

CivE 495 Assignment 2

Benjamin Klassen

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Question 1

Built-up Beam

Category	Value	Reason
<i>Species Group</i>	S-P-F	Parents don't need most expensive wood, S-P-F is readily available in Guelph
<i>Proposed Grade</i>	No.1	Structural Purpose, SS overkill, No 2 doesn't look as nice because of the knots
<i>Use</i>	Bending	Load-bearing the line-load from the upstairs floor
<i>Estimated Size</i>	3-ply 38x235mm	Deeper than wide to maximize bending capacity
f_b	11 MPa	See Table 6.6 (Exceeds small dim by more than 51mm)
f_v	1.2 MPa	See Table 6.6
f_c		Axial not a consideration
E/E_{05}	8500/6000 MPa	See Table 6.6
K_D	1.0	Standard term
K_{Sb}	1.0	Dry; See table 6.10
K_{Sv}	1.0	Dry; See table 6.10
K_{Sc}		Axial not a consideration
K_{SE}	1.0	Untreated - inside; See Table 6.10
K_T	1.0	Untreated; See Table 6.11
K_{Zb}/K_{Zv}	1.1	See Table 6.13
K_H	1.0	Doesn't meet Case 1 or Case 2; See Table 6.12

Tower Column

Category	Value	Reason
<i>Species Group</i>	D.Fir-L	Locally available in BC, strong
<i>Proposed Grade</i>	No.1	High winds in BC will require structurally strong wood, but SS is overkill
<i>Use</i>	Bending, axial	Dead load of tower, snow load, and live load cause axial; high winds up high cause bending

Category	Value	Reason
<i>Estimated Size</i>	235x235mm	Thickness prevents bending, while depth supports axial and square cross-section prevents buckling
f_b	13.8 MPa	See Table 6.7
f_v	1.5	See Table 6.7
f_c	12.2 MPa	See Table 6.7
E/E_{05}	10500/6500	See Table 6.7
K_D	1.0	Most of wind load will be translated to axial through bracing. Thus, standard load governs
K_{Sb}	1.0	Wet condition; See Table 6.10
K_{Sv}	1.0	Wet condition; See Table 6.10
K_{Sc}	0.67	Wet condition; See Table 6.10
K_{SE}	1.0	Wet condition; See Table 6.10
K_T	1.0	Treated for outdoors; See Table 6.11
K_{Zb}/K_{Zv}	1.2	See Table 6.13
K_H	1.0	Doesn't meet Case 1 or Case 2; See Table 6.12

Fence Post

S-P-F chosen because it's readily available. A square section was chosen because this is a fence post.

Category	Value	Reason
<i>Species Group</i>	S-P-F	Readily available
<i>Proposed Grade</i>	No. 2	Temporary construction material should be inexpensive. There is no architectural requirement or stringent load requirement
<i>Use</i>	Bending	Lateral wind forces dominate

Category	Value	Reason
<i>Estimated Size</i>	114x114mm	Posts are square; big cross-section for stability, but not massive for rotting due to the temporary nature of the fence
f_b	4.2 MPa	See Table 6.7
f_v	1.2 MPa	See Table 6.7
f_c		Axial not a consideration
E/E_{05}	6500/4500	See Table 6.7
K_D	1.15	Short term wind load
K_{Sb}	0.84	Wet; See Table 6.10
K_{Sv}	0.70	Wet; See Table 6.10
K_{Sc}		Axial not a consideration
K_{SE}	0.94	Wet; See Table 6.10
K_T	1.0	Not treated - temporary. See Table 6.11
K_{Zb}/K_{Zv}	1.3	See Table 6.13
K_H	1.0	Doesn't meet Case 1 or Case 2; See Table 6.12

Harbour Pier

Category	Value	Reason
<i>Species Group</i>	S-P-F (Pine)	Pine is relatively inexpensive, available, and is more resistant to rot than spruce
<i>Proposed Grade Use</i>	Not graded Axial, Bending	Graded by Clause 14.3 Holds up people walking along the harbour; Waves
<i>Estimated Size</i>	9"ø	Size needs to be reasonable given restrictions on cross-section of tree
f_b	5.04 MPa	80% of value in Table 6.6 (No. 2 values used since large likelihood of knots)

Category	Value	Reason
f_v	0.96 MPa	80% of value in Table 6.6 (No. 2 values used since large likelihood of knots)
f_c	4.16 MPa	80% of value in Table 6.6 (No. 2 values used since large likelihood of knots)
E/E_{05}	6500/4500	See Table 6.6
K_D	1.0	Live load dominates (busy pier)
K_{Sb}		
K_{Sv}	0.96	Wet; See Table 6.10
K_{Sc}	0.69	Wet; See Table 6.10
K_{SE}	0.94	Wet; See Table 6.10
K_T	0.85 (Other Properties)	Wet, treated to prevent rot, incised due to large cross section, axial higher consideration than bending
K_{Zb}/K_{Zv}		Unsure
K_H	1.0	Doesn't meet Case 1 or Case 2; See Table 6.12

Deck Joist

Category	Value	Reason
<i>Species Group</i>	S-P-F (pine)	As long as it is treated, pine will do well against rot. It is also readily available
<i>Proposed Grade</i>	No.1/No.2	SS overkill, No.3 not visually appealing
<i>Use</i>	Bending	Live load from people main loading
<i>Estimated Size</i>	38x140mm	A deck joist doesn't need to be too big. My backyard deck has 2x6" joists
f_b	11.8 MPa	See Table 6.4
f_v	1.5 MPa	See Table 6.4
f_c		Axial not considered
E/E_{05}	9500/6500 MPa	See Table 6.4

Category	Value	Reason
K_D	1.0	Live load dominates
K_{Sb}	0.84	Dry (high ventilation
K_{Sv}	0.96	Wet; See Table 6.10
K_{Sc}		
K_{SE}	0.94	Wet; See Table 6.10
K_T	1.0	Treated, non-incised; See Table 6.11
K_{Zb}/K_{Zv}	1.4	See Table 6.13
K_H	1.1	In bending, met Case 1 but not Case 2, as deck doesn't have sheathing; See Table 6.12

Floor Joist

Category	Value	Reason
<i>Species Group</i>	S-P-F	Available, Can be stained to have "rustic" aesthetic
<i>Proposed Grade</i>	No.1/No.2	Although fancy spots like select structural, floor joists aren't visible.
<i>Use</i>	Bending	Supports live loads, snow loads, and dead weight of items
<i>Estimated Size</i>	38x140mm	Common joist dimension
f_b	11.8 MPa	See Table 6.4
f_v	1.5 MPa	See Table 6.4
f_c		Axial not considered
E/E_{05}	9500/6500 MPa	See Table 6.4
K_D	1.0	Live load dominates
K_{Sb}	1.0	Dry; See Table 6.10
K_{Sv}	1.0	Dry; See Table 6.10
K_{Sc}		Axial not a consideration
K_{SE}	1.0	Dry; See Table 6.10
K_T	1.0	Untreated; See Table 6.11
K_{Zb}/K_{Zv}	1.4	See Table 6.13
K_H	1.4 (Bending and longitudinal shear)	Meets Case 2 criteria; See Table 6.12