



MADE FOR BUILDING
BUILT FOR LIVING

STRUCTURAL PRE-ANALYSIS TABLES



IMPRINT

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Publisher and responsible for the content: KLH Massivholz GmbH

Version: Structural pre-analysis tables, 11/2025

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INTRODUCTION

DESIGN GUIDE FOR USE IN CANADA

KLH® Cross Laminated Timber (CLT) panels are built up using layers of lumber, with successive layers arranged perpendicular to one another. These layers are glued together with environmentally friendly PUR adhesive to form strong, solid wood panels which can be used for floor, roof, and wall construction applications. CLT, as a wood product, is naturally green and sustainable, and structures can often be built more quickly than structures using other materials.

In addition, the total carbon footprint, including shipment by container from Europe, compares favorably with panels delivered by rail or truck, and our prices are very competitive. Panels are delivered to the job site sequenced and numbered for easy erection, with all openings and other details having been precisely made in the factory using CNC technology. Panels can be easily placed and connected with a relatively small crew using simple tools and standard, readily available fasteners. KLH® - CLT is manufactured in Austria of European spruce lumber. Our lumber supply is PEFC certified, with FSC® C119602 certified lumber available on request, and all products are manufactured to ANSI/APA PRG 320 standards.

KLH® was the first manufacturer in the world to produce CLT on a large-scale basis. KLH® - CLT has been used in over 45,000 projects worldwide.

This brochure is designed for engineers who are considering CLT or are currently designing a structure with CLT. Therefore, you'll find numerous technical topics, including design aids, material properties, and more. Other brochures are available, both in print and online, to introduce CLT to potential clients, architects, contractors, and developers.

After you've read through this brochure, we invite you to turn to KLH®, the industry leader in CLT. Please call or email us to begin a conversation about the many benefits offered by KLH® - CLT. We stand ready to provide design assistance, 3D modeling, cost estimates, and any other information and services that your design/construction team requires.

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PRODUCT DESCRIPTION

01 PRODUCT DESCRIPTION

KLH® CROSS-LAMINATED TIMBER

KLH® cross-laminated timber is produced from layers of spruce lumber that are arranged crosswise to one another, with each layer glued to the adjacent layers under 0.6 N/mm² pressure to form large, solid wood elements (panels). The cross-wise arrangement of the longitudinal and transverse layers reduces swelling and shrinkage of the wood in the plane of the panel. Also, the arrangement of the layers results in strong elements capable of significant load carrying capacity over relatively long spans. The lumber used to produce KLH® - CLT panels is dried to a moisture content of 12% (+/-2%) prior to producing the panels.

GLUING

Solvent- and formaldehyde-free PUR adhesive is used to glue the adjacent layers together. The glue is applied automatically and uniformly over the entire adhered surfaces, thus achieving a high level of adhesion under the high manufacturing pressure. All lumber comprising the laminations is carefully sorted prior to manufacturing of the built-up panels.

CNC CUTTING

Precise factory cutting according to specific design requirements takes place using state-of-the-art CNC technology. Cutting accuracy is generally +/-2 mm, resulting in extremely precise finished panels with minimal waste. In addition to panel overall dimensions, window, door, and other openings can easily be prefabricated prior to delivery to the job site.

SURFACE QUALITY

KLH® - CLT panels are available in non-visible (NVQ), industrial visible (IVQ), and domestic visible (DVQ) surface qualities. The DVQ level includes gluing the sides of the boards together in the outer most, visible surface lamination. IVQ and DVQ surfaces are sanded.

ASSEMBLY

CLT panels can be erected quickly and efficiently by relatively small crews using simple tools and connectors. A crane is used to raise the panels into position. Holes, channels, or other surface features, such as those required for utility lines or electrical wiring, can be cut on site, or prefabricated. Erection consists of connecting wall, floor, and roof panels together to quickly build a fully enclosed structure. Of course, CLT panels also work particularly well in combination with wood post-and-beam frameworks.



Lifting of KLH® TL panel



The Children's Course Learning Center in Gladstone | Oregon

TECHNICAL DESCRIPTION

PRODUCT	Solid wood panels with crosswise glued laminations
PRODUCT NAME	KLH® - CLT
USES	Structural elements for walls, floors, and roofs
WOOD TYPE	Spruce (other wood species on request)
PANEL BUILD-UPS	3-, 5-, 7-, and 8-laminations
LAMINATIONS	Lamination thicknesses 20 - 40 mm Sorted for quality and finger-jointed
PANEL GRADE	CV1M1
GLUE	Formaldehyde-free PUR adhesive
LAMINATION PRESSURE	0,6 N/mm ² , minimum
MOISTURE CONTENT	12% (+/-2%) at delivery
MAXIMUM DIMENSIONS	Length 16.50 m / width 3.50 m / thickness 0.32 m
INVOICING WIDTHS	from 2.27 to 3.50 m
SURFACE QUALITIES	Non-visible (NVQ) / Industrial visible (IVQ) / Domestic visible (DVQ)
WEIGHT	For structural calculations, 5.5 kN/m ³ Shipping weight, 500 kg/m ³
DIMENSIONAL CHANGE WITH MOISTURE CONTENT	In-plane: 0.02% per 1% change in moisture content Out-of-plane: 0.24% per 1% change in moisture content
NOMINAL CHAR RATE	38 mm/hr.
EFFECTIVE CHAR DEPTH	48 mm after 1 hour All lamination thicknesses = 35 mm
FIRE DESIGN	According to CSA O86 Annex B
FLAME SPREAD INDEX	Classification B
CERTIFICATION	ANSI/APA PRG 320-2019

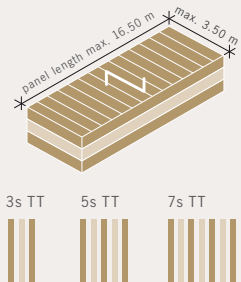
STANDARD PANELS AND STRUCTURES

02 STANDARD PANEL TYPES AND STRUCTURES

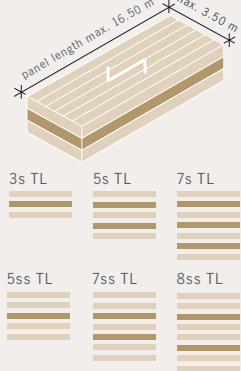
INVOICING WIDTHS: FROM 2.27 TO 3.50 M

MAXIMUM DIMENSIONS: LENGTH 16.50 / WIDTH 3.50 / THICKNESS 0.32 M

FOR THE WALL
Covering layer in the transverse panel direction TT

Thickness (mm)	Panel Type [TT/TL]	Lamination Thickness in CLT Layup (mm)			(mm)	(mm)	(mm)	(mm)
60	3s TT	20	20	20				
70	3s TT	20	30	20				
80	3s TT	30	20	30				
80	3s TT V2	20	40	20				
90	3s TT	30	30	30				
100	3s TT	30	40	30				
100	3s TT V2	40	20	40				
105 *	3s TT	35	35	35				
110	3s TT	40	30	40				
120	3s TT	40	40	40				
100	5s TT	20	20	20	20	20		
110	5s TT	20	20	30	20	20		
120	5s TT	30	20	20	20	30		
120	5s TT V2	20	30	20	30	20		
130	5s TT	30	20	30	20	30		
140	5s TT	30	20	40	20	30		
140	5s TT V2	20	40	20	40	20		
140	5s TT V3	40	20	20	20	40		
150	5s TT	30	30	30	30	30		
150	5s TT V2	40	20	30	20	40		
160	5s TT	40	20	40	20	40		
175 *	5s TT	35	35	35	35	35		
180	5s TT	40	30	40	30	40		
200	5s TT	40	40	40	40	40		
180	7s TT	30	20	30	20	30	20	30

FOR FLOOR AND ROOF
Covering layer in the longitudinal panel direction TL

60	3s TL	20	20	20				
70	3s TL	20	30	20				
80	3s TL	30	20	30				
80	3s TL V2	20	40	20				
90	3s TL	30	30	30				
100	3s TL	40	20	40				
100	3s TL V2	30	40	30				
105 *	3s TL	35	35	35				
110	3s TL	40	30	40				
120	3s TL	40	40	40				

* not available in DVQ

STANDARD PANELS AND STRUCTURES

FOR FLOOR AND ROOF
Covering layer in the longitudinal panel direction TL

Thickness	Panel Type	Lamination Thickness in CLT Layup							
(mm)	[TT/TL]	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)
100	5s TL	20	20	20	20	20			
110	5s TL	20	20	30	20	20			
120	5s TL	30	20	20	20	30			
120	5s TL V2	20	30	20	30	20			
130	5s TL	30	20	30	20	30			
130	5s TL V2	20	30	30	30	20			
140	5s TL	40	20	20	20	40			
140	5s TL V2	20	40	20	40	20			
150	5s TL	40	20	30	20	40			
150	5s TL V2	30	30	30	30	30			
150	5s TL V3	20	40	30	40	20			
160	5s TL	40	20	40	20	40			
160	5s TL V2	20	40	40	40	20			
170	5s TL	40	30	30	30	40			
170	5s TL V2	30	40	30	40	30			
175 *	5s TL	35	35	35	35	35			
180	5s TL	40	30	40	30	40			
180	5s TL V2	30	40	40	40	30			
190	5s TL	40	40	30	40	40			
200	5s TL	40	40	40	40	40			
160	5ss TL	30	30	40	30	30			
140	7s TL	20	20	20	20	20	20	20	
160	7s TL	20	30	20	20	20	30	20	
180	7s TL	20	40	20	20	20	40	20	
180	7s TL V2	30	20	30	20	30	20	30	
200	7s TL	20	40	20	40	20	40	20	
210	7s TL	30	30	30	30	30	30	30	
220	7s TL	30	40	30	20	30	40	30	
220	7s TL V2	40	20	40	20	40	20	40	
230	7s TL	30	40	30	30	30	40	30	
240	7s TL	30	40	30	40	30	40	30	
245 *	7s TL	35	35	35	35	35	35	35	
260	7s TL	40	40	30	40	30	40	40	
180	7ss TL	30	30	20	20	20	30	30	
200	7ss TL	30	30	20	40	20	30	30	
210	7ss TL	30	30	30	30	30	30	30	
220	7ss TL	40	40	20	20	20	40	40	
220	7ss TL V2	30	30	30	40	30	30	30	
230	7ss TL	40	40	20	30	20	40	40	
240	7ss TL	40	40	20	40	20	40	40	
250	7ss TL	40	40	30	30	30	40	40	
260	7ss TL	40	40	30	40	30	40	40	
280	7ss TL	40	40	40	40	40	40	40	
300	8ss TL	40	40	30	40	40	30	40	40
320	8ss TL	40	40	40	40	40	40	40	40

* not available in DVQ

FLEXURAL DESIGN CAPACITIES

03 LIMIT STATES DESIGN (LSD) CAPACITIES - FOR USE IN FLATWISE APPLICATION (for use in Canada)

3.1 LIMIT STATES DESIGN VALUES FOR TT PANELS AND TL PANELS

Table 3.1.1 Specified Strengths and Modulus of Elasticity for Lumber Laminations Used in KLH® - CLT (for use in Canada)

CLT Grade	Major Strength Direction						Minor Strength Direction					
	$f_{b,0}$ (MPa)	E_0 (MPa)	$f_{t,0}$ (MPa)	$f_{c,0}$ (MPa)	$f_{v,0}$ (MPa)	$f_{s,0}$ (MPa)	$f_{b,90}$ (MPa)	E_{90} (MPa)	$f_{t,90}$ (MPa)	$f_{c,90}$ (MPa)	$f_{v,90}$ (MPa)	$f_{s,90}$ (MPa)
CV1M1	14.7	11,000	5.5	15.0	1.8	0.60	14.7	11,000	5.5	15.0	1.8	0.60

3.2 TT PANELS

Table 3.2.1 Unfactored Limit States Design (LSD) Capacities for KLH® - CLT (for use in Canada)

CLT Grade	Layup	Panel Thickness (mm)	Lamination Thickness (mm) in CLT Layup							Major Strength Direction				Minor Strength Direction					
			=	⊥	=	⊥	=	⊥	=	$E_{\text{eff},0}$ (10^9 N-mm ² /m)	$G_{\text{A}}^{\text{eff},0}$ (10^6 N/m)	$M_{r,0}$ (m/m)	$V_{r,0}$ (kN/m)	$E_{\text{eff},90}$ (10^9 N-mm ² /m)	$G_{\text{A}}^{\text{eff},90}$ (10^6 N/m)	$M_{r,90}$ (m/m)	$V_{r,90}$ (kN/m)		
CV1M1	60 3s TT	60	20	20	20					191	3.7	6.5	21.6	7.3	3.7	0.9	7.2		
CV1M1	70 3s TT	70	20	30	20					290	4.0	8.5	25.2	24.8	5.6	2.0	10.8		
CV1M1	80 3s TT	80	30	20	30					462	5.6	11.8	28.8	7.3	4.0	0.9	7.2		
CV1M1	80 3s TT V2	80	20	40	20					413	4.3	10.5	28.8	58.7	7.9	3.5	14.4		
CV1M1	90 3s TT	90	30	30	30					644	5.6	14.6	32.4	24.8	5.6	2.0	10.8		
CV1M1	100 3s TT	100	30	40	30					860	5.8	17.6	36.0	58.7	7.4	3.5	14.4		
CV1M1	100 3s TT V2	100	40	20	40					910	7.9	18.6	36.0	7.3	4.3	0.9	7.2		
CV1M1	105 3s TT	105	35	35	35					1023	6.5	19.9	37.8	39.3	6.5	2.7	12.6		
CV1M1	110 3s TT	110	40	30	40					1196	7.4	22.2	39.6	24.8	5.8	2.0	10.8		
CV1M1	120 3s TT	120	40	40	40					1527	7.5	26.0	43.2	58.7	7.5	3.5	14.4		
CV1M1	100 5s TT	100	20	20	20	20	20					732	7.5	15.0	36.0	191	7.5	7.7	21.6
CV1M1	110 5s TT	110	20	20	30	20	20					940	9.3	17.5	39.6	290	7.7	10.0	25.2
CV1M1	120 5s TT	120	30	20	20	20	30					1400	9.3	23.8	43.2	191	7.7	7.7	21.6
CV1M1	120 5s TT V2	120	20	30	20	30	20					1137	7.9	19.4	43.2	462	11.3	13.9	28.8
CV1M1	130 5s TT	130	30	20	30	20	30					1734	11.3	27.3	46.8	290	7.9	10.0	25.2
CV1M1	140 5s TT	140	30	20	40	20	30					2118	13.4	30.9	50.4	413	8.3	12.4	28.8
CV1M1	140 5s TT V2	140	20	40	20	40	20					1636	8.7	23.9	50.4	910	15.7	21.9	36.0
CV1M1	140 5s TT V3	140	40	20	20	20	40					2331	11.3	34.0	50.4	191	7.9	7.7	21.6
CV1M1	150 5s TT	150	30	30	30	30	30					2472	11.2	33.7	54.0	644	11.2	17.2	32.4
CV1M1	150 5s TT V2	150	40	20	30	20	40					2814	13.4	38.4	54.0	290	8.3	10.0	25.2
CV1M1	160 5s TT	160	40	20	40	20	40	3358	15.7	42.9	57.6	413	8.7	12.4	28.8				
CV1M1	175 5s TT	175	35	35	35	35	35	3925	13.1	45.9	63.0	1023	13.1	23.4	37.8				
CV1M1	180 5s TT	180	40	30	40	30	40	4517	14.9	51.3	64.8	860	11.6	20.7	36.0				
CV1M1	200 5s TT	200	40	40	40	40	40	5859	14.9	59.9	72.0	1527	14.9	30.6	43.2				
CV1M1	180 7s TT	180	30	20	30	20	30	20	30	4261	16.9	48.4	64.8	1137	11.9	22.8	43.2		

* See notes on pg. 9

FLEXURAL DESIGN CAPACITIES

3.3 TL PANELS

Table 3.3.1 Unfactored Limit States Design (LSD) Bending Resistances for KLH® - CLT (for use in Canada)

CLT Grade	Layup	Panel Thickness (mm)	Lamination Thickness (mm) in CLT Layup							Major Strength Direction				Minor Strength Direction						
			=	⊥	=	⊥	=	⊥	=	$EI_{eff,0}$ (10^9 N-mm ² /m)	$GA_{eff,0}$ (10^6 N/m)	$M_{r,0}$ (kN-m/m)	$V_{r,0}$ (kN/m)	$EI_{eff,90}$ (10^9 N-mm ² /m)	$GA_{eff,90}$ (10^6 N/m)	$M_{r,90}$ (kN-m/m)	$V_{r,90}$ (kN/m)			
CV1M1	60 3s TL	60	20	20	20								191	3.7	6.5	21.6	7.3	3.7	0.9	7.2
CV1M1	70 3s TL	70	20	30	20								290	4.0	8.5	25.2	24.8	5.6	2.0	10.8
CV1M1	80 3s TL	80	30	20	30								462	5.6	11.8	28.8	7.3	4.0	0.9	7.2
CV1M1	80 3s TL V2	80	20	40	20								413	4.3	10.5	28.8	58.7	7.9	3.5	14.4
CV1M1	90 3s TL	90	30	30	30								644	5.6	14.6	32.4	24.8	5.6	2.0	10.8
CV1M1	100 3s TL	100	40	20	40								910	7.9	18.6	36.0	7.3	4.3	0.9	7.2
CV1M1	100 3s TL V2	100	30	40	30								860	5.8	17.6	36.0	58.7	7.4	3.5	14.4
CV1M1	105 3s TL	105	35	35	35								1023	6.5	19.9	37.8	39.3	6.5	2.7	12.6
CV1M1	110 3s TL	110	40	30	40								1196	7.4	22.2	39.6	24.8	5.8	2.0	10.8
CV1M1	120 3s TL	120	40	40	40								1527	7.5	26.0	43.2	58.7	7.5	3.5	14.4
CV1M1	100 5s TL	100	20	20	20	20	20			732	7.5	15.0	36.0	191	7.5	7.7	21.6			
CV1M1	110 5s TL	110	20	20	30	20	20			940	9.3	17.5	39.6	290	7.7	10.0	25.2			
CV1M1	120 5s TL	120	30	20	20	20	30			1400	9.3	23.8	43.2	191	7.7	7.7	21.6			
CV1M1	120 5s TL V2	120	20	30	20	30	20			1137	7.9	19.4	43.2	462	11.3	13.9	28.8			
CV1M1	130 5s TL	130	30	20	30	20	30			1734	11.3	27.3	46.8	290	7.9	10.0	25.2			
CV1M1	130 5s TL V2	130	20	30	30	30	20			1392	9.5	21.9	46.8	644	11.1	17.2	32.4			
CV1M1	140 5s TL	140	40	20	20	20	40			2331	11.3	34.0	50.4	191	7.9	7.7	21.6			
CV1M1	140 5s TL V2	140	20	40	20	40	20			1636	8.7	23.9	50.4	910	15.7	21.9	36.0			
CV1M1	150 5s TL	150	40	20	30	20	40			2814	13.4	38.4	54.0	290	8.3	10.0	25.2			
CV1M1	150 5s TL V2	150	30	30	30	30	30			2472	11.2	33.7	54.0	644	11.2	17.2	32.4			
CV1M1	150 5s TL V3	150	20	40	30	40	20			1938	10.1	26.4	54.0	1196	15.1	26.2	39.6			
CV1M1	160 5s TL	160	40	20	40	20	40			3358	15.7	42.9	57.6	413	8.7	12.4	28.8			
CV1M1	160 5s TL V2	160	20	40	40	40	20			2280	11.6	29.1	57.6	1527	14.9	30.6	43.2			
CV1M1	170 5s TL	170	40	30	30	30	40			3882	13.0	46.7	61.2	644	11.4	17.2	32.4			
CV1M1	170 5s TL V2	170	30	40	30	40	30			3348	11.6	40.3	61.2	1196	14.9	26.2	39.6			
CV1M1	175 5s TL	175	35	35	35	35	35			3925	13.1	45.9	63.0	1023	13.1	23.4	37.8			
CV1M1	180 5s TL	180	40	30	40	30	40			4517	14.9	51.3	64.8	860	11.6	20.7	36.0			
CV1M1	180 5s TL V2	180	30	40	40	40	30			3872	13.2	44.0	64.8	1527	14.8	30.6	43.2			
CV1M1	190 5s TL	190	40	40	30	40	40			5132	13.2	55.2	68.4	1196	14.8	26.2	39.6			
CV1M1	200 5s TL	200	40	40	40	40	40			5859	14.9	59.9	72.0	1527	14.9	30.6	43.2			

* See notes on pg. 9

FLEXURAL DESIGN CAPACITIES

Table 3.3.1 Unfactored Limit States Design (LSD) Bending Resistances for KLH® - CLT (for use in Canada) (continued)

CLT Grade	Layup #	Thickness (mm)	Lamination Thickness (mm) in CLT Layup							Major Strength Direction				Minor Strength Direction					
			=	⊥	=	⊥	=	⊥	=	$EI_{eff,0}$ (10^9 N-mm ² /m)	$GA_{eff,0}$ (10^6 N/m)	$M_{r,0}$ (kN-m/m)	$V_{r,0}$ (kN/m)	$EI_{eff,90}$ (10^9 N-mm ² /m)	$GA_{eff,90}$ (10^6 N/m)	$M_{r,90}$ (kN-m/m)	$V_{r,90}$ (kN/m)		
CV1M1	160 7s TL	160	20	30	20	20	20	30	20	2408	11.6	30.8	57.6	1400	14.9	28.1	43.2		
CV1M1	180 7s TL	180	20	40	20	20	20	40	20	3099	12.3	35.2	64.8	2331	19.0	40.1	50.4		
CV1M1	180 7s TL V2	180	30	20	30	20	30	20	30	4261	16.9	48.4	64.8	1137	11.9	22.8	43.2		
CV1M1	200 7s TL	200	20	40	20	40	20	40	20	4101	13.0	41.9	72.0	3358	23.6	50.5	57.6		
CV1M1	210 7s TL	210	30	30	30	30	30	30	30	6121	16.8	59.6	75.6	2472	16.8	39.6	54.0		
CV1M1	220 7s TL	220	30	40	30	20	30	40	30	6578	16.9	61.1	79.2	3308	18.6	49.7	57.6		
CV1M1	220 7s TL V2	220	40	20	40	20	40	20	40	8208	23.6	76.3	79.2	1636	13.0	28.1	50.4		
CV1M1	230 7s TL	230	30	40	30	30	30	40	30	7422	17.2	66.0	82.8	3882	20.4	54.9	61.2		
CV1M1	240 7s TL	240	30	40	30	40	30	40	30	8334	17.4	71.0	86.4	4517	22.3	60.4	64.8		
CV1M1	245 7s TL	245	35	35	35	35	35	35	35	9719	19.6	81.1	88.2	3925	19.6	54.0	63.0		
CV1M1	260 7s TL	260	40	40	30	40	30	40	40	11773	19.0	92.6	93.6	4517	22.3	60.4	64.8		
CV1M1	160 5ss TL	160	60	40	60					3698	11.3	47.3	57.6	58.7	7.9	3.5	14.4		
CV1M1	180 7ss TL	180	60	20	20					20	60	5162	15.7	58.6	64.8	191	8.7	7.7	21.6
CV1M1	200 7ss TL	200	60	20	40					20	60	6936	20.7	70.9	72.0	413	9.5	12.4	28.8
CV1M1	210 7ss TL	210	60	30	30					30	60	7867	16.9	76.6	75.6	644	11.9	17.2	32.4
CV1M1	220 7ss TL	220	80	20	20					20	80	9576	20.7	89.0	79.2	191	9.5	7.7	21.6
CV1M1	220 7ss TL V2	220	60	30	40					30	60	8931	19.0	83.0	79.2	860	12.3	20.7	36.0
CV1M1	230 7ss TL	230	80	20	30					20	80	10873	23.4	96.7	82.8	290	10.0	10.0	25.2
CV1M1	240 7ss TL	240	80	20	40					20	80	12275	26.3	104.6	86.4	413	10.4	12.4	28.8
CV1M1	250 7ss TL	250	80	30	30					30	80	13701	21.3	112.1	90.0	644	12.6	17.2	32.4
CV1M1	260 7ss TL	260	80	30	40					30	80	15282	23.6	120.2	93.6	860	13.0	20.7	36.0
CV1M1	280 7ss TL	280	80	40	40					40	80	18648	22.5	136.2	100.8	1527	15.9	30.6	43.2
CV1M1	300 8ss TL	300	80	30	80					30	80	22772	33.8	155.2	108.0	2062	14.7	35.4	50.4
CV1M1	320 8ss TL	320	80	40	80					40	80	26862	31.4	171.6	115.2	3301	17.4	49.6	57.6

Notes:

Tabulated values are unfactored Limit States Design Values (LSD) determined in accordance with CSA O86, and are based on the following standard conditions:

- 1 Dry service; and
- 2 Standard-term duration load.
- 3 The specified strength in rolling shear, f_s , is taken as approximately 1/3 of the specified strength in shear, f_v , for the corresponding species combination.
- 4 The transverse modulus of elasticity, E_{90} , is estimated as $E/30$.
- 5 The shear modulus, G_0 , is estimated as $E/16$.
- 6 The rolling shear modulus, G_{90} , is estimated as 50 MPa.
- 7 Values are not permitted to be increased for the lumber size adjustment factor in accordance to CSA O86.

IN PLANE SHEAR DESIGN CAPACITIES

04 LIMIT STATES DESIGN (LSD) CAPACITIES - FOR USE IN EDGEWISE APPLICATION (for use in Canada)

4.1 LIMIT STATES DESIGN VALUES FOR TT PANELS AND TL PANELS

Table 4.1.1 LSD Specified Edgewise (In-Plane) Shear Strengths for KLH® - CLT (for use in Canada)

CLT Grade	In Plane Shear		
	Layup (lams.)	$f_{v,0}$ min (MPa)	$f_{v,90}$ min (MPa)
CV1M1	3	3,5	3,5
	5, 7, 8		2,5

Notes:

- $f_{v,0}$ and $f_{v,90}$ are the in-plane shear stresses in the major and minor strength direction, respectively.
- Strength values shall be applied to the full CLT thickness.
- 3 lamination values based on test results from 100 3s TL panels.
- 5, 7, and 8 lamination values are based on test results from 160 5s TL panels.
- Strength values determined by multiplying characteristic strength obtained from testing by 0.96 as per ANSI/APA PRG 320 Cl. 8.5.6.2.

4.2 TT PANELS

Table 4.2.1 TT Panels Limit States Design (LSD) In-Plane Shear Capacities (for use in Canada)

CLT Grade	Layup	Panel Thickness (mm)	Lamination Thickness (mm) in CLT Layup								In Plane Shear			
											Beams/Lintels		Diaphragms/Shearwalls	
			=	⊥	=	⊥	=	⊥	=	⊥	$V_{v,E,0}$ (major) (kN/m)	$V_{v,E,90}$ (minor) (kN/m)	$V_{v,E,0}$ (major) (kN/m)	$V_{v,E,90}$ (minor) (kN/m)
CV1M1	60 3s TT	60	20	20	20						126	126	217	217
CV1M1	70 3s TT	70	20	30	20						147	147	254	254
CV1M1	80 3s TT	80	30	20	30						168	168	290	290
CV1M1	80 3s TT V2	80	20	40	20						168	168	290	290
CV1M1	90 3s TT	90	30	30	30						189	189	326	326
CV1M1	100 3s TT	100	30	40	30						210	210	362	362
CV1M1	100 3s TT V2	100	40	20	40						210	210	362	362
CV1M1	105 3s TT	105	35	35	35						221	221	380	380
CV1M1	110 3s TT	110	40	30	40						231	231	398	398
CV1M1	120 3s TT	120	40	40	40						252	252	435	435
CV1M1	100 5s TT	100	20	20	20	20	20				210	150	362	259
CV1M1	110 5s TT	110	20	20	30	20	20				231	165	398	285
CV1M1	120 5s TT	120	30	20	20	20	30				252	180	435	311
CV1M1	120 5s TT V2	120	20	30	20	30	20				252	180	435	311
CV1M1	130 5s TT	130	30	20	30	20	30				273	195	471	336
CV1M1	140 5s TT	140	30	20	40	20	30				294	210	507	362
CV1M1	140 5s TT V2	140	20	40	20	40	20				294	210	507	362
CV1M1	140 5s TT V3	140	40	20	20	20	40				294	210	507	362
CV1M1	150 5s TT	150	30	30	30	30	30				315	225	543	388
CV1M1	150 5s TT V2	150	40	20	30	20	40				315	225	543	388
CV1M1	160 5s TT	160	40	20	40	20	40				336	240	580	414
CV1M1	175 5s TT	175	35	35	35	35	35				368	263	634	453
CV1M1	180 5s TT	180	40	30	40	30	40				378	270	652	466
CV1M1	200 5s TT	200	40	40	40	40	40				420	300	725	518
CV1M1	180 7s TT	180	30	20	30	20	30	20	30		378	270	652	466

* See notes on pg. 12

IN PLANE SHEAR DESIGN CAPACITIES

4.3 TL PANELS

Table 4.3.1 TL Panels Limit States Design (LSD) In-Plane Shear Capacities (for use in Canada)

CLT Grade	Layup	Panel Thickness (mm)	Lamination Thickness (mm) in CLT Layup							In Plane Shear			
			=	⊥	=	⊥	=	⊥	=	Beams/Lintels		Diaphragms/Shearwalls	
										$V_{v,0}$ (major) (kN/m)	$V_{v,90}$ (minor) (kN/m)	$V_{v,0}$ (major) (kN/m)	$V_{v,90}$ (minor) (kN/m)
CV1M1	60 3s TL	60	20	20	20					126	126	217	217
CV1M1	70 3s TL	70	20	30	20					147	147	254	254
CV1M1	80 3s TL	80	30	20	30					168	168	290	290
CV1M1	80 3s TL V2	80	20	40	20					168	168	290	290
CV1M1	90 3s TL	90	30	30	30					189	189	326	326
CV1M1	100 3s TL	100	40	20	40					210	210	362	362
CV1M1	100 3s TL V2	100	30	40	30					210	210	362	362
CV1M1	105 3s TL	105	35	35	35					221	221	380	380
CV1M1	110 3s TL	110	40	30	40					231	231	398	398
CV1M1	120 3s TL	120	40	40	40					252	252	435	435
CV1M1	100 5s TL	100	20	20	20	20	20			210	150	362	259
CV1M1	110 5s TL	110	20	20	30	20	20			231	165	398	285
CV1M1	120 5s TL	120	30	20	20	20	30			252	180	435	311
CV1M1	120 5s TL V2	120	20	30	20	30	20			252	180	435	311
CV1M1	130 5s TL	130	30	20	30	20	30			273	195	471	336
CV1M1	130 5s TL V2	130	20	30	30	30	20			273	195	471	336
CV1M1	140 5s TL	140	40	20	20	20	40			294	210	507	362
CV1M1	140 5s TL V2	140	20	40	20	40	20			294	210	507	362
CV1M1	150 5s TL	150	40	20	30	20	40			315	225	543	388
CV1M1	150 5s TL V2	150	30	30	30	30	30			315	225	543	388
CV1M1	150 5s TL V3	150	20	40	30	40	20			315	225	543	388
CV1M1	160 5s TL	160	40	20	40	20	40			336	240	580	414
CV1M1	160 5s TL V2	160	20	40	40	40	20			336	240	580	414
CV1M1	170 5s TL	170	40	30	30	30	40			357	255	616	440
CV1M1	170 5s TL V2	170	30	40	30	40	30			357	255	616	440
CV1M1	175 5s TL	175	35	35	35	35	35			368	263	634	453
CV1M1	180 5s TL	180	40	30	40	30	40			378	270	652	466
CV1M1	180 5s TL V2	180	30	40	40	40	30			378	270	652	466
CV1M1	190 5s TL	190	40	40	30	40	40			399	285	688	492
CV1M1	200 5s TL	200	40	40	40	40	40			420	300	725	518
CV1M1	140 7s TL	140	20	20	20	20	20	20	20	294	210	507	362
CV1M1	160 7s TL	160	20	30	20	20	20	30	20	336	240	580	414
CV1M1	180 7s TL	180	20	40	20	20	20	40	20	378	270	652	466
CV1M1	180 7s TL V2	180	30	20	30	20	30	20	30	378	270	652	466

* See notes on pg. 12

IN PLANE SHEAR DESIGN CAPACITIES

Table 4.3.1 TL Panels Limit States Design (LSD) In-Plane Shear Capacities (for use in Canada) (continued)

										In Plane Shear					
CLT Grade	Layup	Panel Thickness (mm)	Lamination Thickness (mm) in CLT Layup							Beams/Lintels		Diaphragms/Shearwalls			
			=	⊥	=	⊥	=	⊥	=	V _{v,0} (major) (kN/m)	V _{v,90} (minor) (kN/m)	V _{v,0} (major) (kN/m)	V _{v,90} (minor) (kN/m)		
CV1M1	200 7s TL	200	20	40	20	40	20	40	20	420	300	725	518		
CV1M1	210 7s TL	210	30	30	30	30	30	30	30	441	315	761	543		
CV1M1	220 7s TL	220	30	40	30	20	30	40	30	462	330	797	569		
CV1M1	220 7s TL V2	220	40	20	40	20	40	20	40	462	330	797	569		
CV1M1	230 7s TL	230	30	40	30	30	30	40	30	483	345	833	595		
CV1M1	240 7s TL	240	30	40	30	40	30	40	30	504	360	869	621		
CV1M1	245 7s TL	245	35	35	35	35	35	35	35	515	368	888	634		
CV1M1	260 7s TL	260	40	40	30	40	30	40	40	546	390	942	673		
CV1M1	160 5ss TL	160	60	40	60					336	240	580	414		
CV1M1	180 7ss TL	180	60	20	20					20	60	378	270	652	466
CV1M1	200 7ss TL	200	60	20	40					20	60	420	300	725	518
CV1M1	210 7ss TL	210	60	30	30					30	60	441	315	761	543
CV1M1	220 7ss TL	220	80	20	20					20	80	462	330	797	569
CV1M1	220 7ss TL V2	220	60	30	40					30	60	462	330	797	569
CV1M1	230 7ss TL	230	80	20	30					20	80	483	345	833	595
CV1M1	240 7ss TL	240	80	20	40					20	80	504	360	869	621
CV1M1	250 7ss TL	250	80	30	30					30	80	525	375	906	647
CV1M1	260 7ss TL	260	80	30	40					30	80	546	390	942	673
CV1M1	280 7ss TL	280	80	40	40					40	80	588	420	1014	725
CV1M1	300 8ss TL	300	80	30	80					30	80	630	450	1087	776
CV1M1	320 8ss TL	320	80	40	80	40	80	672	480	1159	828				

Notes:

Tabulated values are based on the following standard conditions:

- 1 Dry service; and
- 2 In-plane shear capacities for lintels and beams are based on standard-term duration load ($K_D = 1.0$).
- 3 In-plane shear capacities for diaphragms and shearwalls are based on short-term duration load ($K_D = 1.15$).
- 4 In-plane shear strength values are based on testing and shall be applied to the full CLT thickness.
- 5 In-plane shear values for lintels and beams are based on parabolic shear stress over the depth.
- 6 In-plane shear values for shearwalls and diaphragms assume discrete chords are present and that shear demands are uniformly distributed.

PRE-ANALYSIS TABLES

05 SPAN TABLES - GENERAL NOTES FOR KLH® FLOOR AND ROOF PANELS

THE SPAN TABLES FOR FLOOR (CHAPTER 06 AND 07) AND ROOF (CHAPTER 08 AND 09) ELEMENTS MUST BE USED IN ACCORDANCE WITH THE FOLLOWING NOTES.

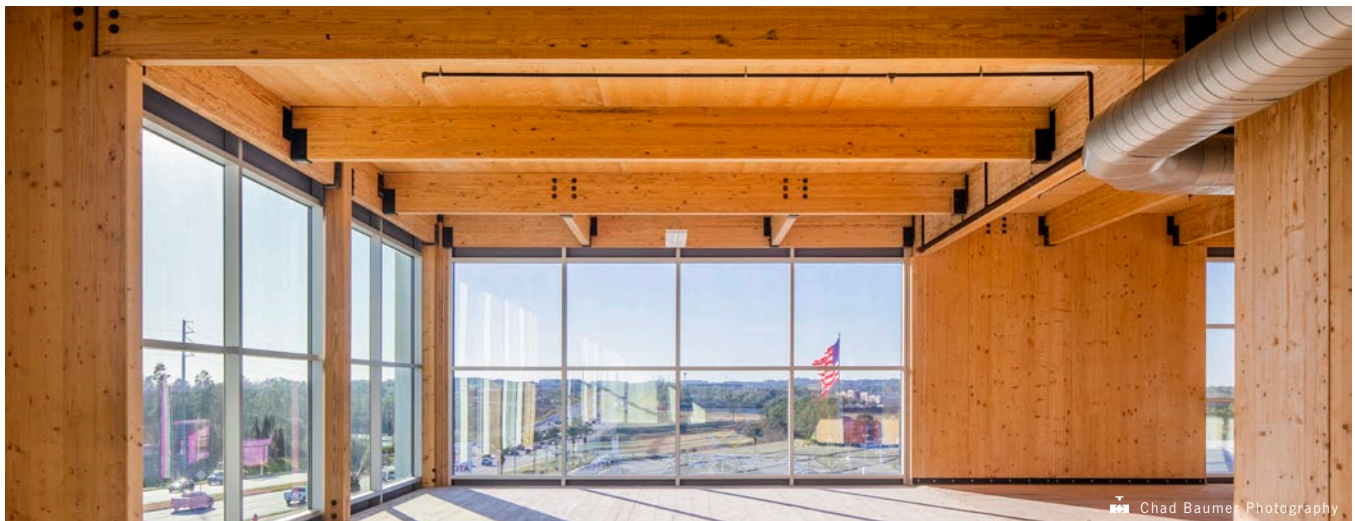
Notes:

- 1 The following modification factors were used for calculations: $K_H = K_S = K_T = 1.0$, K_D varies depending on governing load combination per CSA 086:24 Cl.5.3.2
- 2 Floor Span Tables include:
 - a. NO TOPPING: panel selfweight, 1.0 kPa Partition Load, plus 0.7 kPa for miscellaneous superimposed dead load allowance.
 - b. 38 mm GYPCRETE TOPPING: panel self-weight, 0.7 kPa for gypcrete topping (where indicated), 1.0 kPa Partition Load, plus 0.7 kPa for miscellaneous super imposed dead load allowance.
 - c. 50 mm CONCRETE TOPPING: panel self-weight, 1.2 kPa for concrete topping, 1.0 kPa Partition Load, plus 0.7 kPa for miscellaneous superimposed dead load allowance.
- 3 Roof Span Tables include:
 - a. ROOF LOADING: panel selfweight, plus 0.5 kPa for miscellaneous superimposed dead load allowance.
- 4 CLT is not an isotropic material. Presented values to be used for bending of panels in the major strength axis only.
- 5 Span tables are intended for preliminary design only – responsible engineer shall ensure that the panel meets all the requirements set forth in local Building Code for the project.
- 6 Tabulated deflection spans are based on the requirements of the IBC 2018 Table 1604.3. Engineer to ensure limits are appropriate. Ceiling finishes may require tighter deflection limits.

Construction	Live or Snow	Total
Roof panels		
Supporting plaster or stucco ceiling	L/360	L/240
Supporting nonplaster ceiling	L/240	L/180
Not supporting ceiling	L/180	L/120
Floor panels	L/360	L/180

- 7 Instantaneous elastic deflection due to long-term dead loads has been adjusted by a creep factor of 2.0 for dry service condition.
- 8 Spans are assumed to be equal for double span panels. Where two spans are not equal, use longer span for the design tables.
- 9 Panels assumed to be simply supported with pin support conditions spanning from center lines of support.
- 10 Non-structural flooring topping is assumed to provide an enhanced vibration effect on double spans. Values include a 20% increase. Single spans not enhanced by non-structural floor topping.
- 11 Floor panels: Pattern live loads not considered for deflection.
- 12 Roof panels: Pattern snow loads not considered for deflection.
- 13 Density of timber assumed to be 560 kg/m³
- 14 Maximum spans rounded down to nearest 5 mm.
- 15 Initial weight of panel prior to fire considered in fire governed spans.
- 16

	= Max span is governed by maximum panel length of 16.50 m
bold	= Governing span limit under normal conditions
-	= Governed by Strength
- 17 Total Load and Snow Load deflections include an Importance Factor, $I_s = 0.9$ on SLS loading per NBCC Table 4.1.6.2-A



Fifty West Building in Clearmont | Florida

PRE-ANALYSIS TABLES

06 KLH® FLOOR PANELS - SINGLE SPAN

6.1 FLOORS WITHOUT CONCRETE TOPPING (single span)

according to CSA O86:24

Total SDL = 1.7 kPa

Layup	Live Load																			
	1.9 kPa (Residential)				2.4 kPa (Office & Classroom)				3.6 kPa (Mechanical Room)				4.8 kPa (Assembly)				7.2 kPa (Library)			
			Deflection				Deflection				Deflection				Deflection				Deflection	
	Stren- gth	Vibra- tion	L/180 Total	L/360 Live	Stren- gth	Vibra- tion	L/180 Total	L/360 Live	Stren- gth	Vibra- tion	L/180 Total	L/360 Live	Stren- gth	Vibra- tion	L/180 Total	L/360 Live	Stren- gth	Vibra- tion	L/180 Total	L/360 Live
	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)
60 3s TL	3080	2450	2320	2715	2910	2450	2255	2505	2555	2450	2120	2170	2310	-	2015	1955	1975	-	1845	1685
70 3s TL	3490	2715	2645	3120	3305	2715	2570	2875	2910	2715	2420	2490	2625	-	2300	2245	2245	-	2110	1935
80 3s TL	4080	3060	3085	3655	3875	3060	3000	3370	3415	3060	2830	2925	3090	3060	2695	2640	2645	-	2475	2280
80 3s TL V2	3855	2960	2950	3505	3660	2960	2870	3225	3230	2960	2705	2795	2920	-	2570	2520	2500	-	2360	2170
90 3s TL	4500	3320	3415	4075	4290	3320	3325	3755	3790	3320	3135	3255	3430	3320	2980	2935	2935	-	2740	2530
100 3s TL	5025	3625	3830	4590	4810	3625	3730	4235	4250	3625	3525	3675	3850	3625	3360	3320	3305	-	3095	2870
100 3s TL V2	4885	3565	3730	4480	4680	3565	3630	4130	4135	3565	3430	3575	3745	3565	3260	3225	3210	-	3000	2780
105 3s TL	5180	3730	3945	4755	4965	3730	3845	4380	4390	3730	3630	3795	3980	3730	3455	3425	3415	-	3180	2955
110 3s TL	5445	3880	4155	5020	5235	3880	4050	4625	4630	3880	3830	4010	4195	3880	3645	3620	3600	-	3360	3125
120 3s TL	5840	4120	4470	5435	5635	4120	4355	5010	4990	4120	4120	4340	4525	4120	3925	3915	3890	-	3620	3375
100 5s TL	4510	3405	3565	4275	4320	3405	3475	3940	3815	3405	3280	3420	3455	3405	3125	3090	2965	-	2880	2675
110 5s TL	4830	3620	3865	4655	4640	3620	3765	4295	4105	3620	3565	3730	3720	3620	3395	3375	3195	-	3135	2920
120 5s TL	5595	4020	4375	5305	5395	4020	4265	4890	4775	4020	4035	4245	4330	4020	3850	3835	3720	-	3550	3320
120 5s TL V2	5040	3785	4070	4940	4865	3785	3970	4555	4305	3785	3755	3955	3905	3785	3580	3570	3355	-	3305	3085
130 5s TL	5930	4235	4685	5710	5735	4235	4570	5265	5085	4235	4330	4575	4615	4235	4130	4135	3970	-	3820	3580
130 5s TL V2	5310	3975	4345	5295	5135	3975	4235	4885	4555	3975	4015	4240	4135	3975	3830	3835	3555	-	3535	3315
140 5s TL	6570	4575	5130	6290	6360	4575	5005	5800	5660	4575	4745	5035	5140	4575	4530	4550	4425	-	4185	3940
140 5s TL V2	5505	4130	4540	-	5325	4130	4430	5140	4740	4130	4200	4460	4305	4130	4005	4025	3705	-	3700	3480
150 5s TL	6915	4790	5445	6710	6700	4790	5315	6190	5985	4790	5045	5380	5440	4790	4820	4860	4685	-	4460	4210
150 5s TL V2	6480	4615	5195	6410	6280	4615	5075	5910	5605	4615	4815	5135	5095	4615	4595	4640	4390	-	4250	4010
150 5s TL V3	5740	4300	4790	-	5560	4300	4675	5450	4965	4300	4435	4730	4515	4300	4235	4275	3890	-	-	3695
160 5s TL	7255	5005	5755	7125	7030	5005	5620	6575	6305	5005	5340	5715	5735	5005	5105	5170	4945	-	4730	4485
160 5s TL V2	5980	4475	5040	-	5795	4475	4920	5765	5195	4475	4675	5005	4725	4475	4465	4525	4075	-	-	3915
170 5s TL	7505	5180	5975	7450	7280	5180	5835	6870	6550	5180	5545	5965	5960	5180	5300	5390	5145	-	4910	4665
170 5s TL V2	6970	4965	5680	-	6765	4965	5545	6535	6080	4965	5270	5670	5535	4965	5035	5120	4775	-	4665	4425
175 5s TL	7410	5180	5980	-	7190	5180	5845	6900	6480	5180	5555	5990	5900	5180	5310	5410	5090	-	4920	4680
180 5s TL	7810	5380	6265	-	7580	5380	6125	7240	6840	5380	5820	6290	6230	5380	5570	5685	5380	5380	5165	4920
180 5s TL V2	7230	5145	5940	-	7015	5145	5805	6870	6330	5145	5520	5965	5765	5145	5280	5390	4980	-	4895	4665
190 5s TL	8035	5545	6475	-	7805	5545	6330	7530	7065	5545	6020	6535	6440	5545	5760	5900	5565	5545	5340	5100
200 5s TL	8305	5725	6750	-	8070	5725	6600	7885	7335	5725	6280	6845	6685	5725	6010	6185	5785	5725	5580	5350

* See notes on pg. 13

PRE-ANALYSIS TABLES

6.1 FLOORS WITHOUT CONCRETE TOPPING (single span, continued)

Total SDL = 1.7 kPa

Layup	Live Load																			
	1.9 kPa (Residential)				2.4 kPa (Office & Classroom)				3.6 kPa (Mechanical Room)				4.8 kPa (Assembly)				7.2 kPa (Library)			
	Stren- gth	Vibra- tion	Deflection		Stren- gth	Vibra- tion	Deflection		Stren- gth	Vibra- tion	Deflection		Stren- gth	Vibra- tion	Deflection		Stren- gth	Vibra- tion	Deflection	
			L/180 Total	L/360 Live			L/180 Total	L/360 Live			L/180 Total	L/360 Live			L/180 Total	L/360 Live			L/180 Total	L/360 Live
			(mm)	(mm)			(mm)	(mm)			(mm)	(mm)			(mm)	(mm)			(mm)	(mm)
140 7s TL	5795	4255	4725	5790	5610	4255	4610	5345	4990	4255	4375	4640	4535	4255	4175	4195	3900	-	3860	3635
160 7s TL	6145	4545	5130	-	5955	4545	5010	5865	5335	4545	4755	5095	4855	4545	4545	4605	4185	-	-	3985
180 7s TL	6465	4820	5515	-	6275	4820	5390	-	5665	4820	5125	5540	5160	4820	4900	5005	4455	-	-	4330
180 7s TL V2	7585	5290	6165	-	7360	5290	6025	7120	6640	5290	5730	6190	6050	5290	5485	5600	5225	-	5090	4855
200 7s TL	6950	5165	5990	-	6755	5165	5855	-	6135	5165	5575	6075	5595	5165	5335	5490	4840	-	-	4745
210 7s TL	8220	5765	6830	-	7995	5765	6680	-	7285	5765	6365	6965	6650	5765	6095	6295	5755	-	5665	5450
220 7s TL	8265	5855	6960	-	8040	5855	6810	-	7355	5855	6490	7130	6715	5855	6220	6445	5815	-	5785	5580
220 7s TL V2	9230	6245	7535	-	8985	6245	7375	8875	8215	6245	7030	7720	7500	6245	6745	6985	6495	6245	6280	6060
230 7s TL	8520	6030	7205	-	8295	6030	7050	-	7610	6030	6725	7420	6955	6030	6445	6705	6025	-	6000	5805
240 7s TL	8775	6205	7445	-	8550	6205	7290	-	7865	6205	6955	7705	7190	6205	6670	6965	6235	6205	6210	6025
245 7s TL	9345	6475	7830	-	9105	6475	7670	-	8390	6475	7320	8125	7675	6475	7025	7345	6660	6475	6545	6360
260 7s TL	9875	6795	8270	-	9635	6795	8100	-	8915	6795	7735	8640	8160	6795	7425	7805	7090	6795	6920	6755
160 5ss TL	7615	5145	5890	7315	7380	5145	5750	6745	6615	5145	5460	5850	6015	5145	5215	5280	5190	5145	4825	4565
180 7ss TL	8345	5590	6550	8210	8100	5590	6405	7570	7310	5590	6090	6575	6660	5590	5825	5945	5750	5590	5400	5150
200 7ss TL	9035	6015	7185	-	8785	6015	7025	8380	7980	6015	6690	7285	7275	6015	6410	6590	6295	6015	5960	5715
210 7ss TL	9320	6200	7410	-	9065	6200	7250	8705	8260	6200	6905	7555	7540	6200	6615	6830	6525	6200	6145	5910
220 7ss TL	9970	6530	7900	-	9705	6530	7730	9315	8870	6530	7370	8095	8100	6530	7065	7320	7015	6530	6575	6345
220 7ss TL V2	9630	6400	7710	-	9370	6400	7540	9090	8570	6400	7190	7900	7825	6400	6890	7140	6775	6400	6410	6185
230 7ss TL	10315	6740	8215	-	10045	6740	8045	9730	9210	6740	7675	8460	8415	6740	7360	7655	7295	6740	6855	6635
240 7ss TL	10650	6945	8530	-	10375	6945	8350	10145	9545	6945	7975	8820	8725	6945	7650	7985	7570	6945	7130	6925
250 7ss TL	10940	7135	8755	-	10670	7135	8570	10480	9845	7135	8185	9105	9005	7135	7855	8225	7820	7135	7315	7120
260 7ss TL	11250	7330	9050	-	10975	7330	8865	10880	10155	7330	8470	9455	9295	7330	8130	8550	8080	7330	7585	7405
280 7ss TL	11805	7695	9555	-	11530	7695	9360	-	10730	7695	8950	10075	9835	7695	8600	9105	8560	7695	8025	7880
300 8ss TL	12430	8085	10205	-	12155	8085	10005	-	11375	8085	9585	10850	10435	8085	9220	9820	9095	8085	8625	8520
320 8ss TL	12890	8420	10655	-	12620	8420	10455	-	11875	8420	10020	11435	10910	8420	9645	10345	9520	8420	9030	8970

* See notes on pg. 13

PRE-ANALYSIS TABLES

6.2 FLOORS WITH 38 MM GYPSUM TOPPING (single span)

according to CSA O86:24

Total SDL = 2.4 kPa

Layup	Live Load																			
	1.9 kPa (Residential)				2.4 kPa (Office & Classroom)				3.6 kPa (Mechanical Room)				4.8 kPa (Assembly)				7.2 kPa (Library)			
			Deflection				Deflection				Deflection				Deflection				Deflection	
	Stren- gth	Vibra- tion	L/180 Total	L/360 Live	Stren- gth	Vibra- tion	L/180 Total	L/360 Live	Stren- gth	Vibra- tion	L/180 Total	L/360 Live	Stren- gth	Vibra- tion	L/180 Total	L/360 Live	Stren- gth	Vibra- tion	L/180 Total	L/360 Live
	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)
60 3s TL	2765	2450	2150	2715	2680	2450	2100	2505	2425	-	1995	2170	2210	-	1910	1955	1910	-	1770	1685
70 3s TL	3130	2715	2455	3120	3040	2715	2400	2875	2760	2715	2280	2490	2515	-	2180	2245	2175	-	2020	1930
80 3s TL	3670	3060	2870	3655	3565	3060	2805	3370	3245	3060	2670	2925	2960	-	2560	2640	2565	-	2375	2280
80 3s TL V2	3465	2960	2745	-	3370	2960	2680	3230	3065	2960	2550	2795	2800	-	2440	2520	2420	-	2260	2170
90 3s TL	4050	3320	3180	-	3940	3320	3110	3755	3600	3320	2960	3255	3285	-	2835	2935	2845	-	2630	2530
100 3s TL	4535	3625	3575	-	4410	3625	3495	4235	4040	3625	3335	3675	3690	3625	3195	3320	3200	-	2970	2870
100 3s TL V2	4410	3565	3475	-	4290	3565	3400	4130	3930	3565	3235	3575	3590	3565	3100	3225	3115	-	2875	2780
105 3s TL	4675	3730	3680	-	4550	3730	3600	4385	4175	3730	3430	3800	3815	3730	3285	3425	3310	-	3055	2955
110 3s TL	4920	3880	3880	-	4790	3880	3795	4625	4405	3880	3620	4010	4025	3880	3470	3620	3495	-	3225	3125
120 3s TL	5285	4120	4175	-	5150	4120	4085	5010	4745	4120	3895	4340	4340	4120	3735	3915	3770	-	3475	3375
100 5s TL	4065	3405	3325	-	3960	3405	3255	3940	3625	3405	3100	3420	3315	-	2975	3090	2875	-	2765	2675
110 5s TL	4360	3620	3610	-	4245	3620	3535	-	3905	3620	3370	3730	3570	-	3235	3375	3095	-	3010	2920
120 5s TL	5060	4020	4090	-	4930	4020	4000	4895	4545	4020	3820	4245	4155	4020	3665	3840	3610	-	3415	3320
120 5s TL V2	4560	3785	3805	-	4445	3785	3725	-	4095	3785	3555	3955	3745	-	3410	3570	3255	-	3175	3085
130 5s TL	5370	4235	4385	-	5235	4235	4295	-	4840	4235	4100	4575	4430	4235	3940	4135	3850	-	3670	3580
130 5s TL V2	4810	3975	4065	-	4690	3975	3980	-	4335	3975	3800	4240	3970	-	3650	3835	3450	-	3400	3315
140 5s TL	5955	4575	4805	-	5810	4575	4705	5805	5390	4575	4495	5040	4935	4575	4315	4555	4290	-	4025	3940
140 5s TL V2	4990	4130	4250	-	4870	4130	4165	-	4515	4130	3975	4460	4135	4130	3815	4025	3595	-	3555	3480
150 5s TL	6280	4790	5105	-	6130	4790	5005	-	5700	4790	4785	5380	5220	4790	4600	4865	4545	-	4290	4210
150 5s TL V2	5885	4615	4870	-	5745	4615	4775	-	5340	4615	4565	5135	4895	4615	4385	4640	4260	-	4090	4010
150 5s TL V3	5210	4300	4490	-	5085	4300	4400	-	4730	4300	4205	-	4335	4300	4040	4275	3770	-	3765	3695
160 5s TL	6595	5005	5405	-	6440	5005	5295	-	6005	5005	5070	5720	5505	5005	4875	5170	4795	-	4555	4485
160 5s TL V2	5435	4475	4730	-	5310	4475	4635	-	4950	4475	4435	-	4535	4475	4260	4525	3950	-	-	3915
170 5s TL	6830	5180	5610	-	6675	5180	5500	-	6240	5180	5265	5970	5725	5180	5060	5390	4990	-	4725	4665
170 5s TL V2	6345	4965	5330	-	6200	4965	5225	-	5795	4965	5000	5670	5320	4965	4805	5120	4635	-	4485	4425
175 5s TL	6745	5180	5620	-	6595	5180	5510	-	6175	5180	5275	5990	5665	5180	5070	5410	4940	-	4735	4680
180 5s TL	7110	5380	5890	-	6955	5380	5775	-	6520	5380	5530	6290	5985	5380	5320	5685	5220	-	4975	4920
180 5s TL V2	6585	5145	5585	-	6440	5145	5475	-	6035	5145	5240	5965	5540	5145	5040	5390	4835	-	4710	4665
190 5s TL	7325	5545	6090	-	7170	5545	5970	-	6740	5545	5720	6535	6190	5545	5500	5905	5405	-	5140	5100
200 5s TL	7580	5725	6350	-	7420	5725	6230	-	6995	5725	5970	6845	6430	5725	5745	6185	5615	-	5375	5350

* See notes on pg. 13

PRE-ANALYSIS TABLES

6.2 FLOORS WITH 38 MM GYPSUM TOPPING (single span, continued)

Total SDL = kPa

Layup	Live Load																			
	1.9 kPa (Residential)				2.4 kPa (Office & Classroom)				3.6 kPa (Mechanical Room)				4.8 kPa (Assembly)				7.2 kPa (Library)			
	Stren- gth	Vibra- tion	Deflection		Stren- gth	Vibra- tion	Deflection		Stren- gth	Vibra- tion	Deflection		Stren- gth	Vibra- tion	Deflection		Stren- gth	Vibra- tion	Deflection	
			L/180 Total	L/360 Live			L/180 Total	L/360 Live			L/180 Total	L/360 Live			L/180 Total	L/360 Live			L/180 Total	L/360 Live
			(mm)	(mm)			(mm)	(mm)			(mm)	(mm)			(mm)	(mm)			(mm)	(mm)
140 7s TL	5255	4255	4425	-	5125	4255	4335	-	4750	4255	4145	4640	4350	4255	3980	4195	3785	-	3715	3635
160 7s TL	5585	4545	4815	-	5455	4545	4715	-	5085	4545	4510	-	4660	4545	4335	4605	4060	-	4050	3985
180 7s TL	5890	4820	5185	-	5760	4820	5085	-	5400	4820	4865	-	4955	4820	4680	-	4325	-	-	-
180 7s TL V2	6905	5290	5800	-	6755	5290	5685	-	6335	5290	5445	6190	5815	5290	5240	5600	5070	-	4905	4855
200 7s TL	6340	5165	5635	-	6210	5165	5530	-	5850	5165	5300	-	5380	5165	5100	-	4700	-	-	-
210 7s TL	7510	5765	6435	-	7360	5765	6315	-	6955	5765	6055	-	6395	5765	5830	6295	5590	-	5460	5450
220 7s TL	7555	5855	6565	-	7405	5855	6440	-	7015	5855	6180	-	6455	5855	5950	6445	5650	-	5575	5580
220 7s TL V2	8440	6245	7110	-	8275	6245	6980	-	7840	6245	6700	7720	7210	6245	6455	6985	6310	6245	6055	6060
230 7s TL	7800	6030	6800	-	7650	6030	6675	-	7250	6030	6405	-	6690	6030	6170	-	5855	-	5785	5805
240 7s TL	8035	6205	7030	-	7885	6205	6905	-	7485	6205	6625	-	6915	6205	6385	-	6060	-	5990	6025
245 7s TL	8565	6475	7400	-	8405	6475	7265	-	7980	6475	6980	-	7385	6475	6730	7345	6470	-	6310	6360
260 7s TL	9060	6795	7820	-	8900	6795	7680	-	8465	6795	7375	-	7855	6795	7115	7810	6890	6795	6675	6755
160 5ss TL	6920	5145	5525	-	6760	5145	5415	6745	6305	5145	5175	5850	5780	5145	4970	5285	5035	-	4640	4565
180 7ss TL	7600	5590	6160	-	7435	5590	6040	-	6970	5590	5785	6580	6400	5590	5565	5945	5580	-	5200	5150
200 7ss TL	8245	6015	6770	-	8075	6015	6640	-	7610	6015	6365	7290	6995	6015	6130	6595	6110	6015	5745	5715
210 7ss TL	8515	6200	6985	-	8340	6200	6850	-	7885	6200	6570	7560	7250	6200	6325	6830	6335	6200	5920	5910
220 7ss TL	9115	6530	7455	-	8935	6530	7315	-	8465	6530	7020	8095	7790	6530	6760	7320	6815	6530	6340	6345
220 7ss TL V2	8805	6400	7270	-	8630	6400	7135	-	8175	6400	6845	7900	7525	6400	6595	7140	6580	6400	6180	6185
230 7ss TL	9440	6740	7760	-	9260	6740	7615	-	8780	6740	7315	8460	8095	6740	7050	7655	7085	6740	6615	6635
240 7ss TL	9755	6945	8060	-	9575	6945	7915	-	9085	6945	7600	8825	8395	6945	7330	7985	7355	6945	6885	6925
250 7ss TL	10035	7135	8275	-	9850	7135	8125	-	9355	7135	7800	9105	8665	7135	7525	8230	7595	7135	7060	7120
260 7ss TL	10325	7330	8560	-	10140	7330	8410	-	9640	7330	8080	9455	8950	7330	7795	8550	7850	7330	7320	7405
280 7ss TL	10855	7695	9045	-	10670	7695	8890	-	10165	7695	8545	10080	9470	7695	8245	9110	8320	7695	7750	7880
300 8ss TL	11445	8085	9680	-	11265	8085	9520	-	10745	8085	9165	-	10055	8085	8855	9820	8845	8085	8340	8520
320 8ss TL	11890	8420	10120	-	11715	8420	9950	-	11195	8420	9585	-	10520	8420	9270	10345	9260	8420	8730	8970

* See notes on pg. 13

PRE-ANALYSIS TABLES

6.3 FLOORS WITH 50 MM CONCRETE TOPPING (single span)

according to CSA O86:24

Total SDL = 2.9 kPa

Layup	Live Load																			
	1.9 kPa (Residential)				2.4 kPa (Office & Classroom)				3.6 kPa (Mechanical Room)				4.8 kPa (Assembly)				7.2 kPa (Library)			
			Deflection				Deflection				Deflection				Deflection				Deflection	
	Stren- gth	Vibra- tion	L/180 Total	L/360 Live	Stren- gth	Vibra- tion	L/180 Total	L/360 Live	Stren- gth	Vibra- tion	L/180 Total	L/360 Live	Stren- gth	Vibra- tion	L/180 Total	L/360 Live	Stren- gth	Vibra- tion	L/180 Total	L/360 Live
	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)
60 3s TL	2580	2450	2055	-	2520	2450	2015	2505	2345	-	1925	2170	2150	-	1845	1955	1870	-	1720	1685
70 3s TL	2930	2715	2345	-	2860	2715	2300	-	2670	-	2195	2490	2445	-	2110	2245	2130	-	1965	1930
80 3s TL	3430	3060	2750	-	3355	3060	2695	-	3140	3060	2575	2925	2880	-	2475	2640	2510	-	2310	2280
80 3s TL V2	3240	2960	2625	-	3170	2960	2570	-	2965	2960	2455	2795	2720	-	2360	2520	2370	-	2200	2170
90 3s TL	3795	3320	3045	-	3710	3320	2985	-	3480	3320	2855	3255	3195	-	2740	2935	2785	-	2560	2530
100 3s TL	4250	3625	3425	-	4155	3625	3360	-	3910	3625	3215	3675	3590	-	3095	3320	3135	-	2895	2870
100 3s TL V2	4130	3565	3330	-	4040	3565	3260	-	3805	3565	3120	3575	3490	-	3000	3225	3045	-	2800	2780
105 3s TL	4380	3730	3525	-	4290	3730	3460	-	4040	3730	3310	3800	3710	-	3185	3425	3240	-	2975	2955
110 3s TL	4615	3880	3720	-	4520	3880	3645	-	4260	3880	3490	4010	3915	3880	3360	3620	3420	-	3140	3125
120 3s TL	4960	4120	4005	-	4860	4120	3925	-	4595	4120	3760	4340	4225	4120	3620	3915	3690	-	3385	3375
100 5s TL	3810	3405	3190	-	3730	3405	3125	-	3510	3405	2995	3420	3220	-	2880	3090	2810	-	2695	2675
110 5s TL	4090	3620	3465	-	4005	3620	3400	-	3775	3620	3255	3730	3470	-	3135	3375	3030	-	2935	2920
120 5s TL	4745	4020	3925	-	4650	4020	3850	-	4400	4020	3690	4245	4045	4020	3555	3840	3535	-	3325	3320
120 5s TL V2	4280	3785	3650	-	4190	3785	3580	-	3965	3785	3435	3955	3645	-	3305	3570	3185	-	3090	3085
130 5s TL	5040	4235	4210	-	4945	4235	4130	-	4685	4235	3965	4575	4310	4235	3820	4135	3770	-	3580	3580
130 5s TL V2	4515	3975	3900	-	4430	3975	3830	-	4195	3975	3675	-	3860	-	3540	3835	3375	-	3315	3315
140 5s TL	5595	4575	4615	-	5490	4575	4530	-	5210	4575	4345	5040	4805	4575	4190	4555	4205	-	3925	3940
140 5s TL V2	4690	4130	4080	-	4600	4130	4005	-	4365	4130	3840	-	4025	-	3700	-	3520	-	3465	3480
150 5s TL	5900	4790	4910	-	5795	4790	4820	-	5500	4790	4630	5380	5085	4790	4460	4865	4450	-	4185	4210
150 5s TL V2	5530	4615	4680	-	5430	4615	4595	-	5155	4615	4410	5135	4765	4615	4250	4640	4170	-	3985	4010
150 5s TL V3	4900	4300	4315	-	4805	4300	4235	-	4565	4300	4065	-	4220	-	3920	-	3695	-	3675	-
160 5s TL	6205	5005	5200	-	6090	5005	5105	-	5785	5005	4905	5720	5360	5005	4730	5170	4700	-	4445	4485
160 5s TL V2	5110	4475	4550	-	5020	4475	4465	-	4770	4475	4290	-	4420	-	4135	-	3870	-	-	-
170 5s TL	6430	5180	5400	-	6315	5180	5300	-	6005	5180	5095	5970	5575	5180	4910	5390	4890	-	4610	4665
170 5s TL V2	5970	4965	5130	-	5865	4965	5035	-	5580	4965	4835	-	5180	4965	4665	5120	4540	-	4375	4425
175 5s TL	6350	5180	5405	-	6240	5180	5310	-	5940	5180	5105	-	5520	5180	4920	5410	4840	-	4620	4680
180 5s TL	6700	5380	5670	-	6585	5380	5570	-	6265	5380	5355	-	5830	5380	5165	5685	5115	-	4855	4920
180 5s TL V2	6200	5145	5375	-	6095	5145	5280	-	5800	5145	5075	-	5395	5145	4895	5390	4735	-	4595	4665
190 5s TL	6905	5545	5860	-	6790	5545	5760	-	6470	5545	5535	-	6030	5545	5340	5905	5295	-	5015	5100
200 5s TL	7150	5725	6120	-	7030	5725	6010	-	6705	5725	5780	-	6265	5725	5580	6185	5500	-	5245	5350

* See notes on pg. 13

PRE-ANALYSIS TABLES

6.3 FLOORS WITH 50 MM CONCRETE TOPPING (single span, continued)

Total SDL = kPa

Layup	Live Load																			
	1.9 kPa (Residential)				2.4 kPa (Office & Classroom)				3.6 kPa (Mechanical Room)				4.8 kPa (Assembly)				7.2 kPa (Library)			
	Stren- gth	Vibra- tion	Deflection		Stren- gth	Vibra- tion	Deflection		Stren- gth	Vibra- tion	Deflection		Stren- gth	Vibra- tion	Deflection		Stren- gth	Vibra- tion	Deflection	
			L/180 Total	L/360 Live			L/180 Total	L/360 Live			L/180 Total	L/360 Live			L/180 Total	L/360 Live			L/180 Total	L/360 Live
			(mm)	(mm)			(mm)	(mm)			(mm)	(mm)			(mm)	(mm)			(mm)	(mm)
140 7s TL	4935	4255	4255	-	4840	4255	4175	-	4595	4255	4005	-	4235	-	3860	4195	3705	-	3620	3635
160 7s TL	5255	4545	4630	-	5160	4545	4545	-	4900	4545	4365	-	4540	-	4210	-	3980	-	3950	-
180 7s TL	5545	4820	4990	-	5455	4820	4900	-	5190	4820	4710	-	4830	4820	4545	-	4235	-	-	-
180 7s TL V2	6505	5290	5585	-	6395	5290	5485	-	6085	5290	5275	-	5660	5290	5090	5600	4970	-	4785	4855
200 7s TL	5980	5165	5430	-	5885	5165	5335	-	5610	5165	5130	-	5240	5165	4955	-	4605	-	-	-
210 7s TL	7085	5765	6205	-	6975	5765	6100	-	6655	5765	5870	-	6230	5765	5670	-	5475	-	5330	5450
220 7s TL	7135	5855	6325	-	7025	5855	6220	-	6710	5855	5990	-	6290	5855	5785	-	5535	-	5445	-
220 7s TL V2	7970	6245	6860	-	7850	6245	6745	-	7495	6245	6495	-	7030	6245	6280	6985	6185	-	5915	6060
230 7s TL	7365	6030	6555	-	7260	6030	6445	-	6935	6030	6210	-	6520	6030	6000	-	5740	-	5645	-
240 7s TL	7595	6205	6785	-	7490	6205	6670	-	7160	6205	6425	-	6745	6205	6210	-	5940	-	5850	-
245 7s TL	8095	6475	7140	-	7980	6475	7025	-	7635	6475	6770	-	7200	6475	6545	-	6340	-	6165	-
260 7s TL	8575	6795	7550	-	8460	6795	7425	-	8100	6795	7155	-	7660	6795	6920	-	6755	-	6520	-
160 5ss TL	6510	5145	5310	-	6390	5145	5215	-	6075	5145	5005	5850	5625	5145	4825	5285	4930	-	4520	4565
180 7ss TL	7160	5590	5930	-	7040	5590	5825	-	6700	5590	5600	6580	6230	5590	5405	5945	5470	-	5075	5150
200 7ss TL	7775	6015	6525	-	7650	6015	6410	-	7295	6015	6170	7290	6815	6015	5960	6595	5985	-	5610	5715
210 7ss TL	8035	6200	6730	-	7910	6200	6615	-	7545	6200	6365	-	7065	6200	6145	6830	6210	6200	5780	5910
220 7ss TL	8610	6530	7190	-	8475	6530	7065	-	8095	6530	6805	-	7590	6530	6575	7320	6680	6530	6190	6345
220 7ss TL V2	8315	6400	7010	-	8185	6400	6890	-	7815	6400	6635	-	7330	6400	6410	7140	6450	6400	6035	6185
230 7ss TL	8915	6740	7485	-	8785	6740	7360	-	8395	6740	7090	-	7890	6740	6855	7655	6945	6740	6460	6635
240 7ss TL	9220	6945	7780	-	9090	6945	7655	-	8690	6945	7375	-	8185	6945	7135	7985	7210	6945	6725	6925
250 7ss TL	9485	7135	7985	-	9355	7135	7855	-	8955	7135	7570	-	8450	7135	7320	8230	7445	7135	6895	7120
260 7ss TL	9770	7330	8270	-	9635	7330	8135	-	9230	7330	7840	-	8725	7330	7585	8550	7695	7330	7155	7405
280 7ss TL	10280	7695	8740	-	10150	7695	8600	-	9735	7695	8295	-	9240	7695	8025	9110	8155	7695	7570	7880
300 8ss TL	10850	8085	9365	-	10720	8085	9220	-	10300	8085	8905	-	9810	8085	8630	-	8670	8085	8155	8520
320 8ss TL	11280	8420	9795	-	11160	8420	9645	-	10740	8420	9320	-	10260	8420	9030	-	9080	8420	8540	8970

* See notes on pg. 13

PRE-ANALYSIS TABLES

07 KLH® FLOOR PANELS - DOUBLE SPAN

7.1 FLOORS WITHOUT CONCRETE TOPPING (double span)

according to CSA O86:24

Total SDL = 1.7 kPa

Layup	Live Load																			
	1.9 kPa (Residential)				2.4 kPa (Office & Classroom)				3.6 kPa (Mechanical Room)				4.8 kPa (Assembly)				7.2 kPa (Library)			
			Deflection				Deflection				Deflection				Deflection				Deflection	
	Stren- gth	Vibra- tion	L/180 Total	L/360 Live	Stren- gth	Vibra- tion	L/180 Total	L/360 Live	Stren- gth	Vibra- tion	L/180 Total	L/360 Live	Stren- gth	Vibra- tion	L/180 Total	L/360 Live	Stren- gth	Vibra- tion	L/180 Total	L/360 Live
	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)
60 3s TL	3080	2450	3065	-	2910	2450	-	-	2555	2450	-	-	2310	-	-	-	1975	-	-	-
70 3s TL	3490	2715	-	-	3305	2715	-	-	2910	2715	-	-	2625	-	-	-	2245	-	-	-
80 3s TL	4080	3060	-	-	3875	3060	-	-	3415	3060	-	-	3090	3060	-	-	2645	-	-	-
80 3s TL V2	3855	2960	-	-	3660	2960	-	-	3230	2960	-	-	2920	-	-	-	2500	-	-	-
90 3s TL	4500	3320	-	-	4290	3320	-	-	3790	3320	-	-	3430	3320	-	-	2935	-	-	-
100 3s TL	5025	3625	-	-	4810	3625	-	-	4250	3625	-	-	3850	3625	-	-	3305	-	-	-
100 3s TL V2	4885	3565	-	-	4680	3565	-	-	4135	3565	-	-	3745	3565	-	-	3210	-	-	-
105 3s TL	5180	3730	-	-	4965	3730	-	-	4390	3730	-	-	3980	3730	-	-	3415	-	-	-
110 3s TL	5445	3880	-	-	5235	3880	-	-	4630	3880	-	-	4195	3880	-	-	3600	-	-	-
120 3s TL	5840	4120	-	-	5635	4120	-	-	4990	4120	-	-	4525	4120	-	-	3890	-	-	-
100 5s TL	4510	3405	-	-	4320	3405	-	-	3815	3405	-	-	3455	3405	-	-	2965	-	-	-
110 5s TL	4830	3620	-	-	4640	3620	-	-	4105	3620	-	-	3720	3620	-	-	3195	-	-	-
120 5s TL	5595	4020	-	-	5395	4020	-	-	4775	4020	-	-	4330	4020	-	-	3720	-	-	-
120 5s TL V2	5040	3785	-	-	4865	3785	-	-	4305	3785	-	-	3905	3785	-	-	3355	-	-	-
130 5s TL	5930	4235	-	-	5735	4235	-	-	5085	4235	-	-	4615	4235	-	-	3970	-	-	-
130 5s TL V2	5310	3975	-	-	5135	3975	-	-	4555	3975	-	-	4135	3975	-	-	3555	-	-	-
140 5s TL	6570	4575	-	-	6360	4575	-	-	5660	4575	-	-	5140	4575	-	-	4425	-	-	-
140 5s TL V2	5505	4130	-	-	5325	4130	-	-	4740	4130	-	-	4305	4130	-	-	3705	-	-	-
150 5s TL	6915	4790	-	-	6700	4790	-	-	5985	4790	-	-	5440	4790	-	-	4685	-	-	-
150 5s TL V2	6480	4615	-	-	6280	4615	-	-	5605	4615	-	-	5095	4615	-	-	4390	-	-	-
150 5s TL V3	5740	4300	-	-	5560	4300	-	-	4965	4300	-	-	4515	4300	-	-	3890	-	-	-
160 5s TL	7255	5005	-	-	7030	5005	-	-	6305	5005	-	-	5735	5005	-	-	4945	-	-	-
160 5s TL V2	5980	4475	-	-	5795	4475	-	-	5195	4475	-	-	4725	4475	-	-	4075	-	-	-
170 5s TL	7505	5180	-	-	7280	5180	-	-	6550	5180	-	-	5960	5180	-	-	5145	-	-	-
170 5s TL V2	6970	4965	-	-	6765	4965	-	-	6080	4965	-	-	5535	4965	-	-	4775	-	-	-
175 5s TL	7410	5180	-	-	7190	5180	-	-	6480	5180	-	-	5900	5180	-	-	5090	-	-	-
180 5s TL	7810	5380	-	-	7580	5380	-	-	6840	5380	-	-	6230	5380	-	-	5380	5380	-	-
180 5s TL V2	7230	5145	-	-	7015	5145	-	-	6330	5145	-	-	5765	5145	-	-	4980	-	-	-
190 5s TL	8035	5545	-	-	7805	5545	-	-	7065	5545	-	-	6440	5545	-	-	5565	5545	-	-
200 5s TL	-	5725	-	-	8070	5725	-	-	7335	5725	-	-	6685	5725	-	-	5785	5725	-	-

* See notes on pg. 13

PRE-ANALYSIS TABLES

7.1 FLOORS WITHOUT CONCRETE TOPPING (double span, continued)

Total SDL = 1.7 kPa

Layup	Live Load																			
	1.9 kPa (Residential)				2.4 kPa (Office & Classroom)				3.6 kPa (Mechanical Room)				4.8 kPa (Assembly)				7.2 kPa (Library)			
	Stren- gth	Vibra- tion	Deflection		Stren- gth	Vibra- tion	Deflection		Stren- gth	Vibra- tion	Deflection		Stren- gth	Vibra- tion	Deflection		Stren- gth	Vibra- tion	Deflection	
			L/180 Total	L/360 Live			L/180 Total	L/360 Live			L/180 Total	L/360 Live			L/180 Total	L/360 Live				
			(mm)	(mm)			(mm)	(mm)			(mm)	(mm)			(mm)	(mm)			(mm)	(mm)
140 7s TL	5795	4255	-	-	5610	4255	-	-	4990	4255	-	-	4535	4255	-	-	3900	-	-	-
160 7s TL	6145	4545	-	-	5955	4545	-	-	5335	4545	-	-	4855	4545	-	-	4185	-	-	-
180 7s TL	6465	4820	-	-	6275	4820	-	-	5665	4820	-	-	5160	4820	-	-	4455	-	-	-
180 7s TL V2	7585	5290	-	-	7360	5290	-	-	6640	5290	-	-	6050	5290	-	-	5225	-	-	-
200 7s TL	6950	5165	-	-	6755	5165	-	-	6135	5165	-	-	5595	5165	-	-	4840	-	-	-
210 7s TL	8220	5765	-	-	7995	5765	-	-	7285	5765	-	-	6650	5765	-	-	5755	-	-	-
220 7s TL	-	5855	-	-	8040	5855	-	-	7355	5855	-	-	6715	5855	-	-	5815	-	-	-
220 7s TL V2	-	6245	-	-	-	6245	-	-	8215	6245	-	-	7500	6245	-	-	6495	6245	-	-
230 7s TL	-	6030	-	-	-	6030	-	-	7610	6030	-	-	6955	6030	-	-	6025	-	-	-
240 7s TL	-	6205	-	-	-	6205	-	-	7865	6205	-	-	7190	6205	-	-	6235	6205	-	-
245 7s TL	-	6475	-	-	-	6475	-	-	-	6475	-	-	7675	6475	-	-	6660	6475	-	-
260 7s TL	-	6795	-	-	-	6795	-	-	-	6795	-	-	8160	6795	-	-	7090	6795	-	-
160 5ss TL	7615	5145	-	-	7380	5145	-	-	6615	5145	-	-	6015	5145	-	-	5190	5145	-	-
180 7ss TL	-	5590	-	-	8100	5590	-	-	7310	5590	-	-	6660	5590	-	-	5750	5590	-	-
200 7ss TL	-	6015	-	-	-	6015	-	-	7980	6015	-	-	7275	6015	-	-	6295	6015	-	-
210 7ss TL	-	6200	-	-	-	6200	-	-	-	6200	-	-	7540	6200	-	-	6525	6200	-	-
220 7ss TL	-	6530	-	-	-	6530	-	-	-	6530	-	-	8100	6530	-	-	7015	6530	-	-
220 7ss TL V2	-	6400	-	-	-	6400	-	-	-	6400	-	-	7825	6400	-	-	6775	6400	-	-
230 7ss TL	-	6740	-	-	-	6740	-	-	-	6740	-	-	-	6740	-	-	7295	6740	-	-
240 7ss TL	-	6945	-	-	-	6945	-	-	-	6945	-	-	-	6945	-	-	7570	6945	-	-
250 7ss TL	-	7135	-	-	-	7135	-	-	-	7135	-	-	-	7135	-	-	7820	7135	-	-
260 7ss TL	-	7330	-	-	-	7330	-	-	-	7330	-	-	-	7330	-	-	8080	7330	-	-
280 7ss TL	-	7695	-	-	-	7695	-	-	-	7695	-	-	-	7695	-	-	-	7695	-	-
300 8ss TL	-	8085	-	-	-	8085	-	-	-	8085	-	-	-	8085	-	-	-	8085	-	-
320 8ss TL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

* See notes on pg. 13

PRE-ANALYSIS TABLES

7.2 FLOORS WITH 38 MM GYPSUM TOPPING (double span)

according to CSA O86:24

Total SDL = 2.4 kPa

Layup	Live Load																			
	1.9 kPa (Residential)				2.4 kPa (Office & Classroom)				3.6 kPa (Mechanical Room)				4.8 kPa (Assembly)				7.2 kPa (Library)			
	Stren- gth	Vibra- tion	Deflection		Stren- gth	Vibra- tion	Deflection		Stren- gth	Vibra- tion	Deflection		Stren- gth	Vibra- tion	Deflection		Stren- gth	Vibra- tion	Deflection	
			L/180 Total	L/360 Live			L/180 Total	L/360 Live			L/180 Total	L/360 Live			L/180 Total	L/360 Live				
	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)
60 3s TL	2765	-	-	-	2680	-	-	-	2425	-	-	-	2210	-	-	-	1910	-	-	-
70 3s TL	3130	-	-	-	3040	-	-	-	2760	-	-	-	2515	-	-	-	2175	-	-	-
80 3s TL	3670	-	-	-	3565	-	-	-	3245	-	-	-	2960	-	-	-	2565	-	-	-
80 3s TL V2	3465	-	-	-	3370	-	-	-	3065	-	-	-	2800	-	-	-	2420	-	-	-
90 3s TL	4050	3985	-	-	3940	-	-	-	3600	-	-	-	3285	-	-	-	2845	-	-	-
100 3s TL	4535	4350	-	-	4410	4350	-	-	4040	-	-	-	3690	-	-	-	3200	-	-	-
100 3s TL V2	4410	4280	-	-	4290	4280	-	-	3930	-	-	-	3590	-	-	-	3115	-	-	-
105 3s TL	4675	4475	-	-	4550	4475	-	-	4175	-	-	-	3815	-	-	-	3310	-	-	-
110 3s TL	4920	4655	-	-	4790	4655	-	-	4405	-	-	-	4025	-	-	-	3495	-	-	-
120 3s TL	5285	4945	-	-	5150	4945	-	-	4745	-	-	-	4340	-	-	-	3770	-	-	-
100 5s TL	4065	-	-	-	3960	-	-	-	3625	-	-	-	3315	-	-	-	2875	-	-	-
110 5s TL	4360	4340	-	-	4245	-	-	-	3905	-	-	-	3570	-	-	-	3095	-	-	-
120 5s TL	5060	4825	-	-	4930	4825	-	-	4545	-	-	-	4155	-	-	-	3610	-	-	-
120 5s TL V2	4560	4540	-	-	4445	-	-	-	4095	-	-	-	3745	-	-	-	3255	-	-	-
130 5s TL	5370	5085	-	-	5235	5085	-	-	4840	-	-	-	4430	-	-	-	3850	-	-	-
130 5s TL V2	4810	4770	-	-	4690	-	-	-	4335	-	-	-	3970	-	-	-	3450	-	-	-
140 5s TL	5955	5490	-	-	5810	5490	-	-	5390	-	-	-	4935	-	-	-	4290	-	-	-
140 5s TL V2	4990	4955	-	-	4870	-	-	-	4515	-	-	-	4135	-	-	-	3595	-	-	-
150 5s TL	6280	5750	-	-	6130	5750	-	-	5700	-	-	-	5220	-	-	-	4545	-	-	-
150 5s TL V2	5885	5540	-	-	5745	5540	-	-	5340	-	-	-	4895	-	-	-	4260	-	-	-
150 5s TL V3	5210	5160	-	-	5085	-	-	-	4730	-	-	-	4335	-	-	-	3770	-	-	-
160 5s TL	6595	6005	-	-	6440	6005	-	-	6005	-	-	-	5505	-	-	-	4795	-	-	-
160 5s TL V2	5435	5370	-	-	5310	-	-	-	4950	-	-	-	4535	-	-	-	3950	-	-	-
170 5s TL	6830	6220	-	-	6675	6220	-	-	6240	6220	-	-	5725	-	-	-	4990	-	-	-
170 5s TL V2	6345	5960	-	-	6200	5960	-	-	5795	-	-	-	5320	-	-	-	4635	-	-	-
175 5s TL	6745	6215	-	-	6595	6215	-	-	6175	-	-	-	5665	-	-	-	4940	-	-	-
180 5s TL	7110	6455	-	-	6955	6455	-	-	6520	6455	-	-	5985	-	-	-	5220	-	-	-
180 5s TL V2	6585	6170	-	-	6440	6170	-	-	6035	-	-	-	5540	-	-	-	4835	-	-	-
190 5s TL	7325	6655	-	-	7170	6655	-	-	6740	6655	-	-	6190	-	-	-	5405	-	-	-
200 5s TL	7580	6870	-	-	7420	6870	-	-	6995	6870	-	-	6430	-	-	-	5615	-	-	-

* See notes on pg. 13

PRE-ANALYSIS TABLES

7.2 FLOORS WITH 38 MM GYPSUM TOPPING (double span, continued)

Total SDL = kPa

Layup	Live Load																			
	1.9 kPa (Residential)				2.4 kPa (Office & Classroom)				3.6 kPa (Mechanical Room)				4.8 kPa (Assembly)				7.2 kPa (Library)			
	Stren- gth	Vibra- tion	Deflection		Stren- gth	Vibra- tion	Deflection		Stren- gth	Vibra- tion	Deflection		Stren- gth	Vibra- tion	Deflection		Stren- gth	Vibra- tion	Deflection	
			L/180 Total	L/360 Live			L/180 Total	L/360 Live			L/180 Total	L/360 Live			L/180 Total	L/360 Live			L/180 Total	L/360 Live
			(mm)	(mm)			(mm)	(mm)			(mm)	(mm)			(mm)	(mm)			(mm)	(mm)
140 7s TL	5255	5105	-	-	5125	5105	-	-	4750	-	-	-	4350	-	-	-	3785	-	-	-
160 7s TL	5585	5455	-	-	5455	5455	-	-	5085	-	-	-	4660	-	-	-	4060	-	-	-
180 7s TL	5890	5785	-	-	5760	-	-	-	5400	-	-	-	4955	-	-	-	4325	-	-	-
180 7s TL V2	6905	6345	-	-	6755	6345	-	-	6335	-	-	-	5815	-	-	-	5070	-	-	-
200 7s TL	6340	6195	-	-	6210	6195	-	-	5850	-	-	-	5380	-	-	-	4700	-	-	-
210 7s TL	7510	6920	-	-	7360	6920	-	-	6955	6920	-	-	6395	-	-	-	5590	-	-	-
220 7s TL	7555	7025	-	-	7405	7025	-	-	7015	-	-	-	6455	-	-	-	5650	-	-	-
220 7s TL V2		7490	-	-		7490	-	-	7840	7490	-	-	7210	-	-	-	6310	-	-	-
230 7s TL	7800	7240	-	-	7650	7240	-	-	7250	7240	-	-	6690	-	-	-	5855	-	-	-
240 7s TL	8035	7445	-	-	7885	7445	-	-	7485	7445	-	-	6915	-	-	-	6060	-	-	-
245 7s TL	-	7770	-	-	-	7770	-	-	7980	7770	-	-	7385	-	-	-	6470	-	-	-
260 7s TL	-	8155	-	-	-	8155	-	-		8155	-	-	7855	-	-	-	6890	-	-	-
160 5ss TL	6920	6175	-	-	6760	6175	-	-	6305	6175	-	-	5780	-	-	-	5035	-	-	-
180 7ss TL	7600	6710	-	-	7435	6710	-	-	6970	6710	-	-	6400	-	-	-	5580	-	-	-
200 7ss TL	8245	7215	-	-	8075	7215	-	-	7610	7215	-	-	6995	-	-	-	6110	-	-	-
210 7ss TL	-	7440	-	-	-	7440	-	-	7885	7440	-	-	7250	-	-	-	6335	-	-	-
220 7ss TL	-	7835	-	-	-	7835	-	-		7835	-	-	7790	-	-	-	6815	-	-	-
220 7ss TL V2	-	7680	-	-	-	7680	-	-	8175	7680	-	-	7525	-	-	-	6580	-	-	-
230 7ss TL	-	8085	-	-	-	8085	-	-	-	8085	-	-	8095	8085	-	-	7085	-	-	-
240 7ss TL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7355	-	-	-
250 7ss TL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7595	-	-	-
260 7ss TL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7850	-	-	-
280 7ss TL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
300 8ss TL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
320 8ss TL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

* See notes on pg. 13

PRE-ANALYSIS TABLES

7.3 FLOORS WITH 50 MM CONCRETE TOPPING (double span)

according to CSA O86:24

Total SDL = kPa

Layup	Live Load																			
	1.9 kPa (Residential)				2.4 kPa (Office & Classroom)				3.6 kPa (Mechanical Room)				4.8 kPa (Assembly)				7.2 kPa (Library)			
	Stren- gth	Vibra- tion	Deflection		Stren- gth	Vibra- tion	Deflection		Stren- gth	Vibra- tion	Deflection		Stren- gth	Vibra- tion	Deflection		Stren- gth	Vibra- tion	Deflection	
			L/180 Total	L/360 Live			L/180 Total	L/360 Live			L/180 Total	L/360 Live			L/180 Total	L/360 Live			L/180 Total	L/360 Live
	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)
60 3s TL	2580	-	-	-	2520	-	-	-	2345	-	-	-	2150	-	-	-	1870	-	-	-
70 3s TL	2930	-	-	-	2860	-	-	-	2670	-	-	-	2445	-	-	-	2130	-	-	-
80 3s TL	3430	-	-	-	3355	-	-	-	3140	-	-	-	2880	-	-	-	2510	-	-	-
80 3s TL V2	3240	-	-	-	3170	-	-	-	2965	-	-	-	2720	-	-	-	2370	-	-	-
90 3s TL	3795	-	-	-	3710	-	-	-	3480	-	-	-	3195	-	-	-	2785	-	-	-
100 3s TL	4250	-	-	-	4155	-	-	-	3910	-	-	-	3590	-	-	-	3135	-	-	-
100 3s TL V2	4130	-	-	-	4040	-	-	-	3805	-	-	-	3490	-	-	-	3045	-	-	-
105 3s TL	4380	-	-	-	4290	-	-	-	4040	-	-	-	3710	-	-	-	3240	-	-	-
110 3s TL	4615	-	-	-	4520	-	-	-	4260	-	-	-	3915	-	-	-	3420	-	-	-
120 3s TL	4960	4945	-	-	4860	-	-	-	4595	-	-	-	4225	-	-	-	3690	-	-	-
100 5s TL	3810	-	-	-	3730	-	-	-	3510	-	-	-	3220	-	-	-	2810	-	-	-
110 5s TL	4090	-	-	-	4005	-	-	-	3775	-	-	-	3470	-	-	-	3030	-	-	-
120 5s TL	4745	-	-	-	4650	-	-	-	4400	-	-	-	4045	-	-	-	3535	-	-	-
120 5s TL V2	4280	-	-	-	4190	-	-	-	3965	-	-	-	3645	-	-	-	3185	-	-	-
130 5s TL	5040	-	-	-	4945	-	-	-	4685	-	-	-	4310	-	-	-	3770	-	-	-
130 5s TL V2	4515	-	-	-	4430	-	-	-	4195	-	-	-	3860	-	-	-	3375	-	-	-
140 5s TL	5595	5490	-	-	5490	5490	-	-	5210	-	-	-	4805	-	-	-	4205	-	-	-
140 5s TL V2	4690	-	-	-	4600	-	-	-	4365	-	-	-	4025	-	-	-	3520	-	-	-
150 5s TL	5900	5750	-	-	5795	5750	-	-	5500	-	-	-	5085	-	-	-	4450	-	-	-
150 5s TL V2	5530	-	-	-	5430	-	-	-	5155	-	-	-	4765	-	-	-	4170	-	-	-
150 5s TL V3	4900	-	-	-	4805	-	-	-	4565	-	-	-	4220	-	-	-	3695	-	-	-
160 5s TL	6205	6005	-	-	6090	6005	-	-	5785	-	-	-	5360	-	-	-	4700	-	-	-
160 5s TL V2	5110	-	-	-	5020	-	-	-	4770	-	-	-	4420	-	-	-	3870	-	-	-
170 5s TL	6430	6220	-	-	6315	6220	-	-	6005	-	-	-	5575	-	-	-	4890	-	-	-
170 5s TL V2	5970	5960	-	-	5865	-	-	-	5580	-	-	-	5180	-	-	-	4540	-	-	-
175 5s TL	6350	6215	-	-	6240	6215	-	-	5940	-	-	-	5520	-	-	-	4840	-	-	-
180 5s TL	6700	6455	-	-	6585	6455	-	-	6265	-	-	-	5830	-	-	-	5115	-	-	-
180 5s TL V2	6200	6170	-	-	6095	-	-	-	5800	-	-	-	5395	-	-	-	4735	-	-	-
190 5s TL	6905	6655	-	-	6790	6655	-	-	6470	-	-	-	6030	-	-	-	5295	-	-	-
200 5s TL	7150	6870	-	-	7030	6870	-	-	6705	-	-	-	6265	-	-	-	5500	-	-	-

* See notes on pg. 13

PRE-ANALYSIS TABLES

7.3 FLOORS WITH 50 MM CONCRETE TOPPING (double span, continued)

Total SDL = kPa

Layup	Live Load																			
	1.9 kPa (Residential)				2.4 kPa (Office & Classroom)				3.6 kPa (Mechanical Room)				4.8 kPa (Assembly)				7.2 kPa (Library)			
	Stren- gth	Vibra- tion	Deflection		Stren- gth	Vibra- tion	Deflection		Stren- gth	Vibra- tion	Deflection		Stren- gth	Vibra- tion	Deflection		Stren- gth	Vibra- tion	Deflection	
			L/180 Total	L/360 Live			L/180 Total	L/360 Live			L/180 Total	L/360 Live			L/180 Total	L/360 Live			L/180 Total	L/360 Live
			(mm)	(mm)			(mm)	(mm)			(mm)	(mm)			(mm)	(mm)			(mm)	(mm)
140 7s TL	4935	-	-	-	4840	-	-	-	4595	-	-	-	4235	-	-	-	3705	-	-	-
160 7s TL	5255	-	-	-	5160	-	-	-	4900	-	-	-	4540	-	-	-	3980	-	-	-
180 7s TL	5545	-	-	-	5455	-	-	-	5190	-	-	-	4830	-	-	-	4235	-	-	-
180 7s TL V2	6505	6345	-	-	6395	6345	-	-	6085	-	-	-	5660	-	-	-	4970	-	-	-
200 7s TL	5980	-	-	-	5885	-	-	-	5610	-	-	-	5240	-	-	-	4605	-	-	-
210 7s TL	7085	6920	-	-	6975	6920	-	-	6655	-	-	-	6230	-	-	-	5475	-	-	-
220 7s TL	7135	7025	-	-	7025	-	-	-	6710	-	-	-	6290	-	-	-	5535	-	-	-
220 7s TL V2	7970	7490	-	-	7850	7490	-	-	7495	7490	-	-	7030	-	-	-	6185	-	-	-
230 7s TL	7365	7240	-	-	7260	7240	-	-	6935	-	-	-	6520	-	-	-	5740	-	-	-
240 7s TL	7595	7445	-	-	7490	7445	-	-	7160	-	-	-	6745	-	-	-	5940	-	-	-
245 7s TL	8095	7770	-	-	7980	7770	-	-	7635	-	-	-	7200	-	-	-	6340	-	-	-
260 7s TL		8155	-	-	-	8155	-	-	8100	-	-	-	7660	-	-	-	6755	-	-	-
160 5ss TL	6510	6175	-	-	6390	6175	-	-	6075	-	-	-	5625	-	-	-	4930	-	-	-
180 7ss TL	7160	6710	-	-	7040	6710	-	-	6700	-	-	-	6230	-	-	-	5470	-	-	-
200 7ss TL	7775	7215	-	-	7650	7215	-	-	7295	7215	-	-	6815	-	-	-	5985	-	-	-
210 7ss TL	8035	7440	-	-	7910	7440	-	-	7545	7440	-	-	7065	-	-	-	6210	-	-	-
220 7ss TL	-	7835	-	-	-	7835	-	-	8095	7835	-	-	7590	-	-	-	6680	-	-	-
220 7ss TL V2	-	7680	-	-	8185	7680	-	-	7815	7680	-	-	7330	-	-	-	6450	-	-	-
230 7ss TL	-	8085	-	-	-	8085	-	-	-	8085	-	-	7890	-	-	-	6945	-	-	-
240 7ss TL	-	-	-	-	-	-	-	-	-	-	-	-	8185	-	-	-	7210	-	-	-
250 7ss TL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7445	-	-	-
260 7ss TL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7695	-	-	-
280 7ss TL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8155	-	-	-
300 8ss TL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
320 8ss TL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

* See notes on pg. 13

PRE-ANALYSIS TABLES

08 KLH® ROOF PANELS - SINGLE SPAN

8.1 ROOFS WITH ROOF LOADING (single span)

according to CSA O86:24

Total SDL = 0.5 kPa

Layup #	Snow Load																				
	1.0 kPa Snow							1.5 kPa Snow							2.0 kPa Snow						
	Stren- gth (mm)	Total Deflection			Snow Load Deflection			Stren- gth (mm)	Total Deflection			Snow Load Deflection			Stren- gth (mm)	Total Deflection			Snow Load Deflection		
		L/240 Total (mm)	L/180 Total (mm)	L/120 Total (mm)	L/360 snow (mm)	L/240 snow (mm)	L/180 snow (mm)		L/240 Total (mm)	L/180 Total (mm)	L/120 Total (mm)	L/360 snow (mm)	L/240 snow (mm)	L/180 snow (mm)		L/240 Total (mm)	L/180 Total (mm)	L/120 Total (mm)	L/360 snow (mm)	L/240 snow (mm)	L/180 snow (mm)
60 3s TL	4525	2820	3115	3580	3515	4035	4450	3975	2665	2945	3385	3060	3515	3880	3585	2540	2805	3230	2770	3185	3515
70 3s TL	5100	3190	3525	4055	4040	4640	-	4495	3020	3340	3845	3510	4040	4455	4065	2880	3190	3670	3180	3660	4040
80 3s TL	5940	3690	4075	4680	4730	5425	-	5250	3500	3870	4445	4115	4730	5215	4755	3345	3700	4250	3725	4285	4730
80 3s TL V2	5610	3535	3905	4495	4540	5215	-	4960	3355	3710	4265	3945	4540	5215	4490	3205	3545	4080	3570	4110	-
90 3s TL	6530	4055	4480	5150	5275	6055	-	5785	3855	4260	4905	4590	5275	-	5250	3690	4080	4695	4155	4780	-
100 3s TL	7230	4510	4980	5725	5930	6805	-	6460	4300	4750	5455	5165	5930	-	5870	4120	4550	5230	4680	5375	-
100 3s TL V2	7030	4400	4865	5595	5800	6665	-	6280	4190	4635	5335	5045	5800	-	5705	4015	4440	5110	4565	5255	-
105 3s TL	7415	4640	5130	5900	6155	7065	-	6650	4425	4890	5625	5355	6155	-	6050	4240	4690	5395	4845	5575	-
110 3s TL	7765	4870	5380	6180	6490	7450	-	6995	4645	5135	5900	5645	6490	-	6365	4455	4925	5665	5115	5880	-
120 3s TL	8260	5210	5755	6620	7030	8075	-	7495	4975	5500	6330	6120	7030	-	6835	4775	5285	6080	5540	6370	-
100 5s TL	6485	4200	4635	5325	5520	6335	-	5795	4000	4420	5075	4805	5520	-	5265	3835	4235	4870	4355	5005	-
110 5s TL	6885	4515	4985	5725	6005	-	-	6200	4310	4760	5465	5230	6005	-	5645	4140	4570	5250	4740	5445	-
120 5s TL	7905	5085	5615	6450	6850	7860	-	7175	4860	5370	6170	5965	6850	-	6545	4670	5160	5930	5405	6210	-
120 5s TL V2	7125	4735	5235	6015	6385	-	-	6470	4525	5000	5750	5560	6385	-	5900	4350	4805	5525	5035	5790	-
130 5s TL	8315	5410	5970	6860	7365	-	-	7605	5180	5720	6570	6415	7365	-	6945	4980	5500	6320	5815	6680	-
130 5s TL V2	7450	5020	5545	6370	6840	-	-	6810	4805	5305	6100	5955	-	-	6220	4620	5105	5870	5395	6200	-
140 5s TL	9140	5895	6510	7480	8120	-	-	8420	5650	6240	7170	7075	8120	-	7700	5440	6010	6910	6410	7365	-
140 5s TL V2	7655	5225	5770	6635	7205	-	-	7055	5005	5530	6360	6275	-	-	6450	4815	5325	6125	5680	-	-
150 5s TL	9545	6220	6870	7890	8655	-	-	8855	5970	6590	7575	7540	8655	-	8110	5755	6355	7305	6835	7850	-
150 5s TL V2	8945	5945	6565	7545	8280	-	-	8300	5700	6300	7240	7210	8280	-	7600	5495	6070	6980	6530	7505	-
150 5s TL V3	7925	5480	6050	6955	7635	-	-	7350	5255	5805	6675	6645	-	-	6730	5065	5595	6435	6020	-	-
160 5s TL	9940	6540	7220	8290	9190	-	-	9285	6285	6940	7970	8010	9190	-	8515	6065	6695	7690	7260	8335	-
160 5s TL V2	8195	5730	6330	7270	8065	-	-	7650	5505	6080	6990	7025	-	-	7020	5310	5865	6745	6365	-	-
170 5s TL	10215	6765	7475	8590	9625	-	-	9605	6505	7190	8265	8380	-	-	8820	6280	6940	7980	7595	8725	-
170 5s TL V2	9485	6430	7105	8170	9155	-	-	8920	6185	6835	7860	7970	-	-	8190	5970	6600	7590	7220	-	-
175 5s TL	10050	6755	7465	8580	9660	-	-	9480	6500	7180	8260	8410	-	-	8710	6275	6940	7980	7620	-	-
180 5s TL	10550	7055	7795	8955	10130	-	-	9985	6795	7505	8625	8825	-	-	9180	6565	7255	8340	7995	-	-
180 5s TL V2	9770	6695	7395	8500	9620	-	-	9240	6445	7120	8185	8375	-	-	8500	6225	6880	7915	7590	-	-
190 5s TL	10790	7270	8030	9235	10555	-	-	10240	7000	7740	8905	9190	-	-	9460	6770	7485	8615	8325	-	-
200 5s TL	11085	7540	8330	9575	11040	-	-	10535	7270	8035	9240	9615	-	-	9785	7035	7775	8945	8710	-	-

* See notes on pg. 13

PRE-ANALYSIS TABLES

8.1 ROOFS WITH ROOF LOADING (single span, continued)

Total SDL = 0.5 kPa

Layup #	Snow Load																				
	3.0 kPa Snow							4.0 kPa Snow							8.5 kPa Snow						
	Stren- gth (mm)	Total Deflection			Snow Load Deflection			Stren- gth (mm)	Total Deflection			Snow Load Deflection			Stren- gth (mm)	Total Deflection			Snow Load Deflection		
		L/240 Total (mm)	L/180 Total (mm)	L/120 Total (mm)	L/360 snow (mm)	L/240 snow (mm)	L/180 snow (mm)		L/240 Total (mm)	L/180 Total (mm)	L/120 Total (mm)	L/360 snow (mm)	L/240 snow (mm)	L/180 snow (mm)		L/240 Total (mm)	L/180 Total (mm)	L/120 Total (mm)	L/360 snow (mm)	L/240 snow (mm)	L/180 snow (mm)
60 3s TL	3060	2340	2590	2980	2400	2770	3060	2715	2190	2425	-	2170	2505	-	1940	1780	-	-	1650	1915	-
70 3s TL	3475	2660	2945	3395	2755	3180	-	3085	2495	2760	-	2490	2875	-	2210	2035	-	-	1890	2195	-
80 3s TL	4075	3100	3425	3945	3235	3725	-	3625	2910	3220	-	2925	3370	-	2600	2385	-	-	2230	2585	-
80 3s TL V2	3850	2965	3280	3780	3095	3570	-	3425	2780	3080	-	2795	3230	-	2460	2270	-	-	2120	-	-
90 3s TL	4510	3420	3785	4360	3605	4155	-	4015	3215	3560	-	3255	3755	-	2890	2640	-	-	2475	2870	-
100 3s TL	5055	3830	4235	4870	4065	4680	-	4505	3605	3990	-	3675	4235	-	3250	2980	-	-	2810	-	-
100 3s TL V2	4915	3730	4130	4760	3960	4565	-	4380	3510	3885	-	3575	4130	-	3160	2885	-	-	2715	3155	-
105 3s TL	5215	3945	4365	5030	4205	4845	-	4655	3715	4110	-	3800	4385	-	3360	3060	-	-	2890	3350	-
110 3s TL	5495	4150	4590	5285	4440	5115	-	4905	3910	4325	-	4010	4625	-	3545	3230	-	-	3055	3540	-
120 3s TL	5910	4455	4930	5680	4805	5540	-	5285	4200	4655	-	4340	5010	-	3825	3480	-	-	3300	-	-
100 5s TL	4535	3565	3940	4535	3785	4355	-	4045	3360	3715	-	3420	3940	-	2915	2775	-	-	2615	-	-
110 5s TL	4870	3855	4260	-	4125	4740	-	4350	3635	4020	-	3730	4295	-	3140	3020	-	-	2860	-	-
120 5s TL	5660	4360	4815	5540	4695	5405	-	5055	4110	4550	-	4245	4895	-	3660	3415	-	-	3245	-	-
120 5s TL V2	5100	4055	4485	-	4375	5035	-	4560	3830	4235	-	3955	4555	-	3300	3175	-	-	3020	-	-
130 5s TL	6015	4660	5145	5920	5055	5815	-	5385	4405	4865	-	4575	5265	-	3905	3670	-	-	3505	-	-
130 5s TL V2	5390	4320	4775	-	4690	-	-	4825	4080	4515	-	4240	-	-	3500	3400	-	-	3245	-	-
140 5s TL	6685	5090	5630	6475	5570	6410	-	5985	4815	5325	-	5040	5805	-	4355	4020	-	-	3855	-	-
140 5s TL V2	5600	4510	4985	-	4935	-	-	5015	4260	4715	-	4460	-	-	3645	3555	-	-	3400	-	-
150 5s TL	7055	5395	5965	6855	5945	6835	-	6325	5110	5650	-	5380	6190	-	4610	4285	-	-	4120	-	-
150 5s TL V2	6610	5150	5695	6555	5675	6530	-	5930	4875	5395	-	5135	5915	-	4320	4080	-	-	3925	-	-
150 5s TL V3	5855	4745	5250	-	5230	-	-	5250	4495	4970	-	4730	-	-	3825	3760	-	-	3615	-	-
160 5s TL	7420	5695	6290	7230	6315	7260	-	6660	5400	5970	-	5720	6580	-	4865	4540	-	-	4385	-	-
160 5s TL V2	6115	4985	5515	-	5535	-	-	5490	4725	5230	-	5005	-	-	4010	3970	-	-	3830	-	-
170 5s TL	7695	5905	6530	7510	6600	7595	-	6915	5600	6195	-	5970	6875	-	5060	4710	-	-	4560	-	-
170 5s TL V2	7150	5610	6205	7145	6275	-	-	6425	5320	5890	-	5670	-	-	4700	4470	-	-	4330	-	-
175 5s TL	7610	5905	6530	7515	6625	-	-	6840	5605	6200	-	5990	-	-	5010	4715	-	-	4580	-	-
180 5s TL	8025	6180	6830	7860	6955	7995	-	7220	5870	6490	-	6290	-	-	5295	4950	-	-	4815	-	-
180 5s TL V2	7430	5860	6480	-	6595	-	-	6685	5565	6155	-	5965	-	-	4900	4690	-	-	4560	-	-
190 5s TL	8280	6380	7055	8125	7230	-	-	7460	6060	6710	-	6535	-	-	5485	5110	-	-	4990	-	-
200 5s TL	8580	6635	7340	8450	7570	-	-	7735	6310	6985	-	6845	-	-	5695	5340	-	-	5235	-	-

* See notes on pg. 13

PRE-ANALYSIS TABLES

8.1 ROOFS WITH ROOF LOADING (single span, continued)

according to CSA O86:24

Total SDL = kPa

Layup #	Snow Load																				
	1.0 kPa Snow							1.5 kPa Snow							2.0 kPa Snow						
	Stren- gth (mm)	Total Deflection			Snow Load Deflection			Stren- gth (mm)	Total Deflection			Snow Load Deflection			Stren- gth (mm)	Total Deflection			Snow Load Deflection		
		L/240 Total (mm)	L/180 Total (mm)	L/120 Total (mm)	L/360 snow (mm)	L/240 snow (mm)	L/180 snow (mm)		L/240 Total (mm)	L/180 Total (mm)	L/120 Total (mm)	L/360 snow (mm)	L/240 snow (mm)	L/180 snow (mm)		L/240 Total (mm)	L/180 Total (mm)	L/120 Total (mm)	L/360 snow (mm)	L/240 snow (mm)	L/180 snow (mm)
140 7s TL	8060	5430	5995	6885	7475	-	-	7425	5205	5745	6600	6510	-	-	6790	5010	5535	6360	5900	6780	-
160 7s TL	8420	5835	6445	7405	8210	-	-	7865	5605	6190	7115	7150	-	-	7210	5405	5975	6865	6480	-	-
180 7s TL	8740	6215	6865	7890	-	-	-	8270	5985	6610	7600	7775	-	-	7605	5780	6390	7345	7045	-	-
180 7s TL V2	10250	6940	7660	8800	9950	-	-	9695	6680	7380	8475	8670	-	-	8915	6455	7130	8195	7860	-	-
200 7s TL	9270	6690	7390	8500	-	-	-	8815	6450	7130	8200	8535	-	-	8185	6240	6900	7940	7730	-	-
210 7s TL	10900	7595	8390	9640	-	-	-	10385	7330	8100	9310	9770	-	-	9695	7100	7845	9020	8850	-	-
220 7s TL	10890	7710	8515	9785	-	-	-	10400	7445	8230	9460	10005	-	-	9750	7215	7975	9170	9065	-	-
220 7s TL V2	12165	8335	9200	10565	-	-	-	11615	8055	8895	10215	10800	-	-	10895	7810	8625	9905	9795	-	-
230 7s TL	11165	7950	8785	10095	-	-	-	10685	7685	8495	9765	10410	-	-	10065	7455	8240	9475	9435	-	-
240 7s TL	11430	8190	9050	10405	-	-	-	10960	7925	8755	10070	10820	-	-	10370	7685	8500	9775	9800	-	-
245 7s TL	12140	8595	9495	10915	-	-	-	11655	8320	9195	10570	11395	-	-	11050	8075	8925	10265	10330	-	-
260 7s TL	12730	9030	9985	11480	-	-	-	12250	8750	9675	11130	12135	-	-	11690	8500	9400	10815	10995	-	-
160 5ss TL	10435	6705	7410	8525	9460	-	-	9745	6440	7120	8190	8230	9460	-	8940	6210	6870	7905	7455	8570	-
180 7ss TL	11280	7380	8150	9365	10595	-	-	10670	7105	7850	9020	9230	10595	-	9815	6865	7585	8720	8360	9605	-
200 7ss TL	12060	8015	8850	10160	11710	-	-	11465	7735	8540	9805	10205	-	-	10645	7485	8265	9495	9250	10620	-
210 7ss TL	12355	8245	9110	10470	12185	-	-	11775	7960	8795	10115	10610	-	-	10990	7705	8520	9800	9615	-	-
220 7ss TL	13140	8750	9660	11100	13025	-	-	12550	8455	9340	10730	11350	-	-	11765	8195	9050	10405	10285	-	-
220 7ss TL V2	12690	8540	9430	10840	-	-	-	12120	8250	9115	10475	11080	-	-	11365	7995	8835	10160	10040	-	-
230 7ss TL	13515	9060	10005	11495	-	-	-	12935	8765	9680	11120	11850	-	-	12180	8500	9390	10790	10740	-	-
240 7ss TL	13875	9370	10340	11880	-	-	-	13305	9070	10010	11500	12350	-	-	12585	8800	9720	11170	11195	-	-
250 7ss TL	14180	9590	10600	12185	-	-	-	13625	9290	10265	11805	12775	-	-	12945	9020	9970	11465	11575	-	-
260 7ss TL	14505	9880	10915	12545	-	-	-	13955	9575	10580	12165	13260	-	-	13320	9305	10280	11825	12015	-	-
280 7ss TL	15070	10370	11460	13180	-	-	-	14550	10060	11120	12795	14150	-	-	13970	9780	10820	12450	12820	-	-
300 8ss TL	15715	10995	12140	13945	-	-	-	15220	10685	11795	13555	15180	-	-	14650	10405	11490	13205	13765	-	-
320 8ss TL	16155	11425	12620	14505	-	-	-	15690	11110	12275	14115	-	-	-	15140	10830	11965	13760	14520	-	-

* See notes on pg. 13

PRE-ANALYSIS TABLES

8.1 ROOFS WITH ROOF LOADING (single span, continued)

Total SDL = kPa

Layup #	Snow Load																				
	3.0 kPa Snow							4.0 kPa Snow							8.5 kPa Snow						
	Stren- gth (mm)	Total Deflection			Snow Load Deflection			Stren- gth (mm)	Total Deflection			Snow Load Deflection			Stren- gth (mm)	Total Deflection			Snow Load Deflection		
		L/240 Total (mm)	L/180 Total (mm)	L/120 Total (mm)	L/360 snow (mm)	L/240 snow (mm)	L/180 snow (mm)		L/240 Total (mm)	L/180 Total (mm)	L/120 Total (mm)	L/360 snow (mm)	L/240 snow (mm)	L/180 snow (mm)		L/240 Total (mm)	L/180 Total (mm)	L/120 Total (mm)	L/360 snow (mm)	L/240 snow (mm)	L/180 snow (mm)
140 7s TL	5895	4690	5185	-	5130	-	-	5280	4440	4905	-	4640	-	-	3840	3710	-	-	3555	-	-
160 7s TL	6285	5075	5610	-	5635	-	-	5640	4810	5320	-	5095	-	-	4120	4040	-	-	3900	-	-
180 7s TL	6645	5440	6015	-	6125	-	-	5980	5165	5715	-	5540	-	-	4385	4355	-	-	4235	-	-
180 7s TL V2	7795	6080	6720	7725	6840	-	-	7015	5780	6385	-	6190	-	-	5145	4880	-	-	4750	-	-
200 7s TL	7175	5890	6515	-	6720	-	-	6470	5600	6200	-	6075	-	-	4765	4740	-	-	4645	-	-
210 7s TL	8515	6710	7415	-	7695	-	-	7680	6390	7065	-	6965	-	-	5670	5420	-	-	5335	-	-
220 7s TL	8575	6825	7545	-	7880	-	-	7745	6505	7195	-	7130	-	-	5730	5530	-	-	5460	-	-
220 7s TL V2	9580	7390	8165	9385	8525	-	-	8655	7050	7785	-	7720	-	-	6400	6010	-	-	5930	-	-
230 7s TL	8865	7055	7805	-	8200	-	-	8015	6730	7445	-	7420	-	-	5935	5730	-	-	5680	-	-
240 7s TL	9155	7285	8060	-	8520	-	-	8280	6950	7690	-	7705	-	-	6145	5930	-	-	5895	-	-
245 7s TL	9760	7660	8470	9745	8980	-	-	8830	7310	8090	-	8125	-	-	6560	6250	-	-	6225	-	-
260 7s TL	10345	8070	8930	10280	9555	-	-	9375	7710	8535	-	8640	-	-	6985	6600	-	-	6610	-	-
160 5ss TL	7785	5830	6450	7425	6475	7455	-	6990	5520	6115	-	5850	6745	-	5105	4625	-	-	4460	-	-
180 7ss TL	8580	6465	7145	8220	7270	8360	-	7720	6140	6790	-	6580	7575	-	5660	5175	-	-	5035	-	-
200 7ss TL	9335	7070	7810	8975	8050	9250	-	8415	6725	7435	-	7290	8380	-	6200	5705	-	-	5595	-	-
210 7ss TL	9650	7280	8050	9265	8355	9615	-	8710	6930	7670	-	7560	8705	-	6425	5880	-	-	5780	-	-
220 7ss TL	10350	7750	8570	9855	8945	10285	-	9345	7390	8170	-	8095	9320	-	6910	6285	-	-	6205	-	-
220 7ss TL V2	9995	7560	8360	9620	8730	-	-	9025	7205	7970	-	7900	-	-	6675	6130	-	-	6050	-	-
230 7ss TL	10730	8050	8895	10230	9345	-	-	9700	7680	8490	-	8460	-	-	7185	6555	-	-	6495	-	-
240 7ss TL	11110	8345	9220	10600	9745	-	-	10050	7970	8805	-	8825	-	-	7455	6815	-	-	6780	-	-
250 7ss TL	11440	8555	9460	10890	10065	-	-	10360	8170	9040	-	9105	-	-	7700	6985	-	-	6970	-	-
260 7ss TL	11790	8835	9770	11240	10450	-	-	10685	8445	9340	-	9455	-	-	7960	7240	-	-	7245	-	-
280 7ss TL	12425	9305	10295	11850	11145	-	-	11280	8900	9855	-	10080	-	-	8430	7650	-	-	7710	-	-
300 8ss TL	13135	9920	10960	12595	11980	-	-	11945	9510	10510	-	10850	-	-	8960	8220	-	-	8340	-	-
320 8ss TL	13685	10335	11425	13145	12635	-	-	12465	9920	10970	-	11440	-	-	9380	8595	-	-	8775	-	-

* See notes on pg. 13

PRE-ANALYSIS TABLES

09 KLH® ROOF PANELS - DOUBLE SPAN

9.1 ROOFS WITH ROOF LOADING (double span)

according to CSA O86:24

Total SDL = 0.5 kPa

Layup #	Snow Load																						
	1.0 kPa Snow							1.5 kPa Snow							2.0 kPa Snow								
		Total Deflection			Snow Load Deflection				Total Deflection			Snow Load Deflection				Total Deflection			Snow Load Deflection				
		Stren- gth (mm)	L/240 Total (mm)	L/180 Total (mm)	L/120 Total (mm)	L/360 snow (mm)	L/240 snow (mm)		L/180 snow (mm)	Stren- gth (mm)	L/240 Total (mm)	L/180 Total (mm)	L/120 Total (mm)	L/360 snow (mm)		L/240 snow (mm)	L/180 snow (mm)	Stren- gth (mm)	L/240 Total (mm)	L/180 Total (mm)	L/120 Total (mm)	L/360 snow (mm)	L/240 snow (mm)
60 3s TL	4525	3740	4135	-	-	-	-	3975	3530	3910	-	-	-	-	3585	3360	-	-	-	-	-	-	-
70 3s TL	5100	4230	4680	-	-	-	-	4495	4000	4430	-	-	-	-	4065	3815	-	-	-	-	-	-	-
80 3s TL	5940	4895	5410	-	-	-	-	5250	4640	5135	-	-	-	-	4755	4435	-	-	-	-	-	-	-
80 3s TL V2	5610	4680	5180	-	-	-	-	4960	4440	4915	-	-	-	-	4490	4235	-	-	-	-	-	-	-
90 3s TL	6530	5375	5945	-	-	-	-	5785	5105	5655	-	-	-	-	5250	4880	-	-	-	-	-	-	-
100 3s TL	7230	5985	6620	-	-	-	-	6460	5700	6305	-	-	-	-	5870	5460	-	-	-	-	-	-	-
100 3s TL V2	7030	5830	6455	-	-	-	-	6280	5545	6145	-	-	-	-	5705	5310	-	-	-	-	-	-	-
105 3s TL	7415	6150	6805	-	-	-	-	6650	5855	6485	-	-	-	-	6050	5610	-	-	-	-	-	-	-
110 3s TL	7765	6455	7140	-	-	-	-	6995	6150	6810	-	-	-	-	6365	5895	-	-	-	-	-	-	-
120 3s TL	8260	6900	7635	-	-	-	-	7495	6585	7290	-	-	-	-	6835	6320	-	-	-	-	-	-	-
100 5s TL	6485	5575	6160	-	-	-	-	5795	5305	-	-	-	-	-	5265	5085	-	-	-	-	-	-	-
110 5s TL	6885	6000	6625	-	-	-	-	6200	5725	-	-	-	-	-	5645	5490	-	-	-	-	-	-	-
120 5s TL	7905	6750	7460	-	-	-	-	7175	6445	7125	-	-	-	-	6545	6190	-	-	-	-	-	-	-
120 5s TL V2	7125	6285	6950	-	-	-	-	6470	6000	-	-	-	-	-	5900	5760	-	-	-	-	-	-	-
130 5s TL	8315	7185	7935	-	-	-	-	7605	6870	7595	-	-	-	-	6945	6605	-	-	-	-	-	-	-
130 5s TL V2	7450	6660	7360	-	-	-	-	6810	6370	-	-	-	-	-	6220	6125	-	-	-	-	-	-	-
140 5s TL	9140	7820	8645	-	-	-	-	8420	7490	8285	-	-	-	-	7700	7205	-	-	-	-	-	-	-
140 5s TL V2	7655	6925	-	-	-	-	-	7055	6630	-	-	-	-	-	6450	6375	-	-	-	-	-	-	-
150 5s TL	9545	8260	9125	-	-	-	-	8855	7920	8755	-	-	-	-	8110	7630	-	-	-	-	-	-	-
150 5s TL V2	8945	7880	8715	-	-	-	-	8300	7560	-	-	-	-	-	7600	7280	-	-	-	-	-	-	-
150 5s TL V3	7925	7265	-	-	-	-	-	7350	6965	-	-	-	-	-	6730	6705	-	-	-	-	-	-	-
160 5s TL	9940	8685	9595	-	-	-	-	9285	8340	9220	-	-	-	-	8515	8045	-	-	-	-	-	-	-
160 5s TL V2	8195	7605	-	-	-	-	-	7650	7300	-	-	-	-	-	7020	-	-	-	-	-	-	-	-
170 5s TL	10215	8970	9920	-	-	-	-	9605	8620	9535	-	-	-	-	8820	8315	-	-	-	-	-	-	-
170 5s TL V2	9485	8525	9430	-	-	-	-	8920	8190	-	-	-	-	-	8190	7900	-	-	-	-	-	-	-
175 5s TL	10050	8960	9905	-	-	-	-	9480	8615	-	-	-	-	-	8710	8315	-	-	-	-	-	-	-
180 5s TL	10550	9360	10350	-	-	-	-	9985	9005	9960	-	-	-	-	9180	8700	-	-	-	-	-	-	-
180 5s TL V2	9770	8875	-	-	-	-	-	9240	8540	-	-	-	-	-	8500	8245	-	-	-	-	-	-	-
190 5s TL	10790	9630	10655	-	-	-	-	10240	9270	-	-	-	-	-	9460	8955	-	-	-	-	-	-	-
200 5s TL	11085	9990	11050	-	-	-	-	10535	9630	-	-	-	-	-	9785	9310	-	-	-	-	-	-	-

* See notes on pg. 13

PRE-ANALYSIS TABLES

9.1 ROOFS WITH ROOF LOADING (double span, continued)

Total SDL = 0.5 kPa

Layup #	Snow Load																				
	3.0 kPa Snow							4.0 kPa Snow							8.5 kPa Snow						
	Stren- gth (mm)	Total Deflection			Snow Load Deflection			Stren- gth (mm)	Total Deflection			Snow Load Deflection			Stren- gth (mm)	Total Deflection			Snow Load Deflection		
		L/240 Total (mm)	L/180 Total (mm)	L/120 Total (mm)	L/360 snow (mm)	L/240 snow (mm)	L/180 snow (mm)		L/240 Total (mm)	L/180 Total (mm)	L/120 Total (mm)	L/360 snow (mm)	L/240 snow (mm)	L/180 snow (mm)		L/240 Total (mm)	L/180 Total (mm)	L/120 Total (mm)	L/360 snow (mm)	L/240 snow (mm)	L/180 snow (mm)
60 3s TL	3060	-	-	-	-	-	-	2715	-	-	-	-	-	-	1940	-	-	-	-	-	-
70 3s TL	3475	-	-	-	-	-	-	3085	-	-	-	-	-	-	2210	-	-	-	-	-	-
80 3s TL	4075	-	-	-	-	-	-	3625	-	-	-	-	-	-	2600	-	-	-	-	-	-
80 3s TL V2	3850	-	-	-	-	-	-	3425	-	-	-	-	-	-	2460	-	-	-	-	-	-
90 3s TL	4510	-	-	-	-	-	-	4015	-	-	-	-	-	-	2890	-	-	-	-	-	-
100 3s TL	5055	-	-	-	-	-	-	4505	-	-	-	-	-	-	3250	-	-	-	-	-	-
100 3s TL V2	4915	-	-	-	-	-	-	4380	-	-	-	-	-	-	3160	-	-	-	-	-	-
105 3s TL	5215	5210	-	-	-	-	-	4655	-	-	-	-	-	-	3360	-	-	-	-	-	-
110 3s TL	5495	5485	-	-	-	-	-	4905	-	-	-	-	-	-	3545	-	-	-	-	-	-
120 3s TL	5910	5885	-	-	-	-	-	5285	-	-	-	-	-	-	3825	-	-	-	-	-	-
100 5s TL	4535	-	-	-	-	-	-	4045	-	-	-	-	-	-	2915	-	-	-	-	-	-
110 5s TL	4870	-	-	-	-	-	-	4350	-	-	-	-	-	-	3140	-	-	-	-	-	-
120 5s TL	5660	-	-	-	-	-	-	5055	-	-	-	-	-	-	3660	-	-	-	-	-	-
120 5s TL V2	5100	-	-	-	-	-	-	4560	-	-	-	-	-	-	3300	-	-	-	-	-	-
130 5s TL	6015	-	-	-	-	-	-	5385	-	-	-	-	-	-	3905	-	-	-	-	-	-
130 5s TL V2	5390	-	-	-	-	-	-	4825	-	-	-	-	-	-	3500	-	-	-	-	-	-
140 5s TL	6685	-	-	-	-	-	-	5985	-	-	-	-	-	-	4355	-	-	-	-	-	-
140 5s TL V2	5600	-	-	-	-	-	-	5015	-	-	-	-	-	-	3645	-	-	-	-	-	-
150 5s TL	7055	-	-	-	-	-	-	6325	-	-	-	-	-	-	4610	-	-	-	-	-	-
150 5s TL V2	6610	-	-	-	-	-	-	5930	-	-	-	-	-	-	4320	-	-	-	-	-	-
150 5s TL V3	5855	-	-	-	-	-	-	5250	-	-	-	-	-	-	3825	-	-	-	-	-	-
160 5s TL	7420	-	-	-	-	-	-	6660	-	-	-	-	-	-	4865	-	-	-	-	-	-
160 5s TL V2	6115	-	-	-	-	-	-	5490	-	-	-	-	-	-	4010	-	-	-	-	-	-
170 5s TL	7695	-	-	-	-	-	-	6915	-	-	-	-	-	-	5060	-	-	-	-	-	-
170 5s TL V2	7150	-	-	-	-	-	-	6425	-	-	-	-	-	-	4700	-	-	-	-	-	-
175 5s TL	7610	-	-	-	-	-	-	6840	-	-	-	-	-	-	5010	-	-	-	-	-	-
180 5s TL	8025	-	-	-	-	-	-	7220	-	-	-	-	-	-	5295	-	-	-	-	-	-
180 5s TL V2	7430	-	-	-	-	-	-	6685	-	-	-	-	-	-	4900	-	-	-	-	-	-
190 5s TL	-	-	-	-	-	-	-	7460	-	-	-	-	-	-	5485	-	-	-	-	-	-
200 5s TL	-	-	-	-	-	-	-	7735	-	-	-	-	-	-	5695	-	-	-	-	-	-

* See notes on pg. 13

PRE-ANALYSIS TABLES

9.1 ROOFS WITH ROOF LOADING (double span, continued)

according to CSA O86:24

Total SDL = kPa

Layup #	Snow Load																					
	1.0 kPa Snow							1.5 kPa Snow							2.0 kPa Snow							
		Total Deflection			Snow Load Deflection				Total Deflection			Snow Load Deflection				Total Deflection			Snow Load Deflection			
		Stren- gth (mm)	L/240 Total (mm)	L/180 Total (mm)	L/120 Total (mm)	L/360 snow (mm)	L/240 snow (mm)		L/180 snow (mm)	Stren- gth (mm)	L/240 Total (mm)	L/180 Total (mm)	L/120 Total (mm)	L/360 snow (mm)		L/240 snow (mm)	L/180 snow (mm)	Stren- gth (mm)	L/240 Total (mm)	L/180 Total (mm)	L/120 Total (mm)	L/360 snow (mm)
140 7s TL	8060	7205	7965	-	-	-	-	7425	6905	-	-	-	-	-	6790	6640	-	-	-	-	-	-
160 7s TL	8420	7740	-	-	-	-	-	7865	7430	-	-	-	-	-	7210	7165	-	-	-	-	-	-
180 7s TL	8740	8240	-	-	-	-	-	8270	7930	-	-	-	-	-	7605	-	-	-	-	-	-	-
180 7s TL V2	10250	9215	10180	-	-	-	-	9695	8870	-	-	-	-	-	8915	8565	-	-	-	-	-	-
200 7s TL	9270	8865	-	-	-	-	-	8815	8545	-	-	-	-	-	8185	-	-	-	-	-	-	-
210 7s TL	10900	10070	-	-	-	-	-	10385	9720	-	-	-	-	-	9695	9405	-	-	-	-	-	-
220 7s TL	10890	10220	-	-	-	-	-	10400	9870	-	-	-	-	-	9750	9560	-	-	-	-	-	-
220 7s TL V2	12165	11070	-	-	-	-	-	11615	10695	-	-	-	-	-	10895	10365	-	-	-	-	-	-
230 7s TL	11165	10535	-	-	-	-	-	10685	10185	-	-	-	-	-	10065	9870	-	-	-	-	-	-
240 7s TL	11430	10850	-	-	-	-	-	10960	10495	-	-	-	-	-	10370	10175	-	-	-	-	-	-
245 7s TL	12140	11395	-	-	-	-	-	11655	11025	-	-	-	-	-	11050	10695	-	-	-	-	-	-
260 7s TL	12730	11965	-	-	-	-	-	12250	11585	-	-	-	-	-	11690	11250	-	-	-	-	-	-
160 5ss TL	10435	8885	9835	-	-	-	-	9745	8530	9440	-	-	-	-	8940	8220	-	-	-	-	-	-
180 7ss TL	11280	9790	10825	-	-	-	-	10670	9420	10420	-	-	-	-	9815	9095	-	-	-	-	-	-
200 7ss TL	12060	10640	11760	-	-	-	-	11465	10265	11340	-	-	-	-	10645	9930	-	-	-	-	-	-
210 7ss TL	12355	10930	12090	-	-	-	-	11775	10545	11665	-	-	-	-	10990	10205	-	-	-	-	-	-
220 7ss TL	13140	11605	12830	-	-	-	-	12550	11210	12395	-	-	-	-	11765	10860	-	-	-	-	-	-
220 7ss TL V2	12690	11320	12520	-	-	-	-	12120	10935	12095	-	-	-	-	11365	10590	-	-	-	-	-	-
230 7ss TL	13515	12025	13290	-	-	-	-	12935	11625	12855	-	-	-	-	12180	11270	-	-	-	-	-	-
240 7ss TL	13875	12435	13745	-	-	-	-	13305	12035	13300	-	-	-	-	12585	11675	-	-	-	-	-	-
250 7ss TL	14180	12710	14065	-	-	-	-	13625	12305	13615	-	-	-	-	12945	11940	-	-	-	-	-	-
260 7ss TL	14505	13100	14490	-	-	-	-	13955	12690	-	-	-	-	-	13320	12325	-	-	-	-	-	-
280 7ss TL	15070	13730	-	-	-	-	-	14550	13315	-	-	-	-	-	13970	12940	-	-	-	-	-	-
300 8ss TL	15715	14590	-	-	-	-	-	15220	14175	-	-	-	-	-	14650	13800	-	-	-	-	-	-
320 8ss TL	16155	15145	-	-	-	-	-	15690	14725	-	-	-	-	-	15140	14345	-	-	-	-	-	-

* See notes on pg. 13

PRE-ANALYSIS TABLES

9.1 ROOFS WITH ROOF LOADING (double span, continued)

Total SDL = kPa

Layup #	Snow Load																				
	3.0 kPa Snow							4.0 kPa Snow							8.5 kPa Snow						
	Stren- gth (mm)	Total Deflection			Snow Load Deflection			Stren- gth (mm)	Total Deflection			Snow Load Deflection			Stren- gth (mm)	Total Deflection			Snow Load Deflection		
		L/240 Total (mm)	L/180 Total (mm)	L/120 Total (mm)	L/360 snow (mm)	L/240 snow (mm)	L/180 snow (mm)		L/240 Total (mm)	L/180 Total (mm)	L/120 Total (mm)	L/360 snow (mm)	L/240 snow (mm)	L/180 snow (mm)		L/240 Total (mm)	L/180 Total (mm)	L/120 Total (mm)	L/360 snow (mm)	L/240 snow (mm)	L/180 snow (mm)
140 7s TL	5895	-	-	-	-	-	-	5280	-	-	-	-	-	-	3840	-	-	-	-	-	-
160 7s TL	6285	-	-	-	-	-	-	5640	-	-	-	-	-	-	4120	-	-	-	-	-	-
180 7s TL	6645	-	-	-	-	-	-	5980	-	-	-	-	-	-	4385	-	-	-	-	-	-
180 7s TL V2	7795	-	-	-	-	-	-	7015	-	-	-	-	-	-	5145	-	-	-	-	-	-
200 7s TL	7175	-	-	-	-	-	-	6470	-	-	-	-	-	-	4765	-	-	-	-	-	-
210 7s TL	-	-	-	-	-	-	-	7680	-	-	-	-	-	-	5670	-	-	-	-	-	-
220 7s TL	-	-	-	-	-	-	-	7745	-	-	-	-	-	-	5730	-	-	-	-	-	-
220 7s TL V2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6400	-	-	-	-	-	-
230 7s TL	-	-	-	-	-	-	-	8015	-	-	-	-	-	-	5935	-	-	-	-	-	-
240 7s TL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6145	-	-	-	-	-	-
245 7s TL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6560	-	-	-	-	-	-
260 7s TL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6985	-	-	-	-	-	-
160 5ss TL	7785	7705	-	-	-	-	-	6990	-	-	-	-	-	-	5105	-	-	-	-	-	-
180 7ss TL	-	-	-	-	-	-	-	7720	-	-	-	-	-	-	5660	-	-	-	-	-	-
200 7ss TL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6200	-	-	-	-	-	-
210 7ss TL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6425	-	-	-	-	-	-
220 7ss TL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6910	-	-	-	-	-	-
220 7ss TL V2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6675	-	-	-	-	-	-
230 7ss TL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7185	-	-	-	-	-	-
240 7ss TL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7455	-	-	-	-	-	-
250 7ss TL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7700	-	-	-	-	-	-
260 7ss TL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7960	-	-	-	-	-	-
280 7ss TL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
300 8ss TL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
320 8ss TL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

* See notes on pg. 13

ADDITIONAL DESIGN PROCEDURES

10 ADDITIONAL DESIGN PROCEDURES**10.1 FIRE DESIGN PROCEDURE FOR CLT PANELS**

See CSA O86, Annex B, for procedures to determine the structural resistance of the effective cross section of a CLT panel, defined as the initial cross section reduced by the char layer depth and the zero-strength layer depth on each exposed surface for a given fire duration.

**10.2 DEFLECTION OF HORIZONTAL CLT PANELS
DUE TO OUT-OF-PLANE LOADS**

See CSA O86, Annex A, Section A.8.5.2 for procedures for calculating the maximum deflection of a CLT panel due to out-of-plane loading, including the effects of wood creep.

**10.3 VIBRATION ANALYSIS OF CLT PANELS DUE
TO OUT-OF-PLANE LOADS**

See CSA O86, Annex A, Section A.8.5.3 for procedures to calculate the vibration-controlled span limit for CLT floors, including multiple-span floors with a non-structural element, such as a concrete topping, that is considered to enhance vibration performance.

**10.4 CLT AS COMPRESSION MEMBERS WITH OR
WITHOUT SIMULTANEOUS OUT-OF-PLANE
LOADING**

CSA O86, Sections 8.4.5 and 8.4.6, illustrate procedures for calculating the resistance of CLT panels subjected to compressive axial loads and combined out-of-plane (flatwise) bending and compressive axial load effects

10.5 CLT IN-PLANE BENDING

The engineer should use a rational method to calculate the bending capacity of CLT members used for in-plane loading situations (edgewise bending), such as lintels or cantilevered walls.

10.6 FASTENERS

The engineer should review literature provided by the fastener manufacturer for fastener shear and/or withdrawal capacities, giving consideration, if necessary, to how the fasteners are oriented relative to the direction of grain of the laminations involved in the connection.

FIRE RESISTANCE TESTING

10.7 FIRE PERFORMANCE TESTING AT SOUTHWEST RESEARCH INSTITUTE (SWRI ®)

ASTM E119-16 STANDARD TEST METHODS FOR FIRE TESTS OF BUILDING CONSTRUCTION AND MATERIALS

60-minute Fire Resistance Rating

5-ply 130 mm thick CLT, load bearing roof assembly,
SwRI Project No. 01.23472.01.001, June 6, 2018

5-ply 160 mm thick CLT, load bearing floor assembly,
SwRI Project No. 01.23472.01.004, June 29, 2018

ASTM E119-19 STANDARD TEST METHODS FOR FIRE TESTS OF BUILDING CONSTRUCTION AND MATERIALS

120-minute Fire Resistance Rating

5-ply 175 mm thick CLT, load bearing wall assembly,
SwRI Project No. 01.25700.01.001, April 24, 2020

5-ply 175 mm thick CLT, load bearing floor assembly,
SwRI Project No. 01.25700.01.002, April 24, 2020

5-ply 180 mm thick CLT, load bearing floor assembly,
SwRI Project No. 01.25700.01.003, October 2, 2020

ASTM E84-16 STANDARD TEST METHOD FOR SURFACE BURNING CHARACTERISTICS OF BUILDING MATERIALS

Flame Spread Index and Smoke Developed Index, Classification B

5-ply 130 mm thick CLT, SwRI Project No.
01.23472.02.001, April 17, 2018

ASTM E2768-11 STANDARD TEST METHOD FOR EXTENDED DURATION SURFACE BURNING CHARACTERISTICS OF BUILDING MATERIALS (30 MIN TUNNEL TEST)

Flame Spread Index and Smoke Developed Index, Classification B

5-ply 130 mm thick CLT, SwRI Project No.
01.23472.02.001a



Hidden Creek Community Center in Hillsboro | Portland



Redmond Public Safety Facility in Redmond | Oregon



Timber Lofts in Milwaukee | Wisconsin



SAMPLE CLT GENERAL STRUCTURAL NOTES

11 GENERAL STRUCTURAL NOTES

- 01 Cross-Laminated Timber panels shall be manufactured in accordance with the latest edition of ANSI/APA PRG 320, Standard for Performance-Rated Cross-Laminated Timber.
- 02 Minimum Limit States Design (LSD) properties for the lumber laminations used in the panels shall be grade CV1M1.
- 03 Exposed panel surfaces shall be finished as per the Architectural drawings.
- 04 Contractor to confirm all dimensions and details with Architectural drawings.
- 05 CLT panels shall consist of 3, 5, 7, or 8 layers of crosswise stacked spruce boards and glued together with approved adhesives. Lamination thickness may vary from 20 mm to 40 mm.
- 06 Panels shall not be fabricated until approval of the shop drawings by the E.O.R.
- 07 Panels shall be manufactured with lumber of maximum moisture content of 12% (+/-) 2%.
- 08 The Contractor shall cut no holes, slots, notches, grooves, etc. in the panels without written approval by the E.O.R.
- 09 CLT panels shall be installed in strict conformance with manufacturer's requirements
- 10 Store all panels off the ground and stacked using spacers to separate individual panels. Contractor is responsible for taking appropriate measures to minimize the likelihood of staining, cracking, distortion, warping or other types of damage to the panels.
- 11 Lift and support panels during construction only at designated points shown in the shop drawings.
- 12 Handle panels consistent with their shape to minimize damage.
- 13 Panels shall fit together properly, without trimming or cutting in the field. The Contractor shall report any problems with fit-up to the E.O.R.
- 14 CLT panels shall be adequately braced until all structural diaphragms and permanent bracing systems are installed and connected per the EOR.
- 15 Floor and roof panels shall be oriented with the exterior layers perpendicular to the supports, U.N.O.
- 16 Structural steel components used to connect CLT panels to each other and/or to the structural framework, if supplied by the manufacturer, shall be test fitted in the manufacturing facility prior to shipment.
- 17 The manufacturer shall provide instructions and prepare the panels for shipment in such a way as to facilitate erection.
- 18 Manufacturer shall label all panels.
- 19 Panel labels shall include information on the surface qualities of each face.
- 20 Manufacturer shall submit product certificates to the A.O.R. and E.O.R. for review and written approval prior to fabrication.

SAMPLE CLT SPECIFICATIONS

12 SECTION 06 18 00 GLUED-LAMINATED CONSTRUCTION

Note: although the following specification section pertains to both glued-laminated members as well as cross laminated timber (CLT) panels, the basic provisions noted below focus on CLT only.

PART 1 GENERAL

1.1 SECTION INCLUDES

- A Glued-laminated (Glulam) beams and columns, as well as cross laminated timber (CLT) panels as shown on Drawings.

1.2 RELATED SECTIONS

- A Section 01 33 00 – Submittal Procedures
- B Section 06 10 53 – Miscellaneous Rough Carpentry

1.3 REFERENCES

- A ANSI/APA PRG 320, Standard for Performance-Rated Cross-Laminated Timber.
- B CSA O86, Engineering Design in Wood.
- C CSA O112 SERIES-M1977 (R2006), CSA Standards for Wood Adhesives.
- D National Building Code of Canada with applicable Provincial Building Code and City Building By-law.
- E All codes and standards are to be the current adopted editions.

1.4 DESIGN

- A Structural design shall be conducted by a Professional Engineer for all CLT-to-CLT connections not already detailed on Drawings.

1.5 SUBMITTALS

- A Section 01 33 00: Submittal Procedure.
- B Product data for each type of product indicated.
- C Shop Drawings, including panel location plans, dimensions, shapes and sections, openings, support conditions, and connections.
 - 1 Indicate lifting connections.
 - 2 Indicate locations, tolerances, and details of anchorage to supporting structure.
 - 3 Include and locate openings.
 - 4 Indicate location of CLT panel by identification mark placed on panel.
 - 5 Indicate relationship of CLT panels to adjacent materials.
 - 6 Clearly indicate stress grade, service grade, and appearance grade of surfaces.
 - 7 Provide three dimensional models of all interfaces and CLT panels, including all connections.
 - 8 CLT supplier shall provide a fully accurate three-dimensional (3D) model of the interfaces (supports, abutments, etc.), CLT panels, and all connections prior to submission of shop drawings. Model to be generated using hsbcad (compatible with AutoCAD 2011).

- D Sustainable design submittals.

- 1 Manufacturer's product data for adhesives, sealants, paints, and coatings, including printed manufacturer's statement of VOC content.
- 2 Provide certificates indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material to Project, by rail, by inland waterway, by sea and by all other means. Include statement indicating cost for each regional material, and fraction by weight that is considered regional.
- 3 For non-recycled wood and wood-based materials, provide itemized list of materials including manufacturer and vendor chain-of-custody certificates.
- 4 Certified Wood: Lamination stock shall be produced from wood obtained from forests certified by a PEFC- or FSC®-accredited certification body.

1.6 QUALIFICATIONS

- A Cross laminated timber manufacturer shall conform to the latest approved edition of ANSI/APA PRG 320.
- B All material certificates shall be submitted in accordance with CAN/CSA O177.

1.7 DELIVERY, STORAGE, AND HANDLING

- A Support panels during shipment on non-staining material in same position as during storage.
- B Store panels with adequate bracing and protect panels to prevent contact with soil. Separate panels with blocking so that air may circulate around all faces. Take all reasonable steps to prevent cracking, distortion, warping or other physical damage.
 - 1 Place stored panels so that identification labels are clearly visible.
 - 2 Handle and transport units in a position consistent with their shape and design to avoid excessive stresses that would cause cracking or damage.
 - 3 Lift and support panels only at designated points shown on the Shop Drawings.
 - 4 Cover top and sides with opaque moisture resistant membrane.
 - 5 Maintain protection of panels at all times during construction.

SAMPLE CLT SPECIFICATIONS

PART 2 PRODUCTS

2.1 MATERIALS

- A Provide PEFC- or FSC® C119602-certified wood products.
- B Wood Species: Spruce for lamination stock for panels.
- C CLT adhesive: Provide adhesive products in compliance with ANSI A190.1, DIN 68141, and EN301 and EN302.
- 1 Acceptable Product: Purbond HB X172 by Henkel Corp.
- D Basis-of-Design manufacturer: KLH Massivholz GmbH

2.2 ACCESSORIES

- A Supplier to supply all CLT fasteners.

2.3 FABRICATION

- A Fabricate panels in accordance with ANSI/APA PRG 320. Use multiple layers of 20 mm minimum to 40 mm maximum thick laminations.
- B Manufacturer to be ISO 9001, 14001, and 50001 certified.
- C CLT Layup shall be Stress Grade CV1M1 as per Product listing.
- D Joints: CLT panels shall be joined at panel edges using connections as indicated on the Drawings.
- E CLT shall be delivered to the project site at 12% moisture content ($\pm 2\%$)
- F Tolerances: ± 2 mm for panels $>1 \text{ m}^2$ @ 12% moisture content.

2.4 FINISHES

- A Panels shall satisfy one of the following appearance classifications, as indicated on the Drawings.
See www.klh.at/en/product/surface/ for a complete description of these classifications.
- 1 NSI (NVQ): Non-Visual Quality (very low surface quality, planed)
- 2 ISI (IVQ): Industrial Visual Quality (medium surface quality, sanded)
- 3 WSI (DVQ): Domestic Visual Quality (high surface quality, sanded, surface edges glued)

PART 3 EXECUTION

3.1 EXAMINATION

- A Prior to fabrication, check all dimensions relating to this section of work. Report any discrepancies to the EOR.
- B Prior to site erection, examine all site conditions and ensure an acceptable condition.

3.2 ERECTION

- A Erect panels in accordance with final approved shop drawings.
- B Make adequate provision for possible erection stresses. Set panels level and plumb to correct positions. Securely brace panels and anchor in place to maintain plumb until permanently secured by finished structure.
- C Fit panels closely and accurately, without trimming, cutting, or other modifications, unless approved in writing by the EOR.
- D Site cutting or boring of panels, other than shown on the shop drawings, is not permitted without the written consent of the EOR.

3.3 CLEAN-UP

- A Clean exposed surface of panels after erection and completion of field touch up.
- B Perform cleaning procedures, if necessary, according to Manufacturer's written recommendations. Protect other work from staining or damage due to cleaning operations.
- C Do not use cleaning materials or processes that could damage the appearance of the panels or damage adjacent materials.

END OF SECTION 06 18 00





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