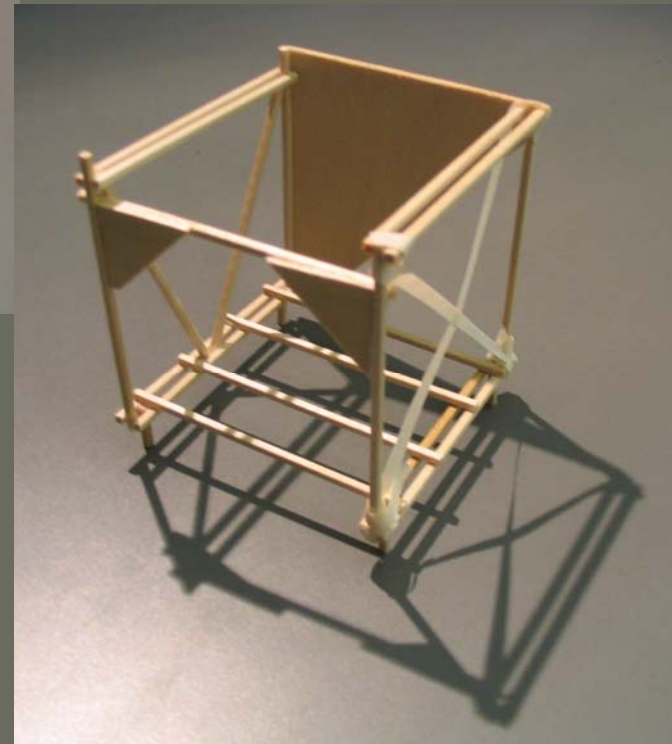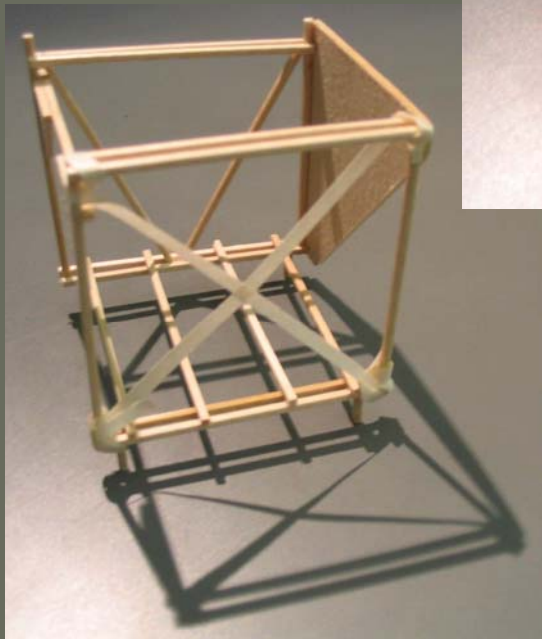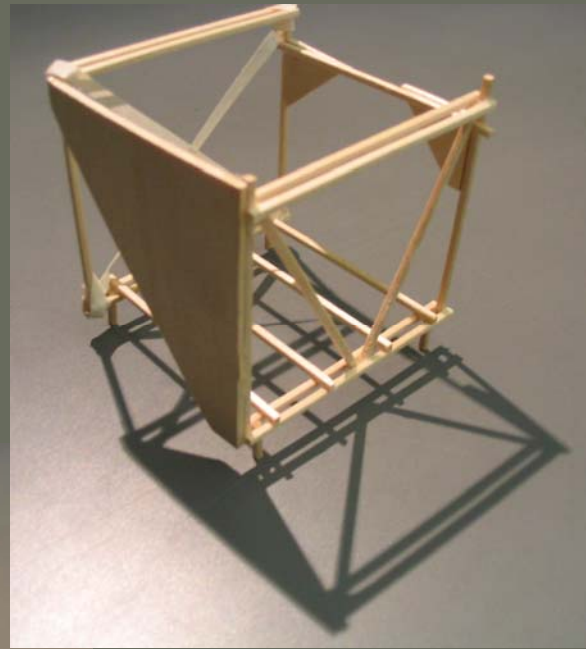# TEAM HARDCORE

Hongseok Cha Shane Boren Tien Nguyen Michael Wood Chris Grossnicklaus

Concept

Construction Process

Main Structural System

Corner Post
(4) 2"x2"x72"

Floor Diaphragm:
Frame-(2) 1"x3"x48";
(2) 1"x3"x46.5"; Joists-
(3) 1"x3"x46.5" spaced
12" apart oc.; 3/8"x48"x48"
plywood decking.

Identification of Components

Chevron

Diagonal Cross Bracing
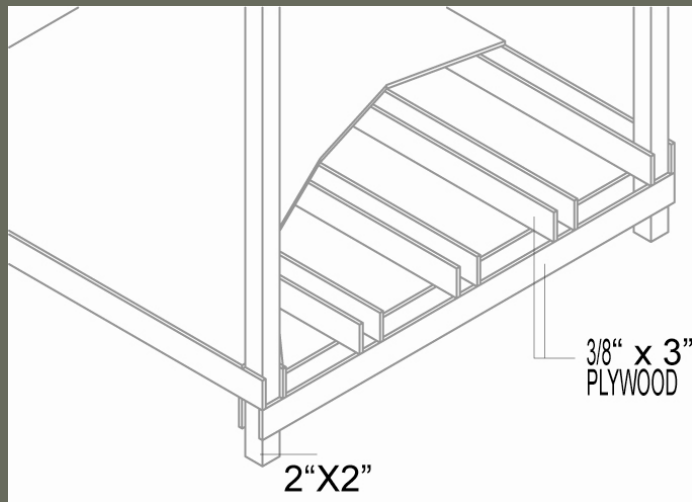
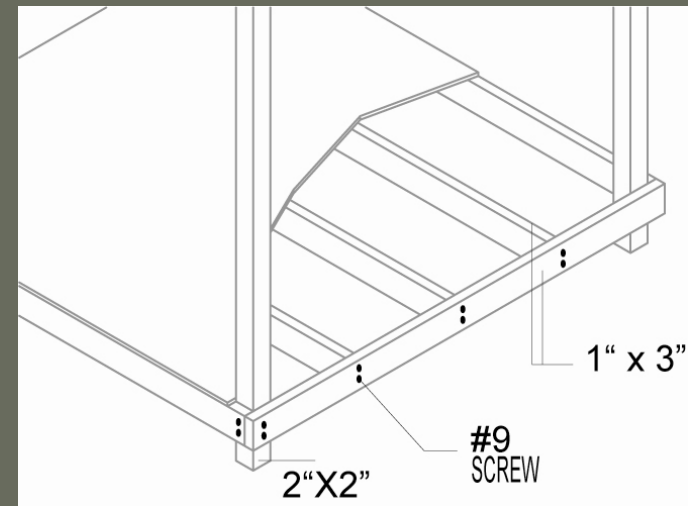Corner Gusset

Shear Wall

Connection Description

All connection were
Made using wood
Screws. Lengths
Varied from 1" to
2.5".

Diaphragm Design Ⅰ – Material Choice

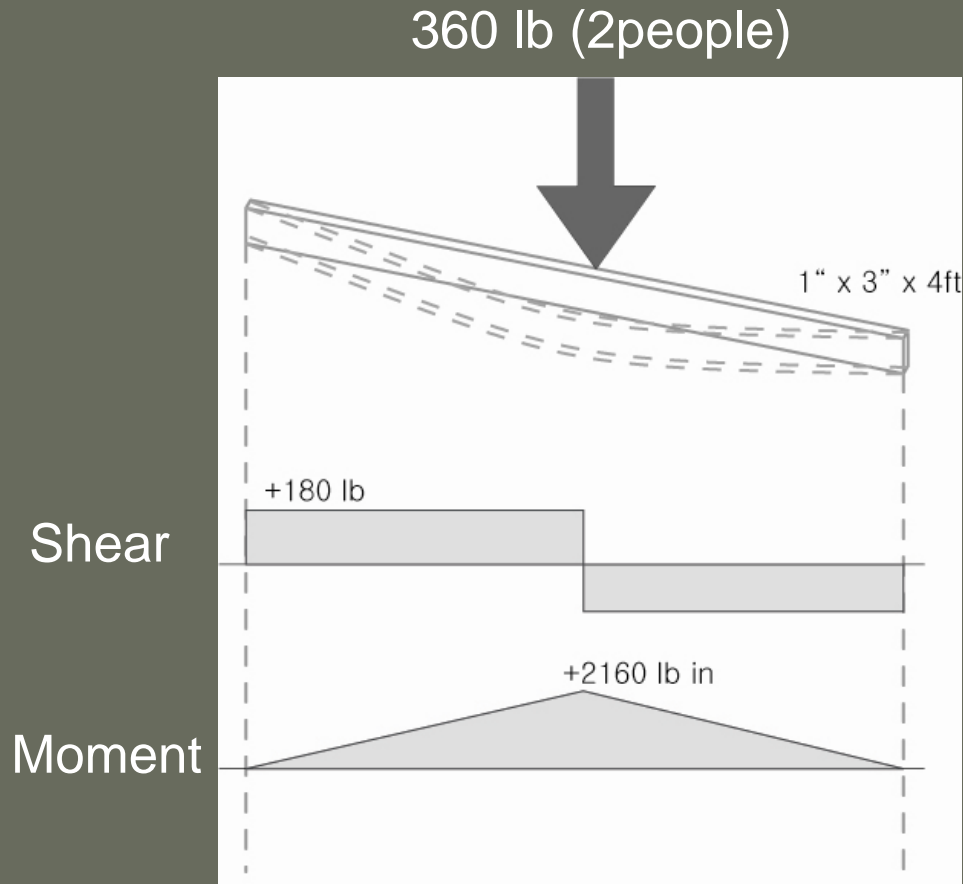3/8" x 3" PLYWOOD

2"X2"

1" x 3"

#9 SCREW

2"X2"

- Sturdy .
- Expensive.
- Special joint between beams needed.

- Weaker than left one.
- Cheaper.
- Easy Construction
- Screw Analysis needed

Diaphragm Design II – Bending Moment

360 lb (2people)

1" x 3" x 4ft

Shear

+180 lb

Moment

+2160 lb in

Requirement :
Bending Strength > Bending Stress

Bending Strength
= 3,900 lb / in2 (Northern White)

Bending Stress
= M_{max} / $S_{(section Modulus)}$
= $\dfrac{2160 \text{ lb in}}{1*3^2 / 6}$ = 2880 lb / in^2

» 3,900 > 2,880

Diaphragm Design III – Material Choice

TABLE 6.
Wood Screws: Plywood-to-Plywood Edge Connections[a]

Depth of Threaded Penetration (in.)	Ultimate Lateral Load (lb)[b]			Ultimate Withdrawal Load (lb)[b]		
	#8	#10	#12	#8	#10	#12
1	180	(185)	195	360	(405)	450
1-1/2	180	(185)	195	410	(455)	500

(a) Plywood receiving screw thread was 3/4"-thick C-D grade with exterior glue (Group 2 inner plies).
(b) Values in parentheses are estimates based on other tests.
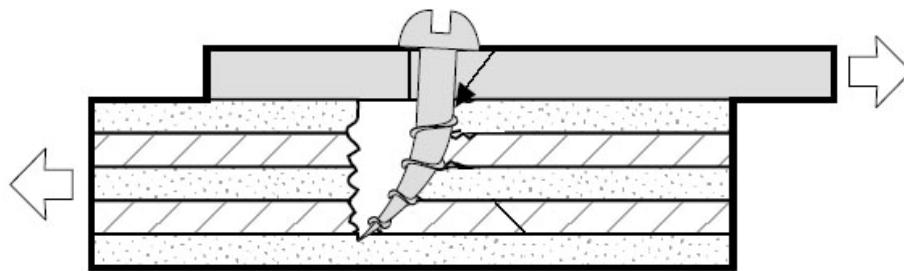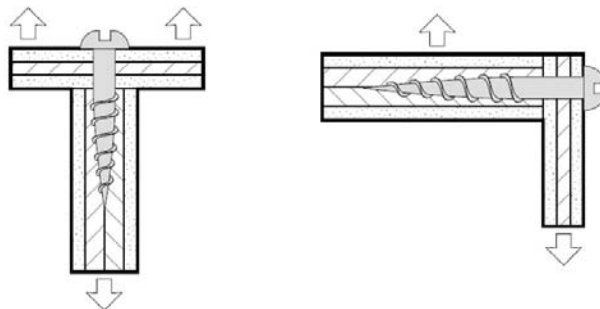
We used #9 Screw

Shear force at the joint
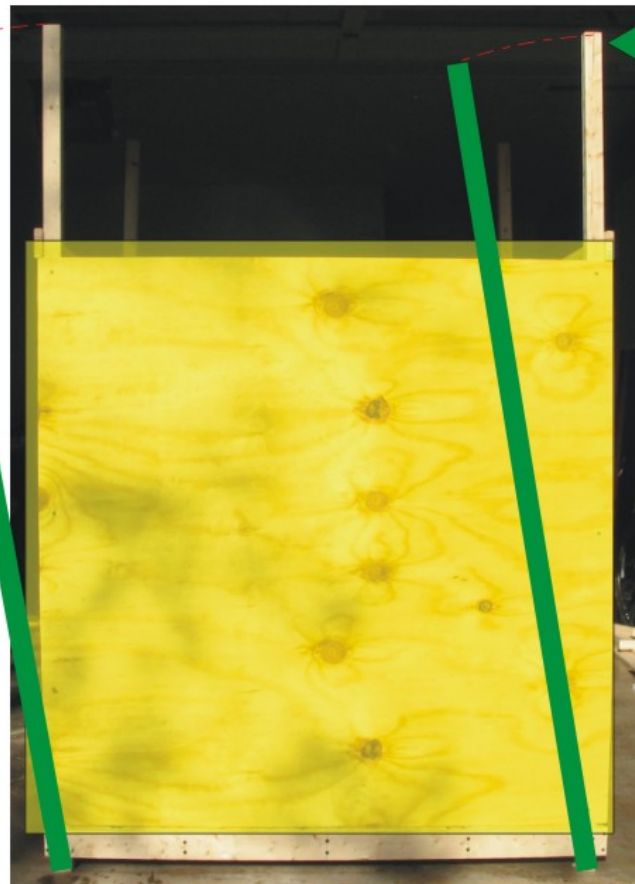= 180 lb

Shear Strength of
2 – Screw
= about 360 lb

Lateral Resisting Systems

System 1: Shear Wall

Effect of lateral
Load if shear wall
Is removed

Applied Lateral
Load

Shear wall carries in
plane forces.

Resists torsional
deformation.

Lateral Resisting Systems

System 2: Diagonal Cross Brace

Effect of lateral Load if diagonal bracing is removed
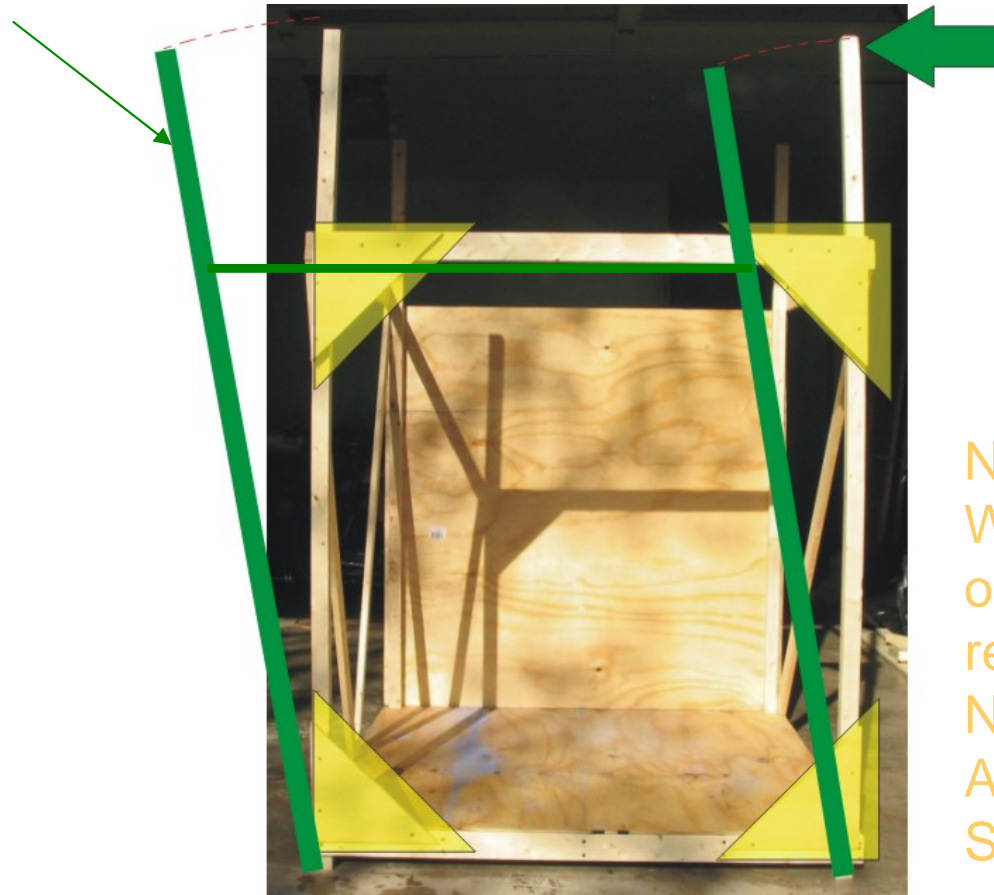
Applied Lateral Load

Lateral Resisting Systems

System 3: Corner Braces

Effect of lateral Load if corner gussets are removed

Applied Lateral Load

Note:
We found that having only the top two corners reinforced that it was Not as stable as when All four corners were Secure.
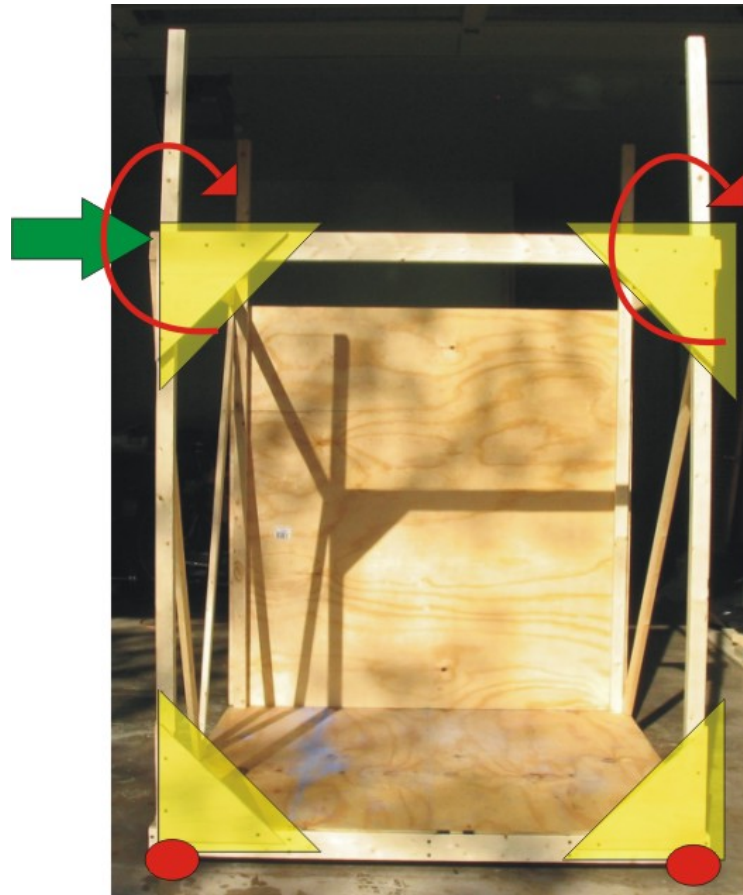
Lateral Resisting Systems

System 4: Chevron

Effect of lateral Load if chevron is removed
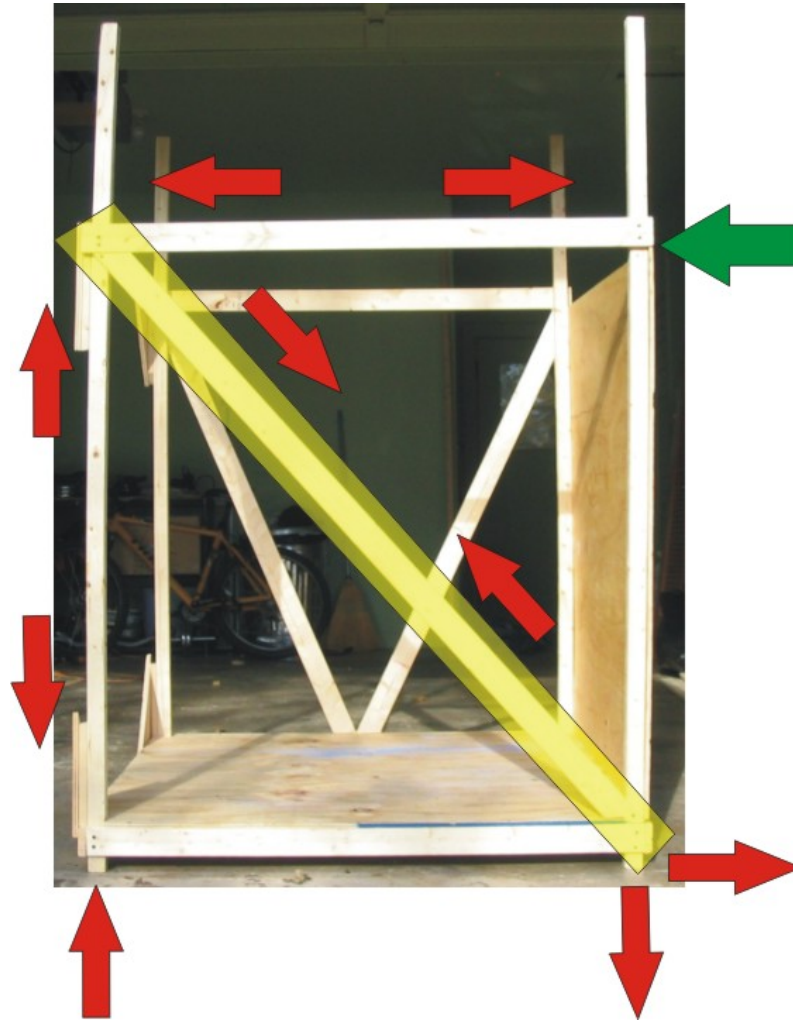
Applied Lateral Load

Fixed Frame Load Tracing

Bracing causes the beam and column to act as one at the corner

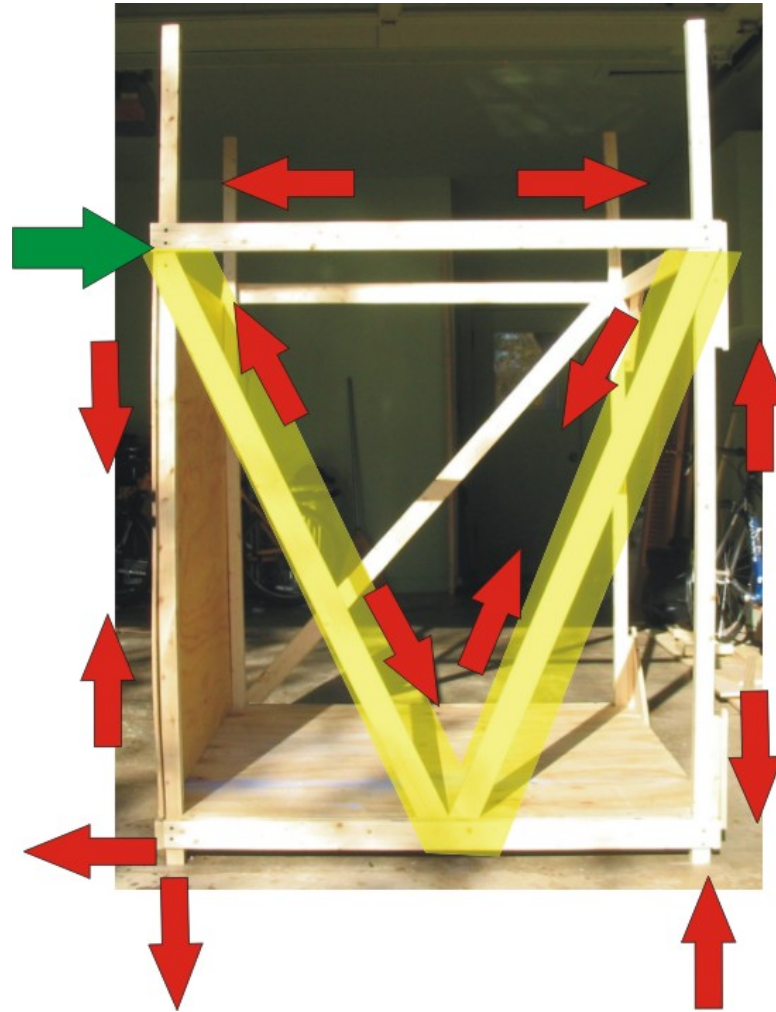Fixed bracing resists overturning and twisting.

Diagonal Support Load Tracing

No moments develop

Chevron Load Tracing

One member in tension, one in compression.

Resists twisting and torsional deformations.

Expense Summary

$43 for this?

Sources

Schodek, Daniel L. *Structures.* 5th Edition.
Pearson Prentice Hall. 2004

THE END