sq.in.	7.75 sq.in.	8.5 sq.in.	9.25 sq.in.	9.75 sq.in.	11 sq.in.	11.5 sq.in.	12.75 sq.in.	washer

Through-bolt connections: 36000 psi tensile strength

Prepared by TimberLogic LLC for:
Honest Abe Log Homes, Inc.
9995 Clay County Hwy., Moss, TN 17837
931-258-3648, www.honestabe.com
See Disclaimer, page 2

8x8 Round: 8x8 (Nominal) Tongue & Groove (T&G) Round-Round Wall-Log

Wall-Log Verification to Codes & Standards

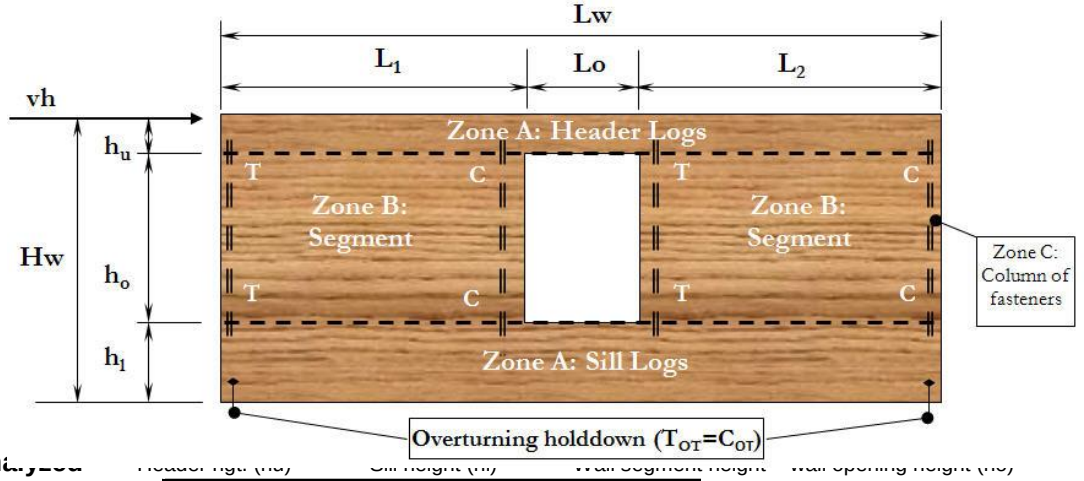
3.54 Shear Walls with Openings

$vh = vh_1 + vh_2$

- Wall openings break the shear wall into segments that are defined by the header logs at the upper and sill logs at the lower boundaries. Wall segment height = total log wall height less height of header above and sill below the opening.
- See Fig. 3.73 Shear wall segments, L1 and L2, are analyzed per the aspect ratio provided by their boundaries.

In the figure,
Zone A follows the fastening patterns defined in **3.53 Shear Walls without Openings**
Zone B defines Ls, which is the length of the shear segment defined by an opening and a corner, between openings, etc.
Zone C The Zone C fastening schedule (a column of fasteners full height of the wall) resists overturning at the ends of the wall and at the log ends next to wall openings. The number of fasteners required at each end of each log is the greater of that specified for overturning (T_{OT}, C_{OT}) or in Segments L1, L2 (T & C).

Fig. 3.73 Shear Wall Segments



3.541 Wall Openings Analyzed

Door	2 log crs.	**0 log crs.**	0 in.	**7.19 ft.**
Egress Window	11.25 in.	**2 log crs.**	15 in.	**6.88 ft.**
Kitchen Window		**5 log crs.**	37.5 in.	**5 ft.**

3.542 Overturning Force in Corners of Wall Segments L1 and L2

Wind	85	90	100	110	120	130	140	150	mph
Ls = ho = L1 = L2	**When $vh_1 = vh_2$, shear force = vh/2 = T = C**						for Wall40 grade wall-logs.		
8.125 ft.	572	641	696	766	820	910	961	1068	lbs.
7.19 ft.	572	641	696	766	820	910	961	1068	lbs.
6.88 ft.	572	641	696	766	820	910	961	1068	lbs.
5 ft.	572	641	696	766	820	910	961	1068	lbs.
2 ft.	572	641	696	766	820	910	961	1068	lbs.

3.543 Check Maximum Fastener Spacing in Shear Wall Segments assuming L1 = L2

- The results shown in this table reflects the company standard wall-log specification.

Ls	Zone B	Fastener Spacing within Shear Wall Segments L1, L2 (L1=L2)							
8 : Lw, max	24	24	24	24	24	24	24	24	in. o/c
16.25 ft.	24	24	24	24	24	24	24	24	in. o/c
8.125 ft.	24	24	24	24	24	24	24	24	in. o/c
7.19 ft.	24	24	24	24	24	21	21	21	in. o/c
6.88 ft.	24	24	24	24	24	20	20	20	in. o/c
5 ft.	20	20	20	20	20	15	15	15	in. o/c
2 ft.	8	8	8	8	8	6	6	6	in. o/c

3.544 Zone C Fastening Schedule for T & C (column at each end of Segments L1, L2)

- T = Tension chord force, lbs.; C= Compression chord force, lbs.; v = Induced unit shear, lbs./ft.; h = Shear wall height, ft.
- The number of fasteners refers to quantity repeated at each end of each log in the wall, effectively forming a column.

Aspect Ratio	1:1	2	2	2	3	3	3	3	4	fasteners

Prepared by TimberLogic LLC for:
Honest Abe Log Homes, Inc.
9995 Clay County Hwy., Moss, TN 17837
931-258-3648, www.honestabe.com
See Disclaimer, page 2

8x8 Round: 8x8 (Nominal) Tongue & Groove (T&G) Round-Round Wall-Log

Wall-Log Verification to Codes & Standards

3.55 Check Capability of Log Wall Acting as a Column

- Wall segment equal in length to fastener spacing behaves as a column fixed at the bottom and pinned at the top.
- Fasteners are centered on log profile or are staggered either side to provide symmetry. Eccentricity = 1

Variables				
Le*Ke/(t/Cf)	Check slenderness ratio: Not exceed 50		52	
Hw = Le	standard wall height = wall unsupported height		8.13	ft.
Ke	buckling constant		1.2	
t	Log bearing = effective thickness		2.25	in.
Cf	1 = rectangular 1.18 = round (NDS 3.7.3)		1	
Fc, para.	Compression parallel to grain for Wall40-grade wall-log.		400	psi
Fc, perp.	Compression perpendicular to grain		350	psi
E	Modulus of elasticity for Wall40-grade wall-log.		800000	psi
Fyb	Bending yield strength of fasteners	**Ref: 5.1**	189700	psi
Cp	(1+(FcE/Fc))/2c -sqrt(((((1+(FcE/Fc))/2c)^2 -((Fce/Fc)/c))	where c = 0.8	0.5539	
Bc	Column capacity Cp * Fc, para.		NA	plf
KcE			0.65	
FcE	KcE * E/(le/d)2		276.58	
b	Design width = column length = standard fastener spacing		24	in. o/c
T	Tributary dead load Roof + Floor framing on sidewall at 100psf-snow, section	3.4	1564	plf
Pw	weight of the wall at mid-height		1415	lbs.

3.56 Check Effect of Pilasters

3.561 Allowable loading (plf), on pilaster

- Pilaster is fully supported at top by roof member(s), at bottom by floor member(s), with appropriate connections to each.
- Timbers are placed with narrow face against log wall. Fasten through post through slotted holes to permit required settling.
- Lumber posts assume placement on a 2x4 sole plate with narrow face to wall and 1/2" sheathing as spacer between.

Pilaster properties:	2-2x6	2-2x6 w/2-ft. shear panel	2-2x6 w/4-ft. shear panel	4x8	6x6	6x8	8x8	6.75x7.5 GLB	6.75x10.5 GLB	
Grade	**Spruce-Pine-Fir #1**			**Eastern White Pine, Rustic Grade & Btr.**				**SP, 24F-V3 GLB**		
Actual Width	1.5	1.5	1.5	3.5	5.5	5.5	7.5	6.75	6.75	in.
Actual Depth	5.5	5.5	5.5	7.375	5.5	7.375	7.375	7.5	10.5	in.
FvA	2228	2228	2228	3227	3781	5070	6914	12150	17010	psi
FbS	13234	13234	13234	30617	26759	48113	65609	151875	297675	psi
EI	49912500	49912500	49912500	128696151	83880729	202236808	275777466	427148438	1.17E+09	psi

3.562 Allowable loading (plf), on Pilaster

Governed by: Vertical span = 8.13 ft.

shear*	365	365	365	529	620	832	1134	1993	2790	plf
bending	133	133	133	309	270	485	662	1532	3002	plf
l/240	206	206	206	532	347	836	1140	1766	4847	plf
	Vertical span =	19.8 ft.								
shear*	150	NA	NA	217	255	341	466	818	1145	plf
bending	23	NA	NA	52	46	82	112	258	506	plf
l/240	14	NA	NA	37	24	58	79	122	336	plf

3.57 Check Lateral Force-Resisting System: Shear Panels

- This analysis follows the specifications set forth in ANSI/AF&PA SDPWS-2008 Special Design Provisions for Wind and Seismic. Unadjusted design values for wood-frame shear panels are taken from Table 4.3A, page 31.
- Shear walls include the specified 2-2x pilaster as end post connection to log wall.
- Double top and bottom plates required, with specified sheathing overlapping both plates top and bottom. Specified nailing pattern is required into each plate.
- 4.3.3.2 Calculated as an unblocked wood structural panel shear wall with a maximum height of 16 feet.
- 4.3.6.1 Framing Requirements: Lumber to be nominal 2" or greater
- 15/32" minimum nominal thickness, OSB or 3-ply plywood structural panels conforming to std. PS1 or PS2.
- Values are based on stud spacing of 16" o/c and panel installed with long dimension vertical.
- Min. 8d nails penetrating minimum 1-3/8" into framing member or blocking, 6" o/c on edge and in field. Minimum 3/8" edge distance required. Adhesive attachment of shear wall sheathing is not considered part of this report.

Prepared by TimberLogic LLC for:
Honest Abe Log Homes, Inc.
9995 Clay County Hwy., Moss, TN 17837
931-258-3648, www.honestabe.com
See Disclaimer, page 2

8x8 Round: 8x8 (Nominal) Tongue & Groove (T&G) Round-Round Wall-Log

Wall-Log Verification to Codes & Standards

3.571 Shear Panel Properties

■ Eq. 4.3-1 $dsw = ((8vh^3)/(EAb))+((vh)/(1000Ga))+(hDa/b)$

Variables					2-ft panel	4-ft. panel	
		Diaphragm deflection, wind			1.2492007	2.27747191	in.
b		shear wall length			2	4	ft.
Da		total vertical elongation of wall anchorage		l/240	0.033854	0.033854	in.
E		modulus of elasticity of end posts			1200000	1200000	psi
A		area of end post cross-section			17	17	$in.^2$
Ga	Table 4.3A	apparent shear wall shear stiffness from	A - Seismic		14	14	kips/in.
		nail slip an panel shear deformation	B - Wind		1	1	
h		shear wall height			8.1250	8.1250	ft.
v		induced unit shear	A - Seismic	560	96	193	lbs./panel
			B - Wind	785	135	270	lbs./panel
	4.3.3	Shear value adjustment:	ASD reduction factor		2.00	2.00	
	Table 4.3A, footnote 3	SG Adjustment Factor (modifies tabulated "v" to SG of framing lumber)			0.86	0.86	[1-(0.5-G)]
C_{ub}	Table 4.3.3.2	Unblocked shear wall adjustment factor			0.80	0.80	

■ 4.3.6.4.1 The specified pilaster and connecton to the log wall is required to transfer the induced unit shear force into and out of the shear wall.

Uplift Anchorage at Shear Wall Ends (SDPWS 4.3.6.4.2)

		2-ft panel	4-ft. panel	
■ Tension and Compression Chords Eq. 4.3-7 T=C=vh	A - Seismic	782.60	1565.20	lbs.
■ Table 4.4.1 Nominal Uplift Capacity of 7/16" Minimum Wood Structural Panel Sheathing or Siding When Used for Both Shear Walls and Wind Uplift Simultaneously over Framing with a Specific Gravity of 0.42 or Greater	B - Wind	1097.04	2194.08	lbs.
Wood structural panel sheathing is used simultaneously to resist shear and uplift from wind forces.				
Tabulated uplift capacity 432 plf / ASD adjustment factor of 2 =	216	432	864	lbs.
-- for alternate nail spacing at top and bottom plates	A - Seismic	350.60	701.20	lbs.
■ Connection to floor: No deadload assumed to be imposed on shear wall.	B - Wind	665.04	1330.08	lbs.
Recommended fastener: 1/2" lag through 2-2x bottom plate at ends into floor beam		1	2	fasteners
W = 241 lbs./inch x 3 in. penetration x $C_{D\text{-wind}}$	1.6	1157	lbs. / fastener	

■ Options for Providing Support for Shear Wall

Option 1: Install foundation wall full length of shear wall
Option 2: Install post to footing beneath end post of shear wall

Option 3: Install beam in floor under shear wall Joist Span = typ. Building width/2	14	14	ft.
Joists o/c = 16 in. DL+LL = 55 psf 73.333 plf	2-2x10	2-LVL 9.25	

Table 4: Framing Options for Built-Up Beam in Floor to Support a Shear Wall

Member		depth	width	A*Fv*Cd	S*Fb*Cd	E*I
#1 Grade						
Spruce-Pine-Fir	2x8	7-1/4"	1-1/2"	1688	15867	57161719
Spruce-Pine-Fir	2x10	9-1/4"	1-1/2"	2154	23677	118717969
Spruce-Pine-Fir	2x12	11-1/4"	1-1/2"	2620	31838	213574219
SCL	LVL 7.5	7-1/2"	1-3/4"	2868	45281	123046875
#N/A	LVL 9.25	#N/A	#N/A	#N/A	#N/A	#N/A
SCL	LVL 11.875	11-7/8"	1-3/4"	4541	113518	488413493
SP	GLB 6x12	12-3/8"	6-3/4"	23055	453431	1918804175

Prepared by TimberLogic LLC for:
Honest Abe Log Homes, Inc.
9995 Clay County Hwy., Moss, TN 17837
931-258-3648, www.honestabe.com
See Disclaimer, page 2

8x8 Round: 8x8 (Nominal) Tongue & Groove (T&G) Round-Round Wall-Log

Wall-Log Verification to Codes & Standards

4.1 Calculation of Thermal Envelope

4.11 Check actual thermal values for floor, roof

4.111 Floor U-Factor:

Size of Opaque Floor Panel: 28 ft. wide 48 ft. long 1344 sq. ft.

UA, floor = 47

16 " o/c joists	132	sf
add'l. rim (corner, blocking)	6	sf
double rim	7	sf
blocking over bearing	3.5	sf

Cavity: 1195.5 sf

Opaque Floor Section	Width (in.)	Area (sf)	% of Floor Area	Resistance (R) Per inch thickness (1/k)	Resistance (R) For listed thickness (1/C)	Effective R-value
Air film-moving, outside		1344	100%		0.167	0.17
2x10, 16" oc	1.25	148.5	11%	1.88	0	0.26
R-30 FG batt		1195.5	89%		30	26.69
Plywood (DF), 3/4" CDX	0.75	1344	100%	0.94		0.71
Air film-horiz.,still,downward heat flow		1344	100%		0.926	0.93
U-Factor of Opaque Floor (U_F) =			**0.035**		**Total R-value**	**28.76**

4.112 Roof U-Factor:

Size of Opaque Roof Panel: 28 ft. wide 48 ft. long 1750 sq. ft. 10:12 roof

UA, roof = 18

24 " o/c rafters	90	sf
ridge	7	sf
blocking over bearing	3.5	sf

Cavity: 1649.5 sf

Opaque Roof Section	Width (in.)	Area (sf)	% of Floor Area	Resistance (R) Per inch thickness	Resistance (R) For listed thickness	Effective R-value
Air film-sloping,still,upward heat flow		1750	100%		0.625	0.63
2x pine decking		1750	100%		1.875	1.88
4x8 W. Hemlock, 24" o/c		100.5	6%		8.391	0.48
Building Felt, 15#		1750	100%		0.06	0.06
Rigid Insul. - Foil faced polyurethane	14	1750	100%	7.2		100.8
2x pine strapping		100.5	6%		1.875	0.11
Plywood (DF), 5/8" CDX		1750	100%		0.775	0.78
Building Felt, 15#		1750	100%		0.06	0.06
Asphalt Shingles		1750	100%		0.441	0.44
U-Factor of Opaque Roof (U_R) =			**0.01**		**Total R-value**	**105.24**

Prepared by TimberLogic LLC for:
Honest Abe Log Homes, Inc.
9995 Clay County Hwy., Moss, TN 17837
931-258-3648, www.honestabe.com
See Disclaimer, page 2

8x8 Round: 8x8 (Nominal) Tongue & Groove (T&G) Round-Round Wall-Log

Fastening Schedule

5.1 Analysis of Specified Fastener

■ Fastener specifications: **OlyLog** **x 10 in.** **at 24" o/c** F1554 Grade 36 All Thread Rod

Adjustment factors:		C_D	C_M	C_t	Ceg	C_{di}	C_{tn}	C_g	C_{delta}	
Product =	**1.6**	1.6	1.0	1.0	NA/0.67	NA/1.1	NA/0.83	1.0	1.0	
Variable		Load Duration	Wet Service	Temp. Factor	End Grain Factor	Diaphragm Factor	Toe Nail (30^o angle)	Group Action	End/Edge Distance	
W	**Direct Withdrawal per Fastener in Connection:**								108	lbs.
	OlyLog design values for direct withdrawal						x adj. factors x penetration (p)		346	lbs.
Z, para.	**Lateral Value (Z) per Fastener in Connection:**						parallel to grain		173	lbs.
Z, perp.							perpendicular to grain		173	lbs.
	OlyLog design values for lateral withdrawal				, parallel to grain		x adj. factors		277	lbs.
	OlyLog design values for lateral withdrawal				, perpendicular to grain		x adj. factors		277	lbs.
p	Required minimum penetration (p):				$WxPxC_D$ =		NDS factor:	10.526316	2	in.
							Minimum lead hole, threaded section:		NA	in.
D	Shank diameter								0.19	in.
Dr	thread minor (root) diameter								0.172	in.
L	fastener length (tip to underside of head)						NDS minimum length=	10	10	in.
T	thread length								2	in.
Fyb	dowel bending yield strength								189700	psi
Ah	area of fastener head/washer (for pull-through resistance)								0.09	sq. in.
P	Pull-down force: Lesser of pull-through testing (lbs. per inch), withdrawal, or head/washer bearing)								539.063	lbs.
	Size washer under head to match W =				0 in. dia. w/hole dia. of 0.315 in.				0	sq. in.
	thickness of side member								7.5	in.
	thickness of main member								7.5	in.
	fastener countersink depth into side member								0.3125	in.
theta	fastener installation angle relative to load to grain (0-90):								5	degrees
G	specific gravity of wood when dry					Eastern White Pine			0.370625298	at 12% MC
Gb	specific gravity of wood when unseasoned								0.35	green
Fe	dowel bearing strength Per Table 4, AF&PA TR12, Equations used to derive tabulated Dowel Bearing Strengths, Fe, 5% Offset									
	For lumber (nail, wood screw), where D< 0.25" = 16600G^1.84								2650	psi
	For lumber (bolt, drift pin, lag screw), where D=> 0.25" =									
	for parallel to grain =						11200G =		4150	psi
	for perp. to grain =						6100G^1.45/D^0.5 =		3300	psi
W	**Direct Withdrawal**				NDS Equation 11.2-1, lags:		$W=1800G^{(3/2)}D^{(3/4)}$		117	lbs./in.
	in end grain				NDS Equation 11.2-2, screws:		$W=2850G^2D$		74	lbs./in.
	88 lbs./in.				NDS Equation 11.2-3, nails:		$W=1380G^{(5/2)}D$		22	lbs./in.
Z	**Lateral Design Value for single shear (two-member) connections**									
Re	when the main and side members are of the same wood species (Fem/Fes)								1	
lm	length of fastener bearing on the main member								2.8125	in.
ls	length of fastener bearing on the side member								7.1875	in.
Rt	lm / ls = 0.3913043							**Parallel**	**Perp.**	
Fem=Fes	Dowel Bearing strength used in calculations					**Rd, para**	**Rd, perp**	2650	2650	
Mode Im	D lm Fem / Rd					2.22	2.22	1476		
Mode Is	D ls Fes / Rd					2.22	2.22	642	642	
Mode II	(k1 D ls Fem) / Rd					2.22	2.22	496	496	
k1	(sqrt(Re+2Re^2(1+Rt+Rt^2)+Rt^2 Re^3)-Re(1+Rt)) / (1+Re)							0.3358		
Mode IIIm	(k2 D lm Fem) / ((1+2Re) Rd)					2.22	2.22	236	236	
k2	Mode IIIm -- (-1 +SQRT(2(1+Re)+((2 Fyb(1+2 Re) D^2) / (3 Fem lm^2))))							1.1056	1.1056	
Mode IIIs	(k3 D ls Fem) / ((2+Re) Rd)					2.22	2.22	502	502	
k3	Mode IIIs -- (-1 +SQRT((2(1+Re) / Re)+((2 Fyb(2+Re) D^2) / (3 Fem ls^2))))							1.0204	1.0204	
Mode IV	(D2 / Rd)*SQRT((2 Fem Fyb) / (3(1+Re))					2.22	2.22	173	173	

Prepared by TimberLogic LLC for:
Honest Abe Log Homes, Inc.
9995 Clay County Hwy., Moss, TN 17837
931-258-3648, www.honestabe.com
See Disclaimer, page 2

8x8 Round: 8x8 (Nominal) Tongue & Groove (T&G) Round-Round Wall-Log

Fastening Schedule

Notes to 5.1

Where:
lm = main member dowel bearing length, in.; at minimum, the length of thread and tip portion of the fastener
ls = side member dowel bearing length, in.
Fem = main member dowel bearing strength, psi; also the equivalent of F_{es} = side member dowel bearing strength, psi
Rd = the Reduction Term Adjusting $P_{5\%}$ Values to Nominal Design Values (AF&PA TR12 Table 2) = 10D + 0.25 for 0.17"<D< 0.25", where D is the minor thread diameter
Re = the ratio of main to side member dowel bearing strength; set at 1 - both members of same species.
Design values shown above shall be multiplied by all applicable adjustment factors per NDS.

NDS Appendix J: When members or when fasteners are loaded in bearing at an angle to grain between 0 and 90 degrees, design values at an angle to grain shall be determined using the Hankinson formula.

for angle: 5 deg.

sin	sin²	cos	cos²
0.08715574	0.007596123	0.9961947	0.99240388

Fc, para (#3 grade)= 350
Fc, perp = 350

For wood-to-wood connections with side members (e.g., rafters) loaded parallel to grain; main member perpendicular to grain.

	Appendix J.5: Z_q =	(Z, para. * Zc, perp)/(Z,para * sin² + Z,perp*cos²)	173
Check Compression:	Appendix J.5: F_q =	(Fc, para. * Fc, perp)/(Fc,para * sin² + Fc,perp*cos²)	350
Check Dowel Bearing:	Appendix J.5: F_q =	(Fe, para. * Fe, perp)/(Fe,para * sin² + Fe,perp*cos²)	2650

5.2 Application of Hankinson's Formula

NDS Appendix J: When members or when fasteners are loaded in bearing at an angle to grain between 0 and 90 degrees, design values at an angle to grain shall be determined using the Hankinson formula.

Equivalent Roof Pitch:			3:12	7:12	10:12	12:12
for angles:	0	5	14.04	30.26	39.81	45
sin	0	0.09	0.24	0.50	0.64	0.71
sin²	0	0.01	0.06	0.25	0.41	0.50
cos	1	1.00	0.97	0.86	0.77	0.71
cos²	1	0.99	0.94	0.75	0.59	0.50

5.21 Adjusted Lateral Withdrawal Design Values with Loads Applied at Varying Angles

For wood-to-wood connections with side members (e.g., rafters) loaded parallel to grain; main member perpendicular to grain.

Fastener	Length	Z, para.	Z, perp.	Appendix J.5: Z_q = (Z, para. * Zc, perp)/(Z,para * sin² + Z,perp*cos²)					
OlyLog	10 in.	256	213	256	256	253	244	236	233
3/8" spike	10 in.	347	209	347	345	334	297	273	261
3/8" lag	10 in.	173	104	173	172	166	148	136	130
5/8" lag	10 in.	547	292	547	543	520	448	403	381

5.22 Adjusted Compression Strength:

Appendix J.5:	Wall40	Fc, perp =	350	Fq = (Fc, para. * Fc, perp)/(Fc,para * sin² + Fc,perp*cos²)					
	Premium	Fc, para =	675	675	670	640	546	489	461
	Select		600	600	597	576	508	464	442
	Rustic		525	525	523	510	466	436	420
	Wall40		400	400	400	397	386	378	373

5.23 Adjusted Dowel Bearing Strength:

				Appendix J.5: F_q = (Fe, para. * Fe, perp)/(Fe,para * sin² + Fe,perp*cos²)					
	D<0.25"	Fe, para =	2650						
	D>=0.25"	Fe, para =	4150						
D=	0.172	Fe, perp =	2650	2650	2650	4016	3628	3368	3235
	0.202		2650	2650	2650	2650	3628	3368	3235
	3/8 "		2400	4150	2648	2634	3502	3195	3041
	1/2 "		2150	4150	2645	2614	3357	3004	2833
	5/8 "		1900	4150	2642	2590	3191	2794	2607
	3/4 "		1550	4150	2636	2544	2910	2459	2257

Prepared by TimberLogic LLC for:
Honest Abe Log Homes, Inc.
9995 Clay County Hwy., Moss, TN 17837
931-258-3648, www.honestabe.com
See Disclaimer, page 2

8x8 Round: 8x8 (Nominal) Tongue & Groove (T&G) Round-Round Wall-Log

Fastening Schedule

5.3 Log Fastening Capacities: Bolts

5.31 Lateral Design Value, Z: Bolts

Per NDS Yield Mode Equations:

Variable	3/4" bolt						
D	Fastener Diameter:		0.75	in.	F1554 Grade 36 All Thread Rod		
Dr	Minor thread diameter:		0.627	in.			
Fyb	F_{yb} = dowel bending yield strength, psi:		45000	psi			
	Required lead hole (NDS11.1.2):		0.78125	in.			
	Min. Edge Distance: 4D=Perp., loaded edge		3 in.		**Shear Plane**		
	Min. End Distance: 7D=Para.-Tension		5.25 in.		**Single**	**Double**	**13 crs.**
L	Overall Length				15	22.5	97.5 in.
lm*	Main/Holding member				7.5	7.5	7.5 in.
ls **	Side member thickness				7.5	7.5	7.5 in.
G	Wood Specific Gravity @EM		12%		0.3706253	0.3706253	0.3706253
Fe	Dowel Bearing Strength,	11200G	, parallel		4150	4150	4150 psi
	Fem = Fes ^	6100G^1.45/D^0.5	, perp.		1650	1650	1650 psi
Re	F_{em}/F_{es}				1	1	1
Rt	l_m / l_s		Rd		1	1	1
Mode Im	$D\ l_m\ F_{em} / R_d$	, parallel	4		5836	5836	5836 lbs.
		, perp.	5		1856	1856	1856 lbs.
Mode Is	$D\ l_s\ F_{es} / R_d$	, parallel	4		5836	11672	70031
		, perp.	5		1856	3712	22275
$k_1=(\sqrt{(R_e+2R_e^2(1+R_t+R_t^2)+R_t^2 R_e^3)-R_e(1+R_t)}) / (1+R_e)$					0.4142		
Mode II	$(k_1\ D\ l_s\ F_{em})$	, parallel	3.6		2686		lbs.
		, perp.	4.5		854		lbs.
$k_2= -1 +\sqrt{(2(1+R_e)+((2\ F_{yb}(1+2\ R_e)\ D^2) / (3\ F_{em}\ l_m^2)))}$		, parallel			1.0535		
		, perp.			1.1320		
Mode IIIm	$(k_2\ D\ l_m\ F_{em}) / ((1+2R_e)\ R_d)$	, parallel	3.2		2562		lbs.
		, perp.	4		876		lbs.
$k_3= -1 +\sqrt{((2(1+R_e) / R_e)+((2\ F_{yb}(2+R_e)\ D^2) / (3\ F_{em}\ l_s^2)))}$		, parallel			1.0535		1.0535
		, perp.			1.1320		1.1320
Mode IIIs	$(k_3\ D\ l_s\ F_{em}) / ((2+R_e)\ R_d)$	, parallel	3.2		2562	5124	30741 lbs.
		, perp.	4		876	1752	10506 lbs.
Mode IV	$(D^2 / R_d)*\sqrt{((2\ F_{em}\ F_{yb}) / (3(1+R_e)))}$	, parallel	3.2		1387	2774	16643
		, perp.	4		700	1400	8395
	Lateral Design Value, Z	, parallel			**1390**	**2770**	**5840** lbs.
		, perp.			**700**	**1400**	**1860** lbs.

Where:

* lm = main member dowel bearing length, in.; at minimum, the length of thread and tip portion of the fastener

** ls = side member dowel bearing length, in.

^ Fem = main member dowel bearing strength, psi; also the equivalent of Fes = side member dowel bearing strength, psi

^^ Rd = the Reduction Term Adjusting P5% Values to Nominal Design Values (AF&PA TR12 Table 2) = 10D + 0.25 for 0.17"<D< 0.25", where D is the minor thread diameter

Design values shown above shall be multiplied by all applicable adjustment factors per NDS.

Prepared by TimberLogic LLC for:
Honest Abe Log Homes, Inc.
9995 Clay County Hwy., Moss, TN 17837
931-258-3648, www.honestabe.com
See Disclaimer, page 2

8x8 Round: 8x8 (Nominal) Tongue & Groove (T&G) Round-Round Wall-Log

Fastening Schedule

5.32 Required Bolting Patterns for Minimum Number of Wall-Logs Acting Collectively as a Beam

- The following analysis assumes a rectangular cross-section as defined by the inscribed rectangle.

Wall-Log		Grade: Select	Bolt Values	3/4" bolt	Bolt hole dia.(D_h) =	25/32"
Width	6.515625	= b (in.) A, wall-log = 48.9 sq.in.	Z, parallel, single bolt	1390 lbs.	* 1.15 (C_D) =	**1599 lbs.**
Log Height	7.5 in.	= t_m, t_s (H_L) = y	Assume a bolt diameter =	3/4 "	Cg =	1
Ft =	375 psi	Q=yA = 366.78 in^2	End distance to 1st bolt =	7	diameters =	5 1/4 "
Fv =	125 psi	206.472 Ivert, wall-log	Distance to next bolt =	4	diameters =	3 " = $s_{critical}$
	81.803 psi	= Allowable shear stress with bolts	Max. shear strength =	533	lbs./lin. inch of header	

5.321 Determine the Section Properties for Multiple-Log Lintels:

Crs = # of logs in lintel:	2	3	4	5	6	7	8	9	logs
Neutral axis of lintel (c):	7.5	11.25	15	18.75	22.5	26.25	30	33.75	in.
Distance to centroid (y):	3.75	5.625	7.5	9.375	11.25	13.125	15	16.875	in.
Total Area of lintel (A_L):	97.808	146.712	195.616	244.52	293.424	342.328	391.232	440.136	$in.^2$
A above neutral axis (A_{NA}):	48.904	73.356	97.808	122.26	146.712	171.164	195.616	220.068	$in.^2$
$Q=yA_{NA}$	183.39	412.628	733.56	1146.188	1650.51	2246.528	2934.24	3713.648	$in.^3$
Moment of Inertia (I, lintel):	1832.52	6184.753	14660.156	28633.118	49478.027	78569.275	117281.25	166988.342	$in.^4$
S=I/c	244.336	549.75582	977.34373	1527.0996	2199.02342	2993.1152	3909.375	4947.80273	$in.^3$
V, shear capacity, lb/Q:	5326	7989	10652	13315	15978	18641	21304	23967	lbs.

5.322 Calculate number of logs in header to support load based on shear capacity:

Ground		100	90	80	70	60	50	20	psf
Based on header loading of:		1570	1460	1350	1250	1150	1050	730	plf
Header Span	3 ft.	1.5	1.5	1	1	1	1	1	logs
	4.5 ft.	2	2	1.5	1.5	1.5	1.5	1	logs
	6 ft.	2	2	2	2	2	2	1.5	logs
	8 ft.	3	3	3	2	2	2	1.5	logs
	10 ft.	3	3	3	3	3	2	2	logs
	12 ft.	4	4	4	3	3	3	2	logs
	13.5 ft.	4	4	4	4	3	3	2	logs

5.323 Calculate number of logs in header to support load based on moment capacity: Fb= 930 psi psi

Based on header loading of:		1570	1460	1350	1250	1150	1050	730	plf
Header Span	3 ft.	1.5	1.5	1	1	1	1	1	logs
	4.5 ft.	2	2	1.5	1.5	1.5	1.5	1	logs
	6 ft.	2	2	2	2	2	2	1.5	logs
	8 ft.	2	2	2	2	2	2	1.5	logs
	10 ft.	3	2	2	2	2	2	2	logs
	12 ft.	3	3	3	3	3	2	2	logs
	13.5 ft.	3	3	3	3	3	3	2	logs

5.324 Determine maximum single shear stress between logs in lintel over header span (psi)

See Table and footnotes from 1.53 (VQ/Ib), V=span/2*w, plf Fv, wall-log = 125 psi psi

Header Span									
	3 ft.	--	--	--	--	--	--	--	psi
	4.5 ft.	31.424	29.222	27.02	25.019	--	--	--	psi
	6 ft.	41.898	38.963	36.027	33.358	30.69	28.021	--	psi
	8 ft.	41.898	38.963	36.027	44.478	40.92	37.362	25.975	psi
	10 ft.	52.373	48.703	45.034	41.698	38.362	46.702	32.469	psi
	12 ft.	50.278	46.755	43.233	50.038	46.035	42.032	38.963	psi
	13.5 ft.	56.563	52.6	48.637	45.034	51.789	47.286	43.833	psi

Prepared by TimberLogic LLC for:
Honest Abe Log Homes, Inc.
9995 Clay County Hwy., Moss, TN 17837
931-258-3648, www.honestabe.com
See Disclaimer, page 2

8x8 Round: 8x8 (Nominal) Tongue & Groove (T&G) Round-Round Wall-Log

Fastening Schedule

5.325 Shear force (lbs. per linear inch) in the header

Ground		100	90	80	70	60	50	20	psf
Header Span	3 ft.	--	--	--	--	--	--	--	lbs./in.
	4.5 ft.	236	219	203	188	--	--	--	lbs./in.
	6 ft.	314	292	270	250	230	210	--	lbs./in.
	8 ft.	314	292	270	334	307	280	195	lbs./in.
	10 ft.	393	365	338	313	288	350	244	lbs./in.
	12 ft.	377	351	324	375	345	315	292	lbs./in.
	13.5 ft.	424	395	365	338	388	355	329	lbs./in.

5.326 Bolt spacing for the outer third of the header (Z parallel, lbs. / VQ/I, lbs. per inch)

Header Span	3 ft.	--	--	--	--	--	--	--	in. o/c
	4.5 ft.	7	7	8	9	--	--	--	in. o/c
	6 ft.	5	5	6	6	7	8	--	in. o/c
	8 ft.	5	5	6	5	5	6	8	in. o/c
	10 ft.	4	4	5	5	6	5	7	in. o/c
	12 ft.	4	5	5	4	5	5	5	in. o/c
	13.5 ft.	4	4	4	5	4	5	5	in. o/c

5.327 Number of bolts per end (1/3 of header span)

Header Span	3 ft.	--	--	--	--	--	--	--	bolts
	4.5 ft.	2	2	2	1	--	--	--	bolts
	6 ft.	4	4	3	3	3	2	--	bolts
	8 ft.	6	6	5	6	6	5	3	bolts
	10 ft.	9	9	7	7	6	7	5	bolts
	12 ft.	11	9	9	11	9	9	9	bolts
	13.5 ft.	13	13	13	10	13	10	10	bolts

5.328 Bolt spacing for the middle third of the header (Z parallel, lbs. / VQ/I, lbs. per inch)

Header Span	3 ft.	--	--	--	--	--	--	--	in. o/c
	4.5 ft.	--	--	--	--	--	--	--	in. o/c
	6 ft.	15	16	18	19	21	23	--	in. o/c
	8 ft.	15	16	18	14	16	17	25	in. o/c
	10 ft.	12	13	14	15	17	14	20	in. o/c
	12 ft.	13	14	15	13	14	15	16	in. o/c
	13.5 ft.	11	12	13	14	12	14	15	in. o/c

5.329 Number of bolts per middle third (1/3 of header span)

Header Span	3 ft.	--	--	--	--	--	--	--	bolts
	4.5 ft.	--	--	--	--	--	--	--	bolts
	6 ft.	1	1	1	1	1	1	--	bolts
	8 ft.	2	1	1	2	1	1	1	bolts
	10 ft.	3	3	2	2	2	2	1	bolts
	12 ft.	3	3	3	3	3	3	2	bolts
	13.5 ft.	4	4	4	3	4	3	3	bolts