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Edwin Zeller  
Woodtone Specialties Inc.  
4175 Crozier Rd  
Armstrong, BC V0E 1B6  
Canada

Subject: Load tables for adhered built-up beams and columns

Dear Edwin,

The purpose of this letter report is to provide you with the final load tables, attached to this summary letter, that have been calculated for your adhered built-up members used horizontally as beams and vertically as columns. Load tables have been created for both US design in accordance with the 2018 AWC National Design Specification (NDS) for Wood and for Canadian design in accordance with the 2014 CSA O86.

**Project Assumptions**

The following assumptions have been made when calculating design values in accordance with the referenced design standards.

- All laminations are visually graded No. 2 Western Red Cedar, categorized as *Western Cedars* in AWC NDS Table 4A and *Northern Species* in CSA O86 Table 6.3.1A.
- All laminations are 41 mm thick at the time of glue-up and are continuous with no end joints.
- Final trimming to size after glue-up is limited to one lamination/face (i.e., either top or bottom lamination) such that an N-ply glue-up will result in a final member with N-1 full laminations and a single partial lamination.
- It is assumed that the laminated members are manufactured with adhesives and processes in accordance with Woodstone's, Intertek approved, quality control manual.
- Only full-thickness laminations are used in strength calculations.
- The full member dimensions are used in stiffness and buckling calculations.
- Beams are uniformly loaded about their strong axis.
- Columns are concentrically loaded with applied load distributed uniformly over the full column width.
- Beams are simply supported with sufficient bearing area.
- Columns pin-ended and bear on sufficient support.
- Beams are continuously supported along their top edge.
- Columns are provided with lateral support only at their ends.
- Beam load tables present critical values based on controlling flexure, shear, or deflection criteria. The critical deflection for US tables is  $L/360$ , while the critical deflection for Canadian tables is  $L/180$  based on O86 Section 5.4.2. Other deflection criteria may control in individual designs.
- Column load tables present critical values based on allowable compressive strength and a maximum slenderness ratio of 50.



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**Analyzed Member Sizes**

The below table provides key properties for the analyzed members. Member lengths for US calculations were 8, 10, 12, 14, 16, 18, and 20 feet. Member lengths for the Canadian calculations were 2.5, 3, 3.5, 4, 4.5, 5, 5.5, and 6 meters.

Key Built-up Member Properties							
Nominal Size	Width		Full Depth (Stiffness)		Full Plies	Reduced Depth (Strength)	
	(in)	(mm)	(in)	(mm)		(in)	(mm)
4 x 4	3.5	88	3.5	88	2	3.2	82
4 x 6	3.5	88	5.4	138	3	4.8	123
4 x 8	3.5	89	7.5	191	4	6.5	164
6 x 6	5.5	140	5.5	140	3	4.8	123
6 x 8	5.5	140	7.5	191	4	6.5	164
8 x 8	7.1	179	7.5	191	4	6.5	164
4 x 10	3.5	88	9.2	233	5	8.1	205
6 x 10	5.4	138	9.2	233	5	8.1	205
8 x 10	7.0	179	9.2	233	5	8.1	205
4 x 12	3.5	89	11.3	288	7	11.3	287
6 x 12	5.5	140	11.3	288	7	11.3	287
8 x 12	7.1	179	11.3	288	7	11.3	287

**Evaluation Method**

As the built-up members did not comply with the production requirements for glued-laminated timber in either ANSI A190.1 or CSA O122, analysis of the members could not be conducted in accordance with the glued-laminated timber provisions in Chapter 5 of the AWC NDS or Clause 7 of CSA O86. Instead, design stresses and/or resistances were calculated for the individual member laminations in accordance with the sawn lumber provisions of each standard (Chapter 4 of the AWC NDS and Clause 6 of CSA O86). These design stresses and/or resistances were then used in the full member section analysis as described below.

Design of horizontal members (i.e., beams) utilized standard engineering mechanics analysis of the outer fiber stresses, as supported by CSA O86 Section 10.5.3. While both compression and tension fibers were checked, flexural design was controlled by using the NDS adjusted tension design stress ( $F_t'$ ) and CSA O86 factored tensile resistance ( $F_t$ ) as  $\sigma$  in standard moment design calculations. Shear design calculations were conducted using the standard sawn lumber method for both US and Canadian tables. As mentioned previously, strength design of the members only considered the contribution of full-thickness laminations while deflection calculations were conducted using the full member dimensions.

Design of vertical members (i.e., columns) utilized the individual lamination design stress ( $F_c'$ ) or factored resistance ( $F_c$ ) in built-up column design equations from Section 15.3 of the NDS and Clause 6.5.6 of CSA O86.

**Load Duration Factors ( $C_D$  and  $K_D$ )**



Three versions of each load table have been created with each table utilizing a different load duration factor based on the type of expected applied loads. US tables have load duration factors of 1.0, which is associated with long-duration loads expected to act on the members for a cumulative period of 10 years over the life of the member (e.g., occupancy live loads), 1.15, which is associated with loads expected to act on members for a cumulative period of 2 months over the life of the member (e.g., snow loads), and 1.25, which is associated with loads expected to act on the members for a cumulative period of 7 days over the life of the member (e.g., construction loads). Canadian tables have load duration factors of 0.65, which is associated with long-term loads such as member self-weight and fixed equipment live loads, 1.00, which is associated with standard-term loads such as snow loads and occupancy live loads, and 1.15, which is associated with short-term loads such as construction loads.

**End Use Considerations**

The tables represent maximum loads based on calculations in accordance with the applicable referenced standards and in some cases may be lower than minimum design loads reasonably expected in end use. Woodtone should consider establishing practical limits (minimums) for publication of tables for end use.

If you have any questions regarding this letter report, please do not hesitate to contact the undersigned.

Sincerely,

**INTERTEK TESTING SERVICES NA, INC.**

Reported by:

Reviewed by:

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**US Beam Tables**

<b>Allowable 10-year Duration Loads (lb/ft) with <math>C_D = 1.0</math> (e.g., Occupancy Live Loads)</b>							
<b>Nominal Size</b>	<b>Span Length (ft)</b>						
	<b>8</b>	<b>10</b>	<b>12</b>	<b>14</b>	<b>16</b>	<b>18</b>	<b>20</b>
<b>4 x 4</b>	33	16	8	4	2	1	0
<b>4 x 6</b>	87	54	37	22	14	9	5
<b>6 x 6</b>	119	74	50	35	22	14	9
<b>4 x 8</b>	157	99	67	48	36	27	18
<b>6 x 8</b>	213	134	91	65	48	36	28
<b>8 x 8</b>	252	158	107	77	57	43	30
<b>4 x 10</b>	244	155	106	76	57	44	35
<b>6 x 10</b>	331	209	142	102	76	59	46
<b>8 x 10</b>	396	249	170	122	91	69	54
<b>4 x 12</b>	488	310	213	155	117	91	72
<b>6 x 12</b>	663	421	289	209	158	123	97
<b>8 x 12</b>	785	497	341	247	186	144	114

<b>Allowable 2-month Duration Loads (lb/ft) with <math>C_D = 1.15</math> (e.g., Snow Loads)</b>							
<b>Nominal Size</b>	<b>Span Length (ft)</b>						
	<b>8</b>	<b>10</b>	<b>12</b>	<b>14</b>	<b>16</b>	<b>18</b>	<b>20</b>
<b>4 x 4</b>	33	16	8	4	2	1	0
<b>4 x 6</b>	100	63	37	22	14	9	5
<b>6 x 6</b>	137	86	58	36	22	14	9
<b>4 x 8</b>	181	114	78	56	40	27	18
<b>6 x 8</b>	246	155	105	76	56	42	29
<b>8 x 8</b>	291	183	125	89	67	44	30
<b>4 x 10</b>	282	178	122	88	66	51	36
<b>6 x 10</b>	382	241	165	119	89	69	54
<b>8 x 10</b>	457	288	197	142	106	81	64
<b>4 x 12</b>	562	357	246	179	136	101	72
<b>6 x 12</b>	764	485	334	242	183	143	113
<b>8 x 12</b>	905	574	395	286	216	168	133

**\*See table notes on following page**





Allowable 7-day Duration Loads (lb/ft) with $C_D = 1.25$ (e.g. Construction Loads)							
Nominal Size	Span Length (ft)						
	8	10	12	14	16	18	20
4 x 4	33	16	8	4	2	1	0
4 x 6	109	65	37	22	14	9	5
6 x 6	150	94	60	36	22	14	9
4 x 8	197	125	85	61	40	27	18
6 x 8	268	169	115	83	62	42	29
8 x 8	317	200	136	98	67	44	30
4 x 10	307	194	133	97	73	51	36
6 x 10	416	263	180	130	98	75	56
8 x 10	497	314	215	155	116	89	70
4 x 12	612	389	268	195	147	101	72
6 x 12	831	528	364	264	200	156	113
8 x 12	984	625	430	312	236	184	145

Notes:

- a) Tabulated ASD values are for simply supported spans continually braced along compression edge and provided with sufficient bearing length at supports.
- b) Service conditions are <16% MC and <100°F.
- c) Highlighted and italicized values are controlled by a deflection limit of L/360. Other deflection limits may apply.
- d) Values have been reduced for an estimated self-weight of 24.3 pcf.

Typical Beam Properties									
Nominal Size	Actual Dimensions		EI (x10 <sup>6</sup> lb-in <sup>2</sup> )	Max Design Moment (ft-lb)			Max Design Shear (lb)		
	Width (in)	Depth (in)		$C_D = 1.0$	$C_D = 1.15$	$C_D = 1.25$	$C_D = 1.0$	$C_D = 1.15$	$C_D = 1.25$
4 x 4	3.5	3.5	12	320	368	400	1,156	1,329	1,445
4 x 6	3.5	5.4	46	719	827	899	1,734	1,994	2,167
4 x 8	3.5	7.5	123	1,292	1,486	1,615	2,335	2,685	2,919
4 x 10	3.5	9.2	223	1,998	2,298	2,498	2,889	3,323	3,612
4 x 12	3.5	11.33	424	3,957	4,550	4,946	4,087	4,700	5,108
6 x 6	5.5	5.5	76	990	1,138	1,237	2,752	3,165	3,440
6 x 8	5.5	7.5	193	1,759	2,023	2,199	3,670	4,220	4,587
6 x 10	5.4	9.2	349	2,716	3,123	3,395	4,531	5,211	5,664
6 x 12	5.5	11.33	667	5,388	6,197	6,735	6,422	7,385	8,027
8 x 8	7.06	7.06	207	2,086	2,398	2,607	4,712	5,419	5,890
8 x 10	7.05	9.2	453	3,252	3,739	4,065	5,877	6,759	7,347
8 x 12	7.06	11.33	856	6,387	7,345	7,984	8,246	9,483	10,308





**US Column Tables**

<b>Allowable 10-year Duration Loads (lb) with <math>C_D = 1.0</math> (e.g., Occupancy Live Loads)</b>							
<b>Nominal Size</b>	<b>Length (ft)</b>						
	<b>8</b>	<b>10</b>	<b>12</b>	<b>14</b>	<b>16</b>	<b>18</b>	<b>20</b>
<b>4 x 4</b>	2,140	1,520	1,120	850	-	-	-
<b>4 x 6</b>	3,210	2,280	1,670	1,270	-	-	-
<b>4 x 8</b>	4,390	3,120	2,300	1,750	-	-	-
<b>4 x 10</b>	5,350	3,800	2,790	2,120	-	-	-
<b>4 x 12</b>	7,680	5,470	4,020	3,050	-	-	-
<b>6 x 6</b>	8,310	6,770	5,430	4,370	3,540	2,910	2,430
<b>6 x 8</b>	11,080	9,020	7,240	5,820	4,730	3,890	3,240
<b>6 x 10</b>	13,560	10,990	8,800	7,060	5,720	4,700	3,910
<b>6 x 12</b>	19,400	15,790	12,670	10,190	8,270	6,800	5,670
<b>8 x 8</b>	16,010	14,100	12,130	10,300	8,710	7,370	6,280
<b>8 x 10</b>	19,950	17,550	15,100	12,820	10,830	9,170	7,800
<b>8 x 12</b>	28,020	24,670	21,230	18,030	15,240	12,900	10,980

<b>Allowable 2-month Duration Loads (lb) with <math>C_D = 1.15</math> (e.g., Snow Loads)</b>							
<b>Nominal Size</b>	<b>Length (ft)</b>						
	<b>8</b>	<b>10</b>	<b>12</b>	<b>14</b>	<b>16</b>	<b>18</b>	<b>20</b>
<b>4 x 4</b>	2,220	1,560	1,130	860	-	-	-
<b>4 x 6</b>	3,330	2,340	1,700	1,290	-	-	-
<b>4 x 8</b>	4,560	3,200	2,340	1,770	-	-	-
<b>4 x 10</b>	5,560	3,890	2,840	2,150	-	-	-
<b>4 x 12</b>	7,980	5,600	4,090	3,090	-	-	-
<b>6 x 6</b>	9,030	7,190	5,680	4,510	3,630	2,970	2,470
<b>6 x 8</b>	12,040	9,590	7,570	6,020	4,840	3,960	3,290
<b>6 x 10</b>	14,710	11,670	9,190	7,290	5,860	4,790	3,970
<b>6 x 12</b>	21,070	16,780	13,250	10,530	8,480	6,930	5,750
<b>8 x 8</b>	17,800	15,390	13,010	10,880	9,090	7,630	6,450
<b>8 x 10</b>	22,170	19,160	16,190	13,540	11,300	9,480	8,020
<b>8 x 12</b>	31,140	26,920	22,760	19,040	15,910	13,350	11,290

**\*See table notes on following page**





Allowable 7-day Duration Loads (lb) with $C_D = 1.25$ (e.g., Construction Loads)							
Nominal Size	Length (ft)						
	8	10	12	14	16	18	20
4 x 4	2,270	1,580	1,140	860	-	-	-
4 x 6	3,400	2,370	1,720	1,300	-	-	-
4 x 8	4,650	3,240	2,360	1,780	-	-	-
4 x 10	5,670	3,940	2,860	2,160	-	-	-
4 x 12	8,140	5,670	4,120	3,110	-	-	-
6 x 6	9,460	7,430	5,810	4,590	3,680	3,000	2,490
6 x 8	12,610	9,910	7,750	6,120	4,910	4,000	3,310
6 x 10	15,400	12,050	9,400	7,410	5,940	4,840	4,000
6 x 12	22,070	17,350	13,560	10,710	8,590	7,000	5,800
8 x 8	18,910	16,160	13,520	11,210	9,300	7,770	6,550
8 x 10	23,560	20,120	16,820	13,940	11,570	9,660	8,140
8 x 12	33,090	28,280	23,650	19,610	16,280	13,600	11,460

## Notes:

- Tabulated ASD values are for pinned-end concentrically loaded columns.
- Service conditions are <16% MC and <100°F.
- Entries of “-” denote configurations that exceed a slenderness ratio, L/d, of 50.



**Canadian Beam Tables**

<b>Total Factored Long-term Loads (N/m) with <math>K_D = 0.65</math> (e.g., Dead Loads)</b>								
<b>Nominal Size</b>	<b>Span Length (m)</b>							
	<b>2.5</b>	<b>3</b>	<b>3.5</b>	<b>4</b>	<b>4.5</b>	<b>5</b>	<b>5.5</b>	<b>6</b>
<b>4 x 4</b>	414	278	197	144	107	81	62	47
<b>4 x 6</b>	818	554	395	291	220	170	132	104
<b>6 x 6</b>	1,300	880	627	462	350	269	209	164
<b>4 x 8</b>	1,369	931	667	495	378	294	232	184
<b>6 x 8</b>	2,154	1,465	1,049	779	595	462	364	290
<b>8 x 8</b>	2,762	1,881	1,350	1,005	768	599	474	379
<b>4 x 10</b>	1,953	1,332	958	715	549	430	342	275
<b>6 x 10</b>	3,062	2,089	1,503	1,122	861	674	536	431
<b>8 x 10</b>	3,972	2,710	1,949	1,455	1,116	874	695	559
<b>4 x 12</b>	3,562	2,444	1,770	1,332	1,032	817	659	538
<b>6 x 12</b>	5,603	3,844	2,784	2,095	1,623	1,286	1,036	846
<b>8 x 12</b>	7,164	4,915	3,559	2,679	2,076	1,644	1,325	1,082

<b>Total Factored Standard-term Loads (N/m) with <math>K_D = 1.0</math> (e.g., Snow Loads, Occupancy Live Loads)</b>								
<b>Nominal Size</b>	<b>Span Length (m)</b>							
	<b>2.5</b>	<b>3</b>	<b>3.5</b>	<b>4</b>	<b>4.5</b>	<b>5</b>	<b>5.5</b>	<b>6</b>
<b>4 x 4</b>	652	444	318	237	181	141	111	89
<b>4 x 6</b>	1,283	877	632	473	364	286	228	185
<b>6 x 6</b>	2,040	1,394	1,004	752	578	454	362	293
<b>4 x 8</b>	2,141	1,467	1,061	797	616	487	391	318
<b>6 x 8</b>	3,369	2,308	1,669	1,254	969	766	615	501
<b>8 x 8</b>	4,315	2,959	2,142	1,611	1,248	987	795	648
<b>4 x 10</b>	3,046	2,092	1,516	1,142	886	703	568	464
<b>6 x 10</b>	4,777	3,280	2,377	1,792	1,390	1,103	890	728
<b>8 x 10</b>	6,196	4,255	3,084	2,324	1,803	1,430	1,154	945
<b>4 x 12</b>	5,533	3,812	2,775	2,102	1,640	1,310	1,066	880
<b>6 x 12</b>	8,703	5,997	4,365	3,306	2,580	2,061	1,676	1,384
<b>8 x 12</b>	11,127	7,667	5,581	4,227	3,299	2,635	2,144	1,770

\*See table notes on following page







Total Factored Short-term Loads (N/m) with $K_D = 1.15$ (e.g., Construction Loads)								
Nominal Size	Span Length (m)							
	2.5	3	3.5	4	4.5	5	5.5	6
4 x 4	754	515	371	277	212	167	133	107
4 x 6	1,482	1,015	734	551	426	336	270	219
6 x 6	2,357	1,614	1,166	875	676	533	428	348
4 x 8	2,472	1,697	1,230	926	718	570	460	376
6 x 8	3,889	2,670	1,934	1,457	1,130	896	723	591
8 x 8	4,981	3,422	2,481	1,871	1,453	1,154	932	764
4 x 10	3,515	2,417	1,755	1,325	1,031	820	664	546
6 x 10	5,512	3,790	2,752	2,079	1,617	1,286	1,042	856
8 x 10	7,150	4,917	3,570	2,696	2,097	1,668	1,351	1,110
4 x 12	6,377	4,399	3,206	2,432	1,901	1,521	1,240	1,027
6 x 12	10,031	6,919	5,043	3,825	2,990	2,393	1,951	1,615
8 x 12	12,826	8,847	6,448	4,891	3,823	3,059	2,494	2,065

Notes:

- a) Tabulated values are for simply supported spans continually braced along compression edge and provided with sufficient bearing length at supports.
- b) Service conditions are <19% MC and <50°C.
- c) Highlighted and italicized values are controlled by a deflection limit of L/180. Other deflection limits may apply.
- d) Values have been reduced for an estimated self-weight of 388 kg/m<sup>3</sup>.

Typical Beam Properties									
Nominal Size	Actual Dimensions		<i>EI</i> (kN-m <sup>2</sup> )	Factored <i>M<sub>r</sub></i> (kN-m)			Factored <i>V<sub>r</sub></i> (kN)		
	Width (mm)	Depth (mm)		0.65	1.0	1.15	0.65	1.0	1.15
4 x 4	88	88	35	0.35	0.53	0.6	6.2	9.6	11.0
4 x 6	88	138	135	0.67	1.04	1.2	8.2	12.7	14.6
6 x 6	140	140	224	1.07	1.65	1.9	11.3	17.5	20.1
4 x 8	89	191	362	1.12	1.72	2.0	9.6	14.8	17.0
6 x 8	140	191	569	1.76	2.71	3.1	15.1	23.3	26.8
8 x 8	179	179	599	2.25	3.47	4.0	19.3	29.8	34.2
4 x 10	88	233	649	1.59	2.44	2.8	11.0	16.9	19.4
6 x 10	138	233	1018	2.49	3.83	4.4	17.2	26.5	30.5
8 x 10	179	233	1321	3.23	4.96	5.7	22.3	34.3	39.5
4 x 12	89	288	1240	2.86	4.40	5.1	14.2	21.9	25.2
6 x 12	140	288	1951	4.50	6.92	8.0	22.4	34.5	39.6
8 x 12	179	288	2494	5.75	8.85	10.2	28.7	44.1	50.7



**Canadian Column Tables**

<b>Total Factored Long-term Axial Load (kN) with <math>K_D = 0.65</math> (e.g., Dead Loads)</b>								
<b>Nominal Size</b>	<b>Length (m)</b>							
	<b>2.5</b>	<b>3</b>	<b>3.5</b>	<b>4</b>	<b>4.5</b>	<b>5</b>	<b>5.5</b>	<b>6</b>
<b>4 x 4</b>	23	17	12	9	-	-	-	-
<b>4 x 6</b>	35	25	18	13	-	-	-	-
<b>4 x 8</b>	48	35	25	18	-	-	-	-
<b>4 x 10</b>	58	42	30	22	-	-	-	-
<b>4 x 12</b>	84	60	44	32	-	-	-	-
<b>6 x 6</b>	88	75	63	52	43	35	29	23
<b>6 x 8</b>	118	101	84	69	57	46	38	31
<b>6 x 10</b>	144	122	102	84	68	56	45	37
<b>6 x 12</b>	206	176	147	122	100	81	67	55
<b>8 x 8</b>	164	149	134	118	103	89	77	66
<b>8 x 10</b>	205	187	167	147	129	111	96	82
<b>8 x 12</b>	287	261	234	206	180	156	134	115

<b>Total Factored Standard-term Axial Load (kN) with <math>K_D = 1.00</math> (e.g., Snow Loads, Occupancy Live Loads)</b>								
<b>Nominal Size</b>	<b>Length (m)</b>							
	<b>2.5</b>	<b>3</b>	<b>3.5</b>	<b>4</b>	<b>4.5</b>	<b>5</b>	<b>5.5</b>	<b>6</b>
<b>4 x 4</b>	28	19	13	9	-	-	-	-
<b>4 x 6</b>	42	29	20	14	-	-	-	-
<b>4 x 8</b>	58	39	27	19	-	-	-	-
<b>4 x 10</b>	70	48	33	23	-	-	-	-
<b>4 x 12</b>	101	69	48	34	-	-	-	-
<b>6 x 6</b>	122	100	80	63	50	40	32	26
<b>6 x 8</b>	163	133	106	84	66	53	42	34
<b>6 x 10</b>	198	161	128	101	80	63	50	40
<b>6 x 12</b>	285	232	186	147	116	92	74	60
<b>8 x 8</b>	239	210	182	155	130	109	91	76
<b>8 x 10</b>	298	263	227	193	163	136	114	95
<b>8 x 12</b>	418	368	318	271	228	191	160	133

\*See table notes on following page



Total Factored Short-term Axial Load (kN) with $K_D = 1.15$ (e.g., Construction Loads)								
Nominal Size	Length (m)							
	2.5	3	3.5	4	4.5	5	5.5	6
4 x 4	29	20	13	10	-	-	-	-
4 x 6	44	29	20	14	-	-	-	-
4 x 8	61	41	28	20	-	-	-	-
4 x 10	73	49	34	24	-	-	-	-
4 x 12	106	71	49	35	-	-	-	-
6 x 6	135	108	85	66	52	41	33	26
6 x 8	180	144	113	89	69	55	43	35
6 x 10	218	174	136	106	83	65	52	41
6 x 12	314	252	198	155	121	95	76	61
8 x 8	268	233	199	167	139	115	96	79
8 x 10	335	292	249	209	174	144	120	99
8 x 12	469	408	348	293	244	202	167	139

Notes:

- a) Tabulated values are for pinned-end, concentrically loaded, untreated columns.
- b) Service conditions are <19% MC and <50°C.
- c) Entries of “-” denote configurations that exceed a slenderness ratio,  $C_c$ , of 50.

Revision	Date	Summary	Reporter	Reviewer
0	3/31/2023	Original Issue	A. Holstein	C. Wagner
1	4/28/2023	Added 4x4, 4x6, 4x10, 6x10, 8x10 to scope	A. Holstein	C. Wagner

