ASPECT STRUCTURAL ENGINEERS

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ASPECT INTRO

Pleasure to meet you!

OUR TEAM



and growing....

ASSOCIATES



DUNCAN BOURKE P.Eng., B.Sc.

ILANA DANZIG P.Eng., M.Eng., PE, SE ANDREW SEETON P.Eng., M.A.Sc.

PRINCIPALS



BERNHARD GAFNER Struct.Eng., P.Eng., MiStructE, Dipl. Ing. FH/STV. ANDREW CHAD Struct.Eng., M.Eng., P.Eng.

MEHRDAD JAHANGIRI P.Eng., Dipl.Ing. (Germany) GINA SHEPPARD CAD / BIM Manager ADAM GERBER P.Eng., M.A.Sc., CPHC®

OUR OFFICE LOCATIONS



OUR SERVICES

- Full-service Engineer of Record
- Specialty Timber Engineering
- Timber Design Assist
- Supplier Market Integrations
- Tendering and Procurement Optimizations



OUR PROJECTS



OUR PROJECTS



HOW WE THINK

"Number crunching is easy.

Crunching the <u>right numbers</u> is the key to successful projects."

HOW WE THINK

We are currently 6 engineers who are either carpenters, ran a carpenter shop or worked at a supplier's technical department – across 3 continents.

You can't switch off that side of the brain....

Today's Agenda

- Market Maturity
- Building Materials
- Connection Systems
- Supply
- Pitfalls
- Specialty Engineering
- ASPECT Design Process

Market Maturity



BUILDING MATERIALS

Linear Products
Panel Products
Timber Concrete
Specialty
Composite

Linear Products





GL *"Glue Laminated Timber"* PSL *"Parallel Strand Lumber"*



NLT / DLT "Nail or Dowel Laminated Timber"



CLT "Cross Laminated Timber"

Panel Products



GLT *"Glue Laminated Timber"*



SCL "Structural Composite Lumber"

Timber Concrete Composite



TCC *"Timber Concrete Composite"*

Specialty

Stressed Skin Panel / Delta Beam / LVL



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CONNECTION SYSTEMS

Standard

- Proprietary
- Custom

Standard

Simpson / Rothoblaas / ASSY

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* For more details se	envicoo co	NECTORS AND TIMBER (PLATES' catalogue	



Images provided by suppliers

Proprietary

HSK HBV TS3.0 Glued in Rods



Custom

Pins / Notches



SUPPLY

Nail-Laminated
Glue-Laminated
Cross-Laminated
Timber
Timber







CLT SUPPLIERS (CAN | US | EU)

Estimated realistic supply capacity based on industry publications and conversations.

Not all suppliers are shown, only the ones relevant to US and Canadian projects.

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	Structurlam Penticton, BC, CAN	50 000 m ³	50 000 m³	Yes	3.0 x 12.19	
	Nordic Structures Montreal, QC, CAN	50 000 m ³	50 000 m³	Yes	4 x 19.5	
	Katerra Spokane, WA, USA	50 000 m ³	100 000 m ²	Yes	3.64 x 18.24	
AMERICA	Smartlam Columbia Falls, MT, USA	50 000 m*	50 000 m³	Yes	3.2 x 12.19	
H AM	International Beam Dothan, AL, USA	?	?	Yes	3.0 x 15.8	
NORTH	DR Johnson Riddle, OR, USA	10 000 m ³	10 000 m³	Yes	3.0 x 9.7 (12.1)	
	Vaagen Timber Colville, WA, USA	-	15 000 m³	Not Yet	1.2 x 18.2	
	Kalesnikoff Castlegar, BC, CAN	-	15 000 m³	Not Yet	3.5 x 18.2	
	Structurlam Arkansas, USA	-	?	-	3.5 x 18.2	
	MPP (Freres Lumber) Lyons, OR, USA	?	?	Yes	3.64 x 14.5	

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	KLH Massivholz Teufenbach-Katsch, AT	120 000 m³	220 000 m ³	Yes	3.5 x 16.5
	Stora Enso Bad St. Leonhard, Ybbs, AT	195 000 m³	220 000 m ³	In Progress	2.95 x 16 3.95 x 16
ų	Binderholz Bausysteme Unternberg, AT, Burgbernheim, DE	195 000 m³	220 000 m ²	In Progress	1.25 x 24 3.5 x 22
EUROPE	Hasslacher Norica Timber Stall im Mölltal, AT	55 000 m*	60 000 m ³	In Progress	3.2 x 20
-	Rubner Holzbau Brixen, IT	7 000 m ³	15 000 m³	In Progress	4 x 17
	Züblin Timber Aichach, DE	30 000 m ³	30 000 m ³	Not Yet	4.8 x 19.8
	W.u.J Derix Niederkrüchten, DE	12 500 m²	100 000 m ³	Not Yet	3.5 x 18
	XLam Dolomiti Castel Ivano, IT	15 500 m³	15 500 m³	Not Yet	3.5 x 13.5
	Mayr-Melnhof Holz Gaishorn, AT	75 000 m ³	100 000 m³	Not Yet	3.5 x 16 3.0 x 16.5
	Schillinger Holz Kusnacht, CH	50 000 m ³	100 000 m ³	Not Yet	3.4 x 18

Mat. Siles

CLT SUPPLY



Different Materials Different Tolerances Different Markets



Sizes Available



Performance Requirements



Design for Manufacturing





Design for Transportation





Design for Installation



Virtual Construction (BIM)





Specialty Engineering

By the Supplier or Engineer-of-Record?

OUR DESIGN PROCESS



Real Supplier Options

	Mass Timber Suppliers - Overview																
			Size and Annual Output Capacity ft ³ (m ³) Capability G														
Company	Material Supply	Project Coordina tion	Address	Website		Contact Technical	NLT	DLT	GLT Panels	GL Beams / Column	CLT	LSL	LVL	PSL	Description of Equipment (CNC etc)	CAD/ CAM	

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Real Material Options

Prodcut	Description	Typ Size	Span Direction	TCC Connections	Production Standards	Supply NA	Species NA	Supply EU	Species EU	To Consider when comparing to NA
NIT	Regular framing members (2x, 3x) on edge fastened together with nails	Typ 4' or 8' wide. Length is limited by sawn lumber. Less than 20' is ok. Longer is difficult to get lumber. Staggered lamination layup is possible, but redcution in strenght and stiffness	reinforced, additional	Distributed connection required. Discrete connection may overstress interlaminar connections	No, need to rely on ARCH/EOR specs.	Anyone could do it. Structurecraft, Seagate, Guardian, Skanska?	Any, based on local availality. D.Fir and SPF are typ	Yes, multiple suppliers		NLT Supply from EU does not make sense. Only small players in the market and similar cots to GLT
DLT	Regular framing members (2x, 3x) on edge and fastened together with hard wood dowels	Typ 4' or 8' wide. Length is limited by sawn lumber. Less than 20' is ok. Longer is difficult to get lumber. Staggered lamination layup is possible, but redcution in strenght and stiffness	One way only, unless reinforced, additonal members are intorduced or TCC	Distributed connection required. Discrete connection may overstress interlaminar connections	No, need to rely on ARCH/EOR specs.	Structurecraft (2018), Guardian (no proof)	Any, based on local availality. D.Fir and SPF are typ	Yes, multiple suppliers		DLT Supply from EU does not make sense. Only small players in the market and similar cots to GLT
GLT	"Glulam beams on edge"	Typ 2' wide to keep cuping to minimum. Wider is doable. Keep to 4-6' max. Length is limited by produciton facilty but is typically governed by max transportation length	reinforced, additional	Distributed and discrete connection possible	Yes, APA	Nordic, Western Archrib, QB Corporation, Structurlam, Western Structures, Calvert, American Laminators, Guardian Structures a few will likely team up for floor panels but can handle columns	Any, based on local availality. D.Fir and SPF are typ	Merk, Hasslacher, Binder, Wiehag	European SPF	European Glulam has the same stiffness as D.Fir, but only 70-80% of strength
LSL	Timber strands glued together	Typ 4' wide due to plant logistics. Theoretically 8' is possible. Length is limited by produciton facilty but is typically governed by max transportation length	Typically one way only, unless reinforced, additonal members are intorduced or TCC. Theoretical 2-way action possible	Distributed and discrete connection possible	Yes, CCMC/ICC	Weyerhaeuser, LP	Aspen	No	N/A	Not beeing produced in Europe
	2x members crosswise glued together. "Jumbo Plywood"	Typ 8' or 10' wide. Length is limited by produciton facilty (40'-60').	One or two way span capabilites.	Distributed and discrete connection possible	Yes, APA	Nordic, Structurlam, Guardian Structures, Smartlam Smartlam will team up, others will likely go alone	local availality. SPF	KLH, Merk, Stora Enso, Hasslacher, Binder they will likely team up for this project	European SPF	European CLT supplier are more flexible in regards to lamination size. The CLT is comparable is strength and stiffness to regular NA CLT - unless NA suppliers use MSR lumber in face laminations

Detail Design & Optimization

Detail 5/S-H-7.30; Steel Beam to GL Column

- Steel supply and installation needs to go hand in hand with wood install Scope - Bid documents need to be clear - respect trade specific tolerances
- Glulam beam length will be +/- 1/8" Tolerance
 - Steel beam will have more tolerance in its depth
 - Give tolerance for glulam and steel assembly (column base) together not only glulam length
- Keep CNC time to a minimum. Hundegger K2 or sim Fabrication - Slotting of member as shown may result in tear out, not acceptable if highly visible
- Installation - Steel trade is used to bolts. Consider horizontal slotted slip-critical connection one end to prevent racking of columns to fit? - Landing of GL column over top of 4 rods is tricky. Will need to take lots of measures to keep rods straight and square - Field injection of adhesive?
 - Temporary bracing of columns
- Raise column base 4-6" above concrete for durability. Wood column will stain from mopping the floor Others - Unless steel beam is cantilevering, consider using single span beams only for "clean" detail

Suggestions:

Could notch column to receive beam end in order to allow for beam length tolerance and column width tolerance.

NOTE: Beams are typically not planed in their width! Hand cleaning of notch after **CNC** machining likely required

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THIS DRAWING TO BE READ IN CONJUCTION WITH ALL STRUCTURAL DRAWINGS AND CONTRACT DOCUMENTS

elemention contained herein is for use of the Client only. ASPECT

table to any other parties relating to the use of these drawings.



one dearing former

- HSS stub to keep base of GL column above concrete

- Glued-in rods to secure beam and base plate

- Extend beam top flange and cut web diagonally. Add head plate and add 4-3/8 self tapping screws

-columns do not require temporary bracing during installation



sedent. Hard copy drawings are the official document

Do not spake off hand domy drawings or any

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604-762-7844 hello@aspectengineers.com 155-288 East Georgia Street Vancouver, B.C.

ASPECT STRUCTURAL ENGINEERS

Microsoft Campus

Scole NTS AG/BG Drown: Designed AG BG Checked 2017-03-21 Plot Date:

Ele

RAF

Details

Job Nic 1209 WG No SK-02





Procurement



THIS DRAWING TO BE READ IN CONJUCTION WITH ALL STRUCTURAL DRAWINGS AND CONTRACT DOCUMENTS

HOW WE THINK

We are currently 6 engineers who are either carpenters, ran a carpenter shop or worked at a supplier's technical department – across 3 continents.

You can't switch off that side of the brain....

THANK YOU!

BERNHARD GAFNER Struct.Eng., P.Eng., MiStructE, Dipl. Ing. FH/STV. bernhard@aspectengineers.com

