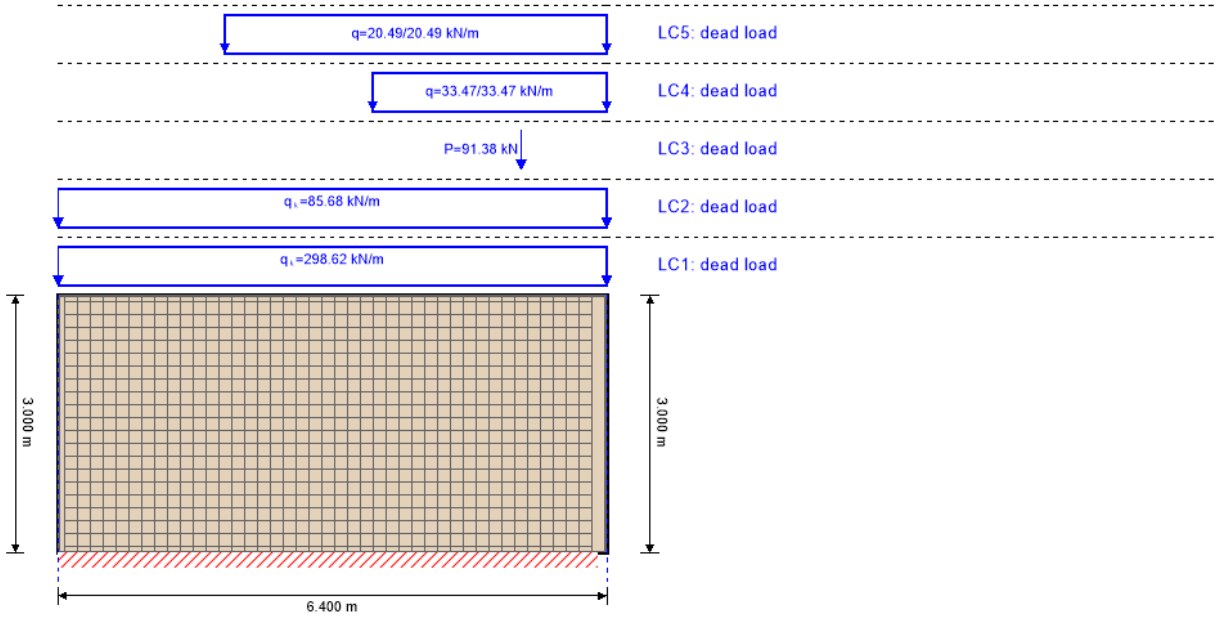
Vedlegg 15

Dimensjonering av vegg i Calculatis

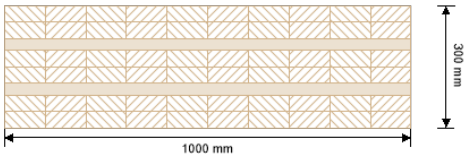
system



global utilization ratio 45 %

ULS	45 %	ULS fire	!	SLS	0 %	

section: CLT 300 L8s - 2



layer	thickness	orientation	material
1	40.0 mm	0°	C24 spruce
2	40.0 mm	0°	C24 spruce
3	30.0 mm	90°	C24 spruce
4	40.0 mm	0°	C24 spruce
5	40.0 mm	0°	C24 spruce
6	30.0 mm	90°	C24 spruce
7	40.0 mm	0°	C24 spruce
8	40.0 mm	0°	C24 spruce
t_{CLT}	**300.0 mm**		

material values

material	$f_{m,k}$	$f_{t,0,k}$	$f_{t,90,k}$	$f_{c,0,k}$	$f_{c,90,k}$	$f_{v,k}$	$f_{r,k\ min}$	$E_{0,mean}$	G_{mean}	$G_{r,mean}$
	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]
C24 spruce	24.00	14.00	0.12	21.00	2.50	4.00	1.25	12,500.00	690.00	50.00

load

load case groups

	load case category	Typ	duration	Kmod	γ_{inf}	γ_{sup}	Ψ_0	Ψ_1	Ψ_2
LC1	dead load	G	permanet	0.6	1	1.35	1	1	1
LC2	dead load	G	permanet	0.6	1	1.35	1	1	1
LC3	dead load	G	permanet	0.6	1	1.35	1	1	1
LC4	dead load	G	permanet	0.6	1	1.35	1	1	1
LC5	dead load	G	permanet	0.6	1	1.35	1	1	1

LC1:dead load

continous load
q_k
[kN/m]
298.62

LC2:dead load

continous load
q_k
[kN/m]
85.68

LC3:dead load

point load	
distance from start	P_k
[m]	[kN]
5.400	91.38

LC4:dead load

trapezoidal load			
distance from start	$q_{k,a}$	load at end	laod length
[m]	[kN/m]		[m]
3.670	33.47	33.47	2.730

LC5:dead load

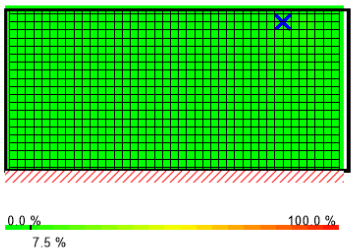
trapezoidal load			
distance from start	$q_{k,a}$	load at end	laod length
[m]	[kN/m]		[m]
1.940	20.49	20.49	4.460

ULS combinations

	combination rule
LCO1	1.35/1.00 * LC1 + 1.35/1.00 * LC2 + 1.35/1.00 * LC3 + 1.35/1.00 * LC4 + 1.35/1.00 * LC5

Ultimate limit state (ULS) - design results

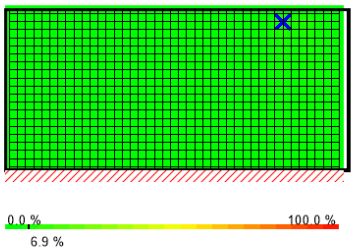
utilization rate of shear stress in plane on net section



LCO1

Id	X	Z	k_{mod}	$f_{IP,Netto,k}$	Q	$\tau_{IP,Net,d}$	ratio
[-]	[m]	[m]	[-]	[N/mm²]	[kN]	[N/mm²]	[%]
833	5.175	2.775	0.6	8.0	5.01	0.28	8 %

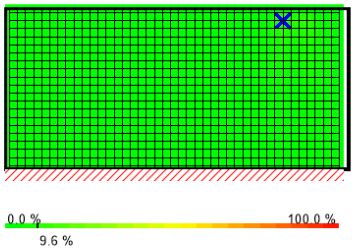
utilization rate of shear stress in plaen of gross section



LCO1

Id	X	Z	k_{mod}	$f_{v,IP,Brutto,k}$	Q	$\tau_{IP,Gross,d}$	ratio
[-]	[m]	[m]	[-]	[N/mm²]	[kN]	[N/mm²]	[%]
833	5.175	2.775	0.6	3.5	5.01	0.11	7 %

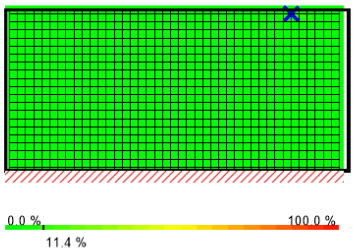
utilization rate of torsional shear stress in face glued surfaces



LCO1

Id	X	Z	k_{mod}	$f_{v,IP,T,k}$	Q	$\tau_{T,Node,d}$	ratio
[-]	[m]	[m]	[-]	[N/mm²]	[kN]	[N/mm²]	[%]
833	5.175	2.775	0.6	2.5	5.01	0.11	10 %

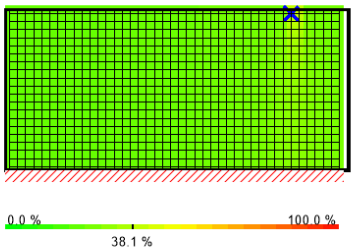
utilization rate of axail force horizontal



LCO1

Id	X	Z	k_{mod}	$f_{m,k}$	$N_{h,max}$	M_y	$\sigma_{h,max}$	ratio
[-]	[m]	[m]	[-]	[N/mm²]	[kN]	[kNm]	[N/mm²]	[%]
876	5.325	2.925	0.6	24.0	1.3393	0.0000	1.26	11 %

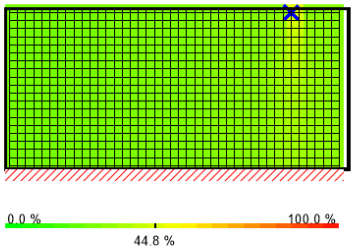
utilization rate of axail force vertical



LCO1

Id	X	Z	k_{mod}	$f_{m,k}$	$N_{v,max}$	M_y	$\sigma_{v,max}$	ratio
[-]	[m]	[m]	[-]	[N/mm²]	[kN]	[kNm]	[N/mm²]	[%]
876	5.325	2.925	0.6	24.0	1.8446	0.0000	4.22	38 %

utilization rate for buckling

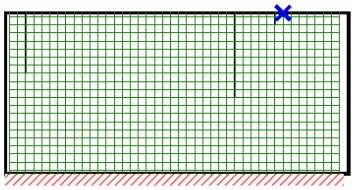


LCO1

Id	X	Z	l_k	λ_y	β_c	$k_{c,y}$	$f_{c,d}$	$\sigma_{c,0,d}$	$\sigma_{m,y,d}$	ratio
[-]	[m]	[m]	[m]	[-]	[-]	[-]	[N/mm²]	[N/mm²]	[N/mm²]	[%]
876	5.325	2.925	3.0	32	0.1	0.972	9.69	4.22	0.00	45 %

Service limit state design (SLS) - design results

horizontal deformation

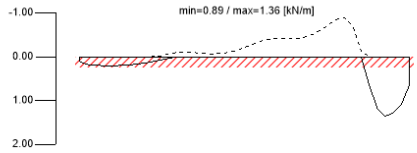


LCO1

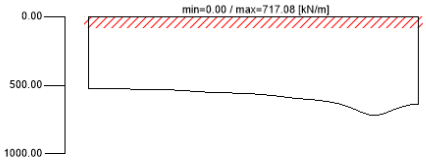
Id	X	Z	w_{limit}	limit	$v_{h,max}$	ratio
[-]	[m]	[m]	[mm]	[mm]	[mm]	[%]
917	5.175	3	10.0	L/300 = 10.0	0.0390	0.4 %

support reaction

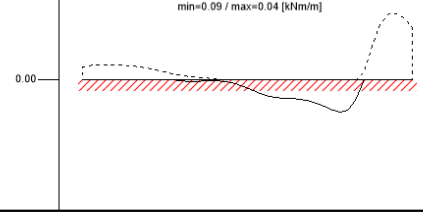
support reaction horizontal min/max



support reaction vertical min/max



support reaction moment min/max



reference documents for this analysis

English title	description
EN 338	EN 338 - Structural timber — Strength classes
EN 1995-1-1	EN 1995-1-1 - Eurocode 5: Design of timber structures - Part 1-1: General - Common rules and rules for buildings
ETA-14/0349	European Technical Assessment ETA-14/0349 of 02.10.2014

reference documents for this analysis	
English title	description
Expertise Rolling shear - no edge gluing, H.J. Blass	Expertise on Rolling shear for CLT
EN 1995-1-2	EN 1995-1-2 - Eurocode 5 — Design of timber structures — Part 1-2: General — Structural fire design
EN 14080	EN 14080 - Timber Structures - Glued laminated timber and glued solid timber - Requirements
DIN EN 1995-1-1	EN 1995-1-1 - Eurocode 5: Design of timber structures - Part 1-1: General - Common rules and rules for buildings
DIN EN 1995-1-1 NA	EN 1995-1-1 - National Annex – Nationally determined parameters – Eurocode 5: Design of timber structures – Part 1-1: General — Common rulesand rules for buildings
Technical expertise 122/2011/02: analysis of load bearing capacity and separation performance of CLT elements	Verification of the load bearing capacity and the insulation criterion of CLT structures with Stora Enso CLT
Technical expertise 2434/2012 - BB: failure time tf of gypsum fire boards (GKF) according to ON B 3410	Expertise on failure time tf of gypsum wall fire boards according to ON B3410 and gypsum wall boards type DF according to EN 520
EN 1990	EN 1990 - Eurocode — Basis of structural design
Fire safety in timber buildings - technical guildeline for Europe	Fire safety in timber buildings - technical guildeline for Europe; publishes by SP Technical Research Institute of Sweden
National specifications concerning ÖNORM EN 1995-1-2, national comments and national supplements, chapter 12	ÖNORM EN 1995-1-2 - National specifications concerning ÖNORM EN 1995-1-2, national comments and national supplements, chapter 12
Analysis of CLT wall elements, using a beam grid model - TU-Graz - focus_sts 113_1_SF_12	Analysis of CLT shear walls with beam grid models - TU-Graz - focus_sts 113_1_SF_12
DIN EN 1995-1-2_NA	DIN EN 1995-1-2 - Germany - National Annex - Eurocode 5: Design of timber structures — Part 1-2: General — Structural fire design — National specifications concerning DIN EN 1995-1-2, national comments and national supplements
Expertise Rolling shear, H.J. Blass	Expertise on rolling shear strength and rolling shear modulus of CLT panels
Expertise shear in plane of CLT, H.J. Blass	Expertise - revision of DIBt technical approval Z-9.1/599 - shear in the plane of CLT

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