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Blackwell

Edmonton Wood Solutions Fair 2015

Reciprocal Framing Systems

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16 September 2015

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"Reciprocal Frames will Save the World!"
(Probably Not)

*"Reciprocal Frames will Revolutionize
the Wood Industry!"*
(Still... No)


"Reciprocal Frames are Kind of Cool!"
(👉)

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WHAT


Reciprocal Frame - "A structure made up of mutually supporting beams in a closed circuit"

*Reciprocal Frame Architecture
Olga Papovic Larsen, 2008*



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*"He lifted himself by the seat of his pants
and I'll never forget the grim look on his face
as he hoisted himself and took leave of this place"*
- The Lorien
© J. Smith, 1972



Reciprocal Frames

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WHY

- Span
- Geometric Complexity
- 2-Way Action
- Folly

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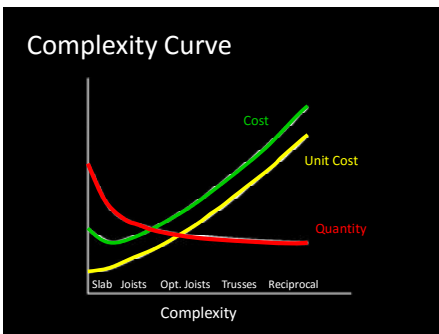
Efficiency – The great Myth

Taught the answer is usually repetition, but is that true?

Repetition
Piece Count
Volume

More complex can be cheaper

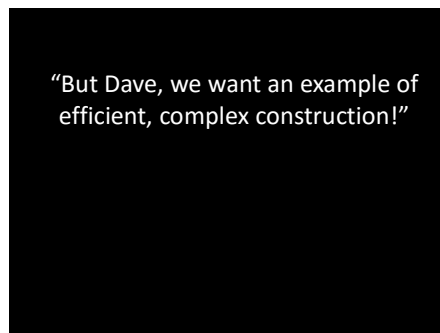
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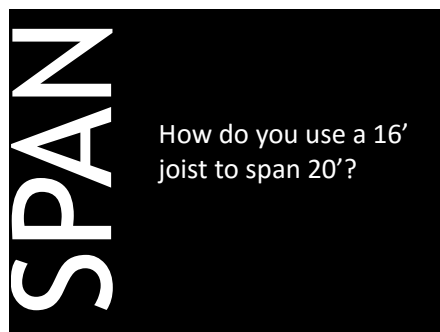
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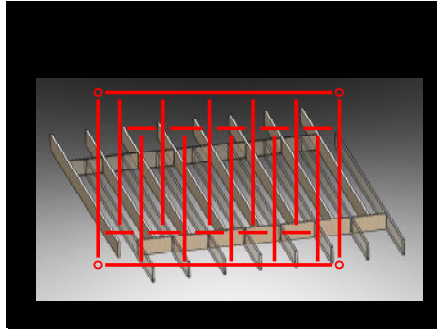
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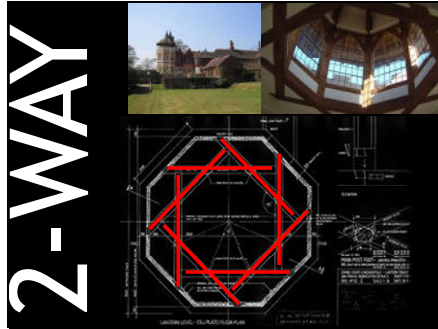
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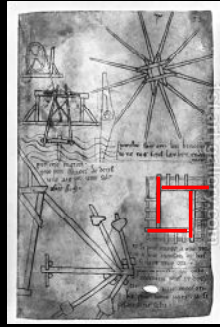


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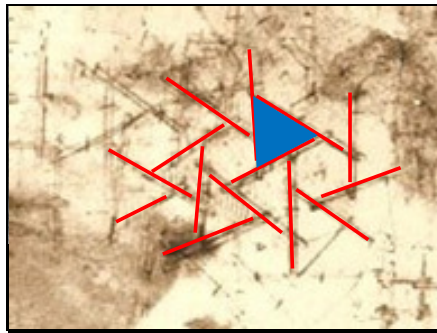
Villard de
Honnecourt

Reciprocal frame Sketches

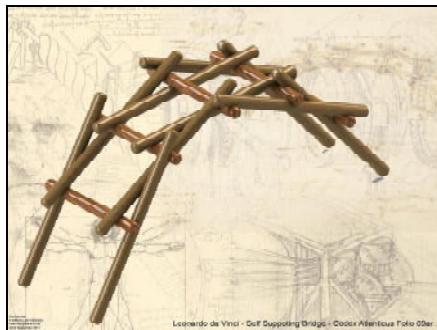
1270

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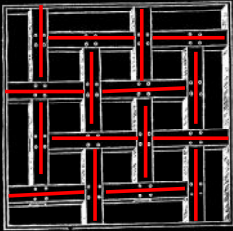


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Sebastiano Serlio 1475-1554

Italian Architect wrote the "7 books on Architecture"





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John Wallis

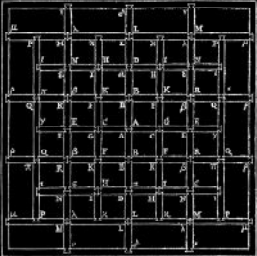
1616-1703

English Mathematician

Author Opera Mathematica

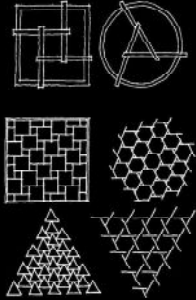
Gave us ∞



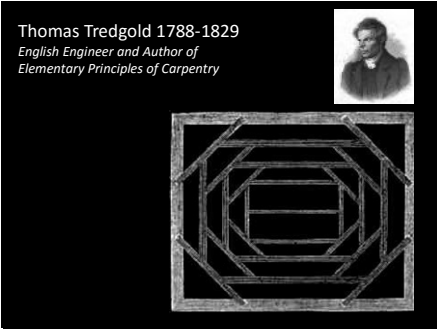


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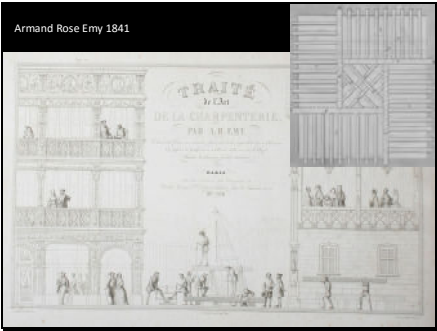
Other reciprocal frame systems considered by Wallis



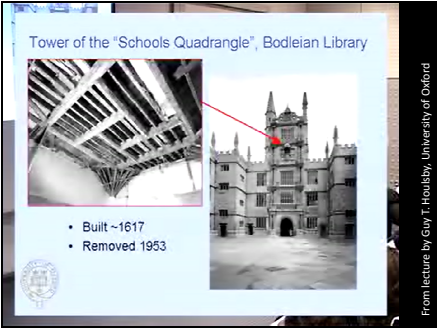
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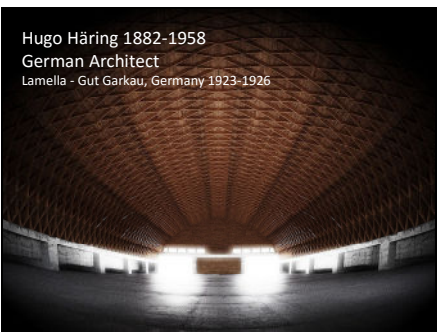
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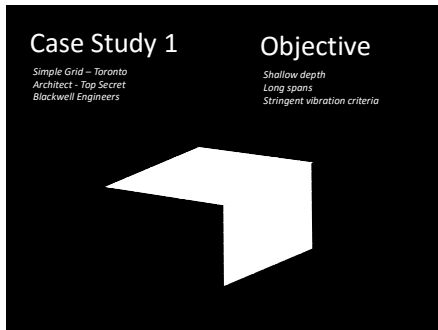
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“But Dave, why would we build reciprocal frames today? And how well do they work?”

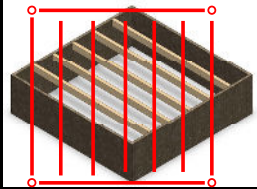
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Option 1 – Conventional Framing

Designed for Strength and Deflection



Piece Count – 5
Deepest Member – 494
Total Volume – 7.07 m³

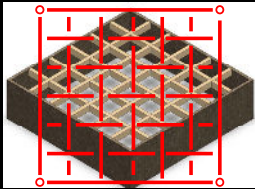


265x494


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Option 2 – Reciprocal Framing

Designed for Strength and Deflection



Piece Count – 10
Deepest Member – 456
Total Volume – 12.2 m³



265x456

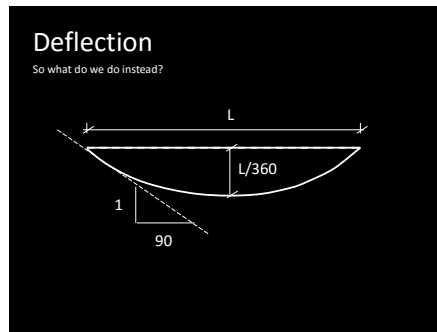
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Deflection

Do we take L/360 for granted?



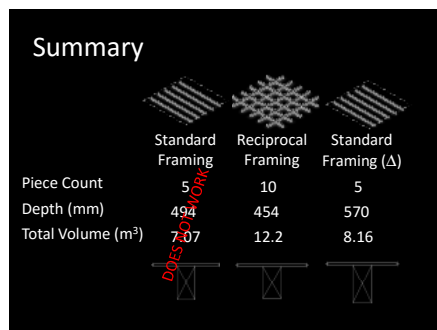
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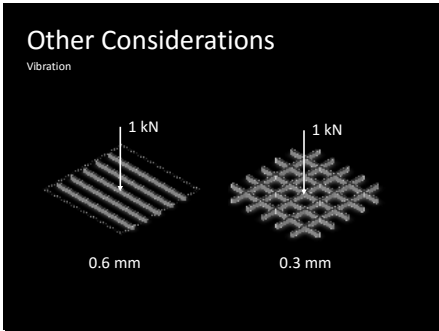
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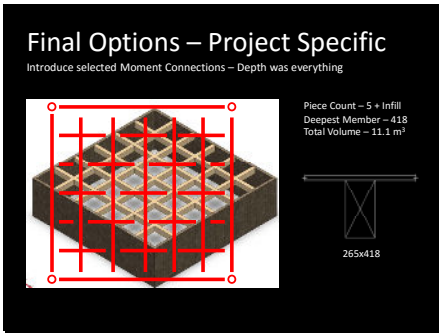
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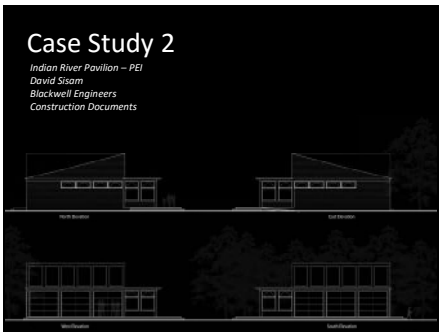
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Option 1 – Valley Framing



Piece Count – 15

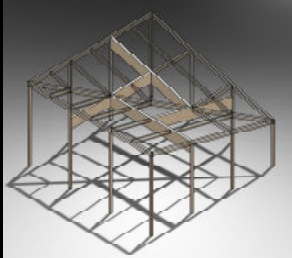
Total Volume – 5.8 m³

Largest Piece – 731 kg



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Option 2 – Reciprocal Beam



Piece Count – 37

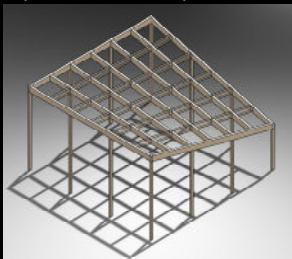
Total Volume – 4.8 m³

Largest Piece – 268 kg



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Option 3 – Reciprocal Joist



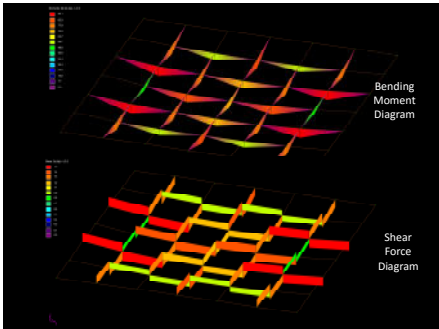
Piece Count – 47

Total Volume – 5.6 m³

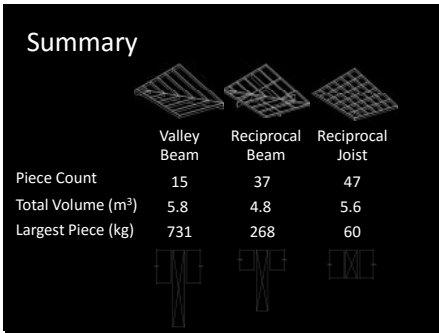
Largest Piece – 60 kg



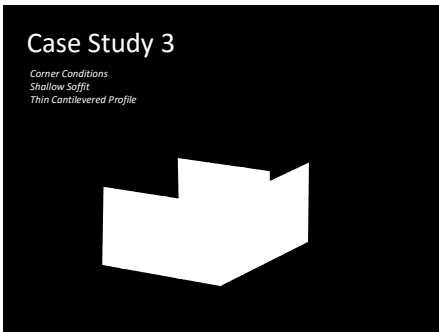
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“Lists of Considerations”

- Shrinkage
- Joint movement
- Erection Complexity

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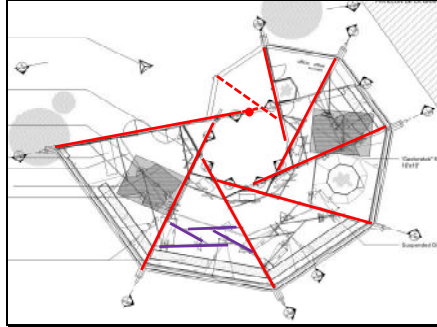
“Come on Dave! Show us modern and big!”

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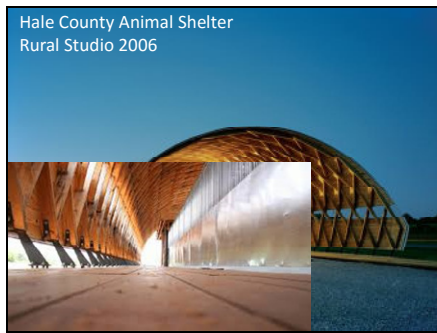
Discovery Center, Ventura California
Restored 1940s Lamella



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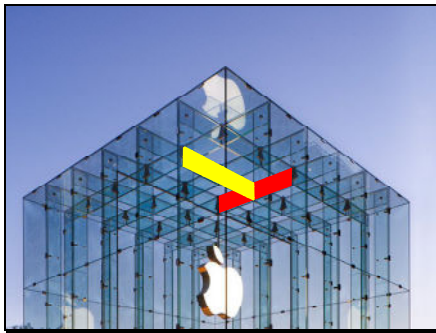
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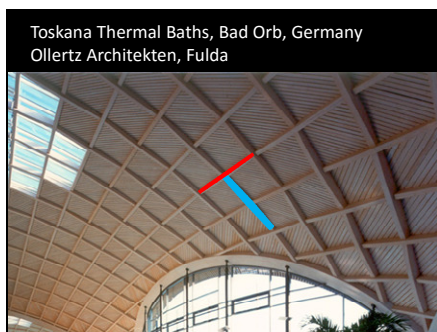
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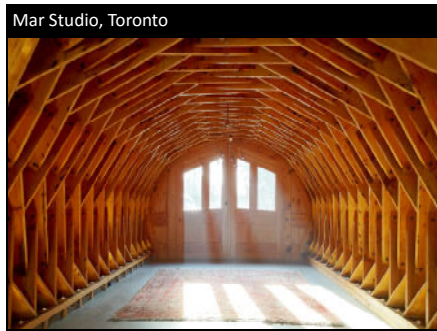
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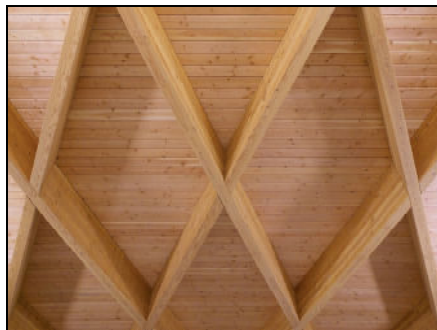
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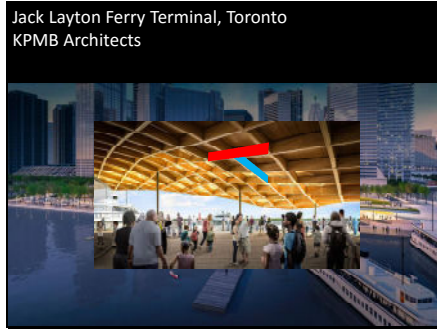
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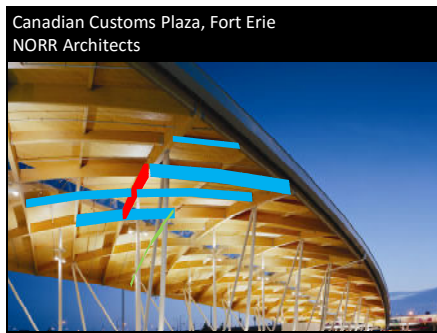
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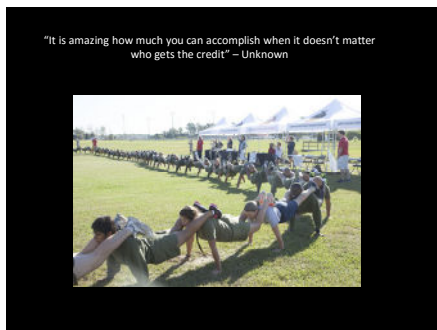
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