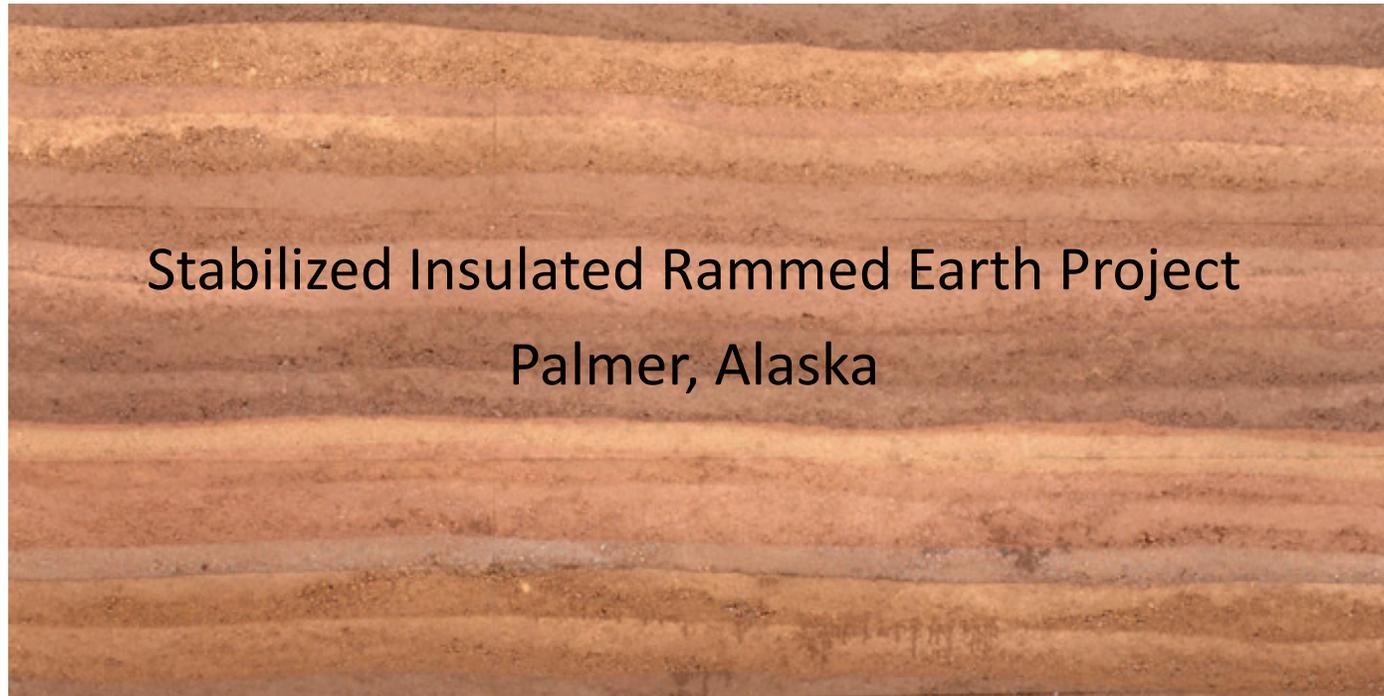


Innovative Building Around Alaska



Overview

- Project team
- Genesis
- What is rammed earth?
- Building design/details
- How to build a rammed earth wall



Project team



- Tribally Designated Housing Entity for 12 tribes in 10 communities within the Aleutian and Pribilof Island region
- Established in July 1977
- Has developed over 304 single-family homes, 65 low-rent units, and 17 fair market rentals
- Own, manage, and operate over 258 housing units throughout the region



Project team - continued



Genesis

“In the beginning...”



Project genesis

AHA's mission

The mission of the Aleutian Housing Authority, working in partnership with member tribes, is to contribute to the building of healthy, stable communities throughout the Aleutian/Pribilof region by being the primary provider of quality, affordable housing, and housing related support services; expanding and improving community infrastructure; and being a major generator of opportunities for employment and economic development.

AHA's core values

- *Commitment*
- *Teamwork*
- *Communications*
- *Integrity*
- *Accountability*
- *Partnership*
- *Innovation*



Project genesis

AHA's mission

The mission of the Aleutian Housing Authority, working in partnership with member tribes, is to contribute to the building of healthy, stable communities throughout the Aleutian/Pribilof region by being the primary provider of quality, affordable housing, and housing related support services; expanding and improving community infrastructure; and being a major generator of opportunities for employment and economic development.

AHA's core values

- *Commitment*
- *Teamwork*
- *Communications*
- *Integrity*
- *Accountability*
- *Partnership*
- *Innovation - We are always seeking continuous improvement. We are never afraid to question the status quo.*



Project genesis - continued

Mission

“...healthy, stable communities...”

Project imperatives

- Promotes resident health (IAQ, etc.)
- Long-term durability
- Culturally/historically appropriate



What's a "barabara"?



Project genesis - continued

Mission

“...quality, affordable housing...”

Project imperative

- Intangibles (aesthetic appeal, etc.)
- First cost
- Low maintenance
- Energy efficient



Project genesis - continued

Mission

“...improving community infrastructure...”

Project imperative

- Improve quality of built environment
- Low energy demand
- Minimal waste generation



Project genesis - continued

Mission

"...employment and economic development..."

Project imperative

- Use local materials
- Use on-site labor
- Develop local industry



IMAGINE A CREATIVE,
LIVABLE, AFFORDABLE HOME.
NOW IMAGINE IT IN ALASKA.

LIVING
ALEUTIAN
HOME
DESIGN
COMPETITION



What is rammed earth?

And what *isn't* it?



What is rammed earth?



What is rammed earth?

- Traditional rammed earth:

- Gravel
- Sand
- Clay
- Water
- Lime (occasionally)
- Animal blood (infrequently)

- *Stabilized* rammed earth:

- Gravel
- Sand
- Cement
- Water
- Admixtures (waterproofing/efflorescence prevention, pigments, etc.)



What is rammed earth?

- Mix proportions:

- | | |
|---|----------------------------|
| • Coarse aggregate (D-1) | 58.5 tons (45% by weight) |
| • Fine aggregate (coarse concrete sand) | 58.5 tons (45% by weight) |
| • Cement | 11.5 tons (9% by weight) |
| • Pigment | 0.5 tons (0.5% by weight) |
| • Xypex C-500 NF (waterproofing) | 0.2 tons (<0.2% by weight) |



What is rammed earth?

Laboratory Test Data (ASTM C39/C42/C617/C1231)

Cylinder Number	Break Age	Diameter Inches	Area (in ²)	Break Date	Maximum Load (lbs)	Break Type	Compressive Strength (psi)	Required Strength (psi)
1266	7	5.91	27.43	8/3/2015	85,095	3	3,100	
1267	7	5.91	27.43	8/3/2015	81,971	3	2,990	
1268	14	5.88	27.15	8/10/2015	98,359	3	3,620	
1269	14	5.89	27.25	8/10/2015	99,936	5	3,670	
1270	28	5.90	27.34	8/24/2015	102,986	3	3,770	
1271	28	5.91	27.43	8/24/2015	123,321	3	4,500	
1272	28	5.90	27.34	8/24/2015	113,887	2	4,170	
1273	28	5.90	27.34	8/24/2015	87,961	2	3,220	
1274	56			9/21/2015				
1275	56			9/21/2015				



Advantages of rammed earth

Pro

- Locally sourced materials (except for cement, rebar, admixtures, pigment, sealant)
- Natural (mostly)
- Continuous insulation
- Hygroscopic buffering
- Durable
- No additional finishes required
- Attractive

Con

- Labor intensive; slow
- Equipment intensive (or else *really, really* slow)
- Requires elaborate foundations
- High seismic loads
- Costly
- Cement content = CO² footprint

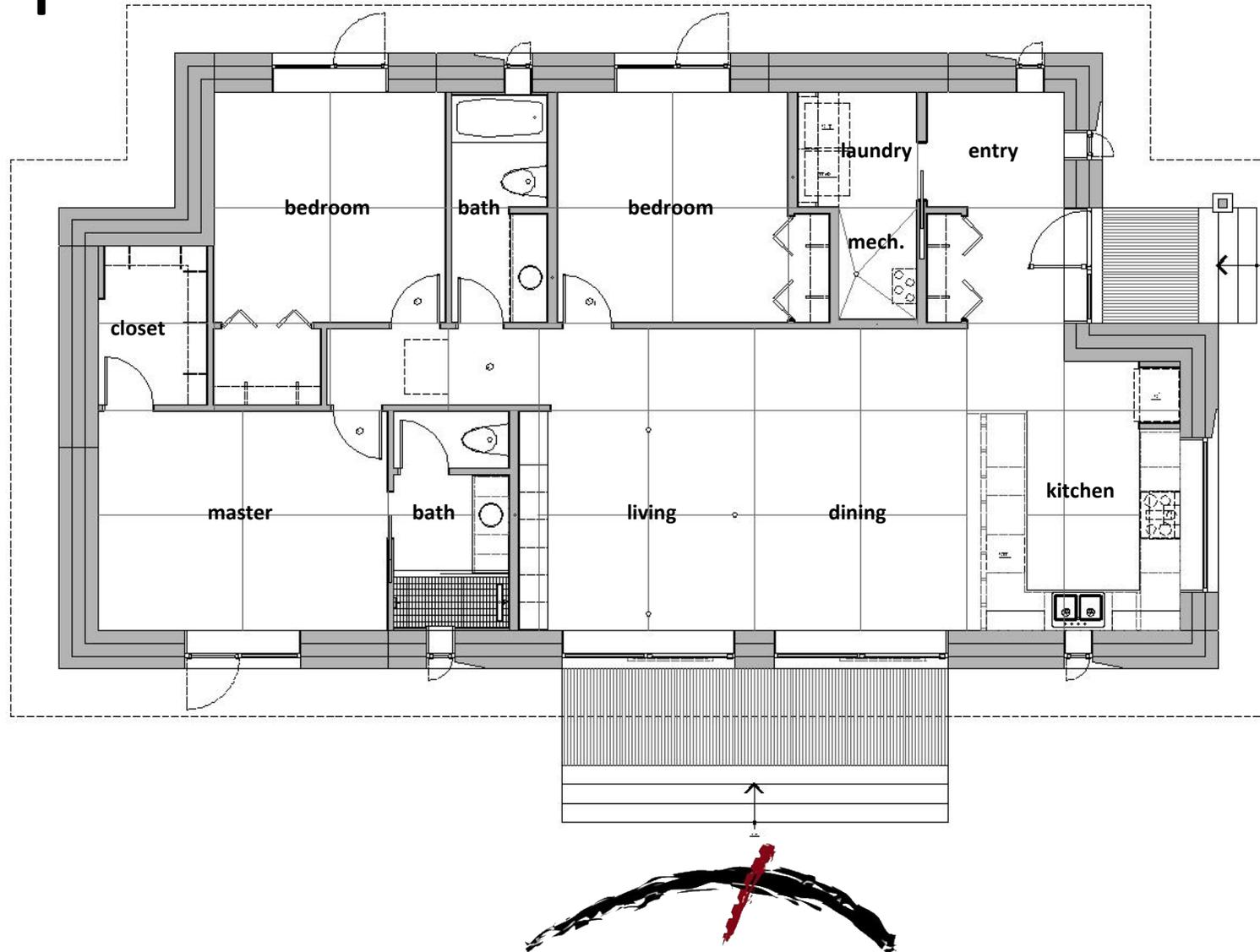


The project

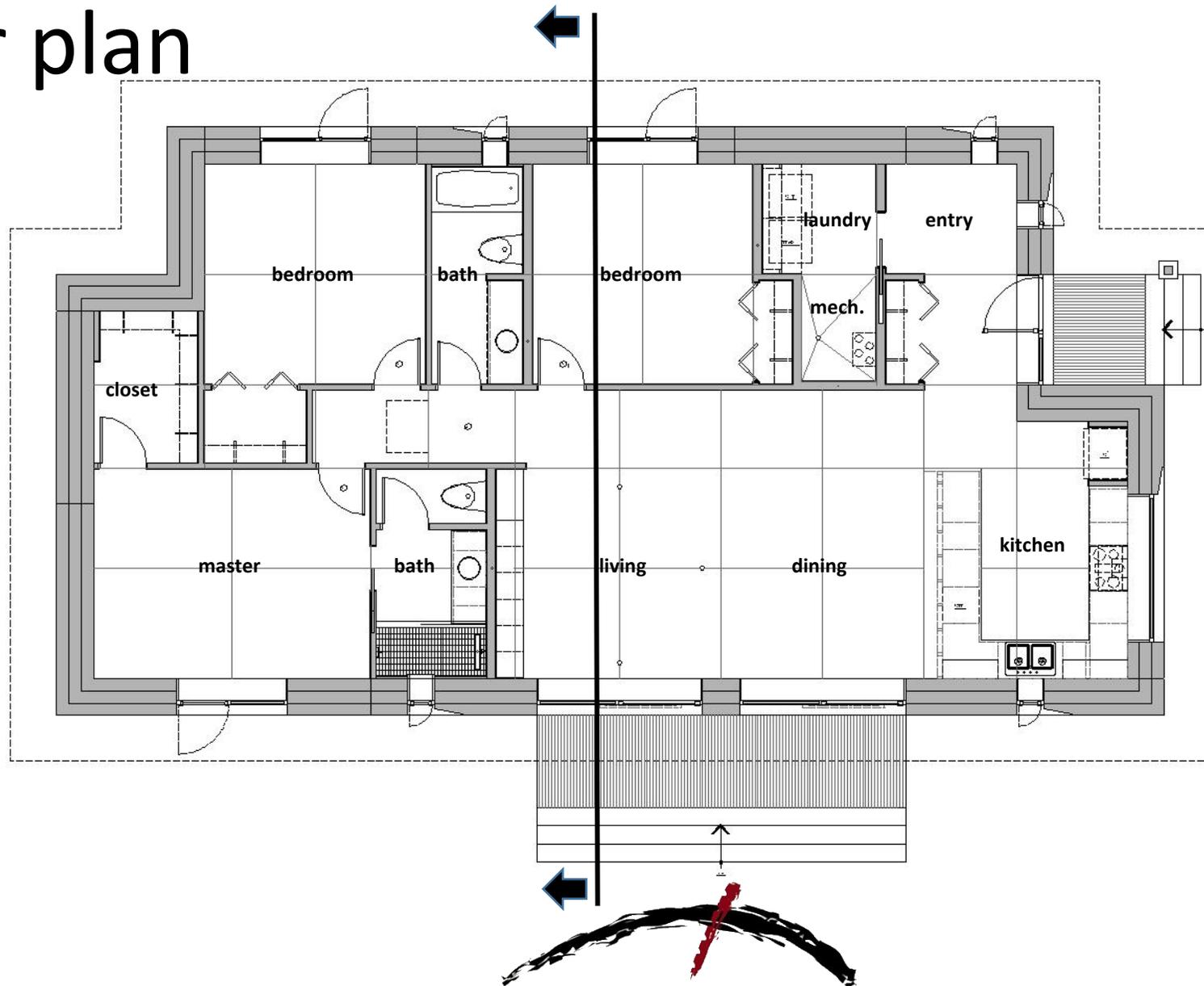
Design and details



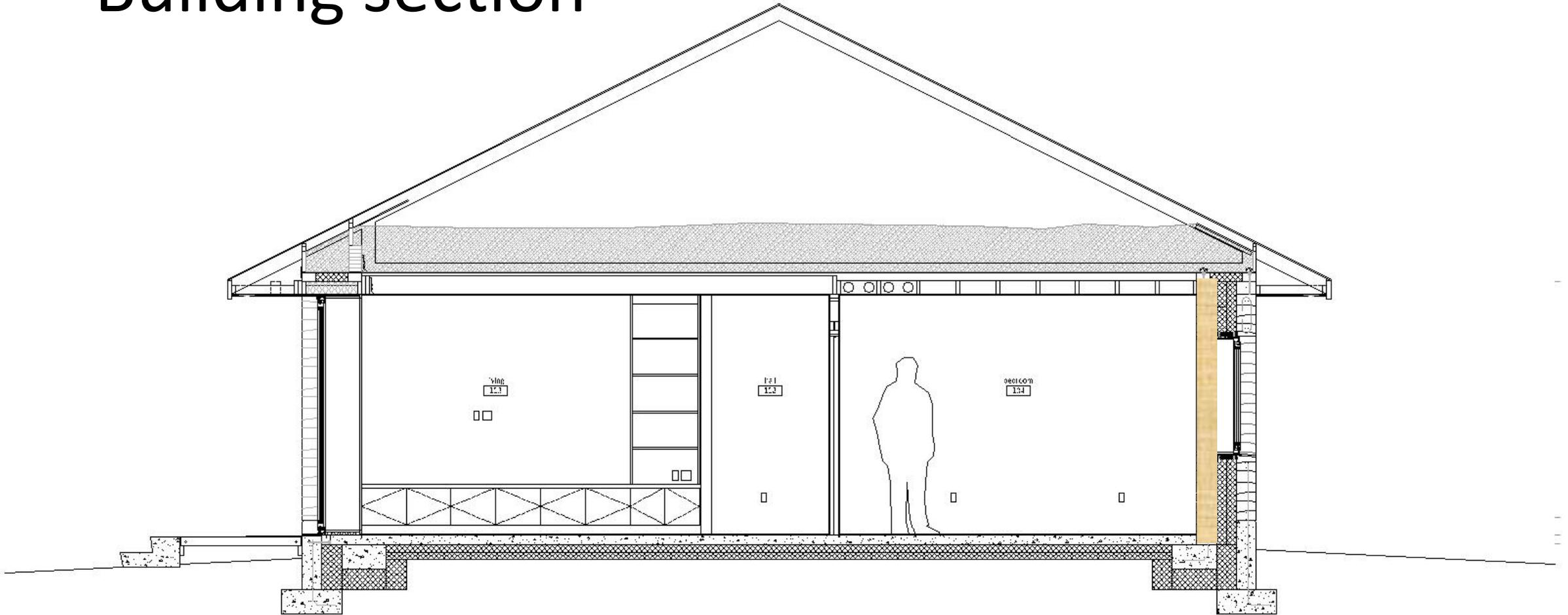
Floor plan



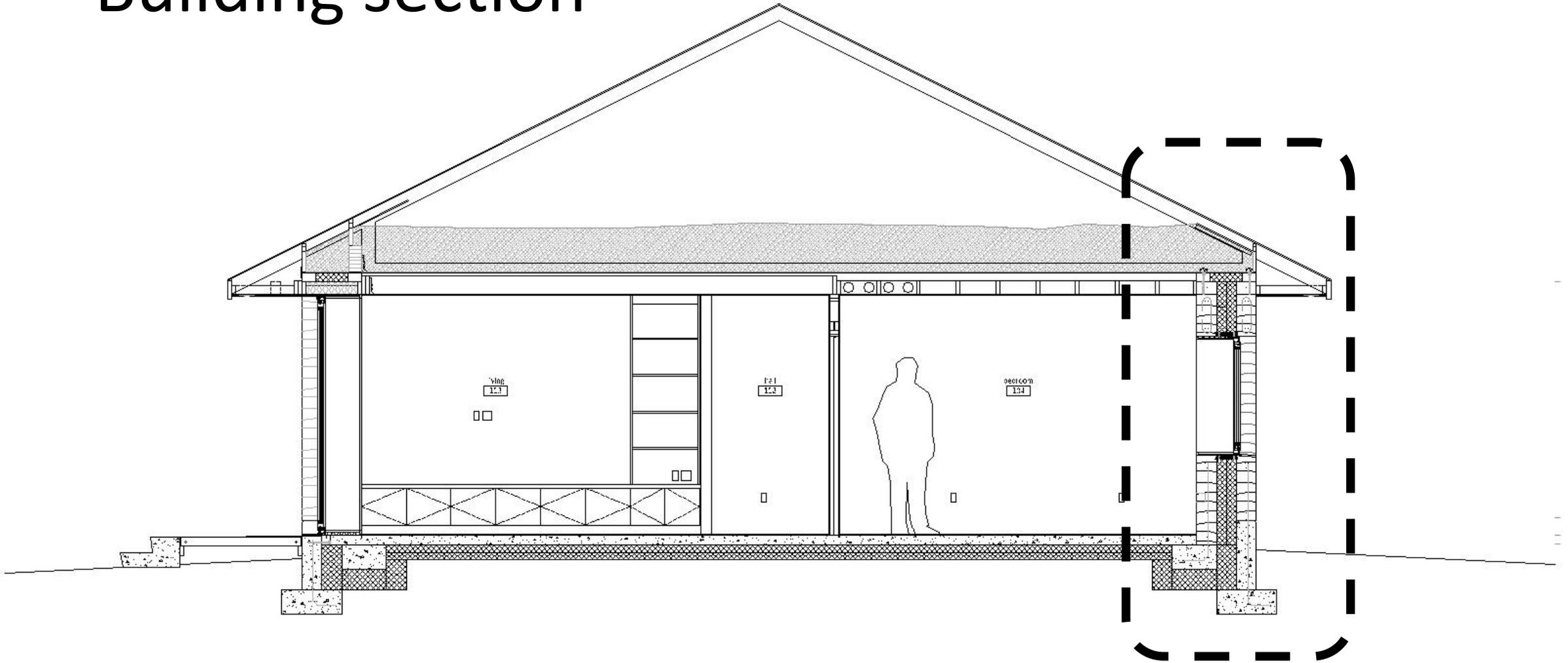
Floor plan



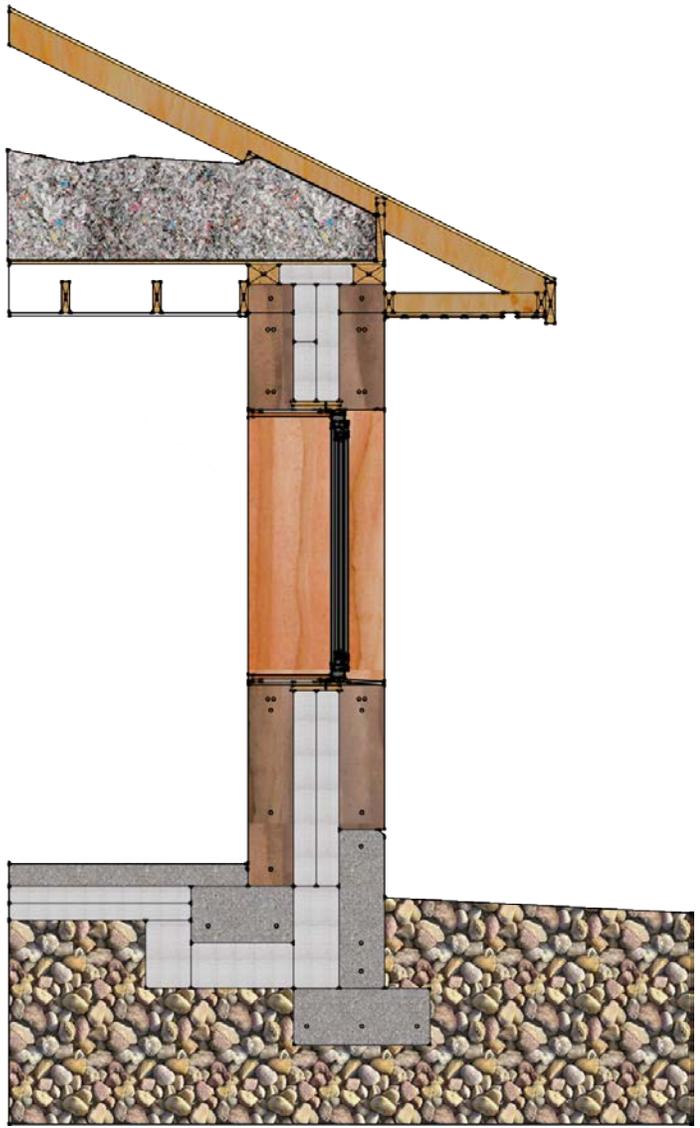
Building section



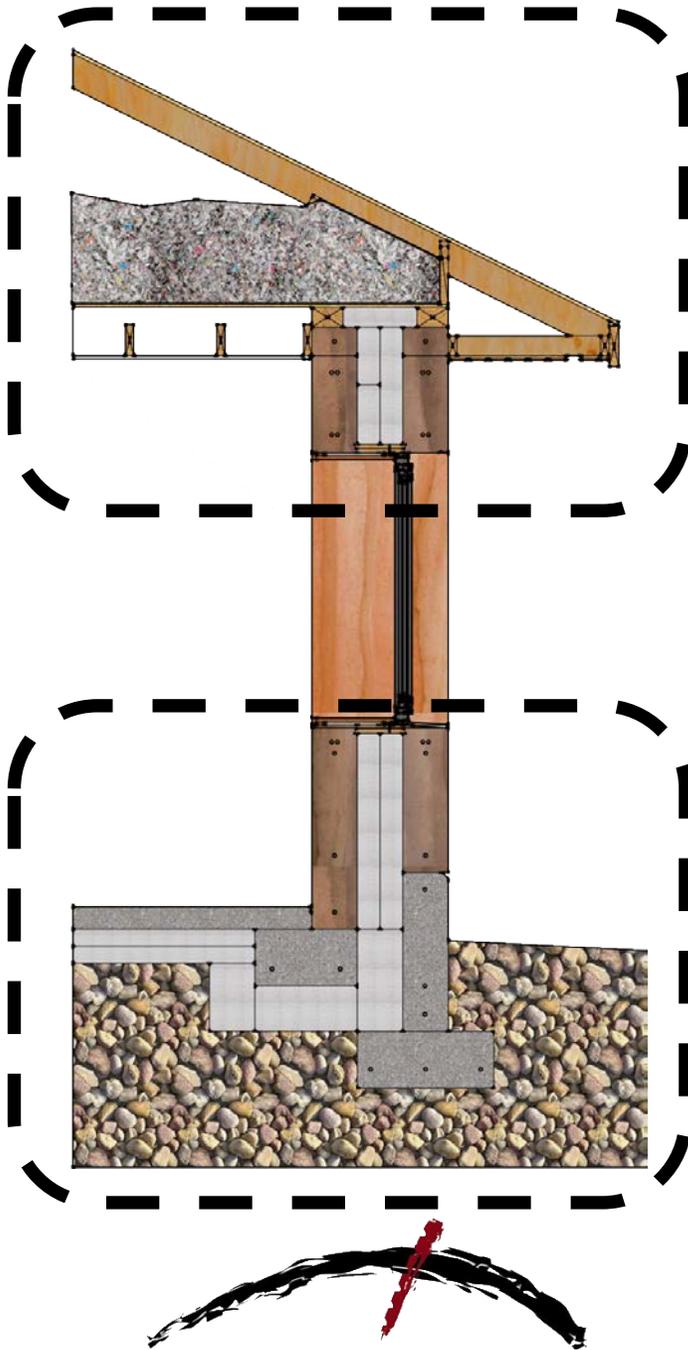
Building section



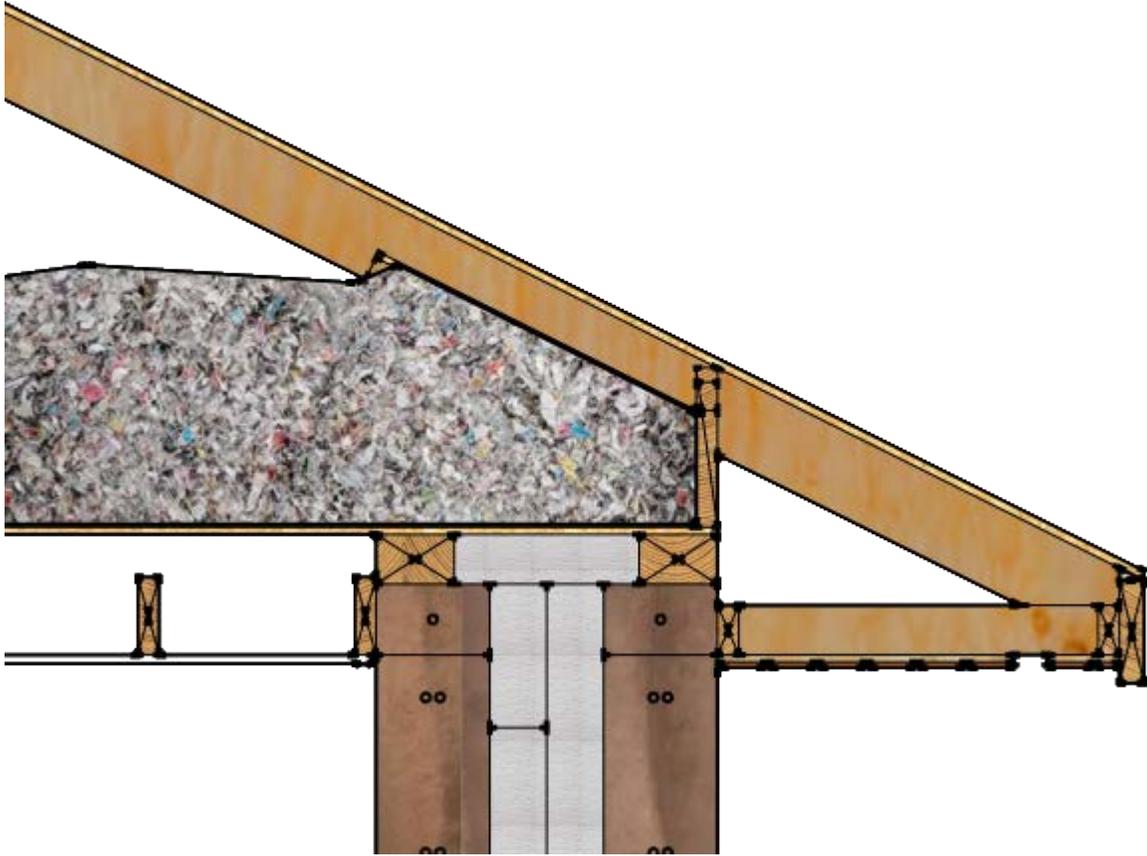
Wall section



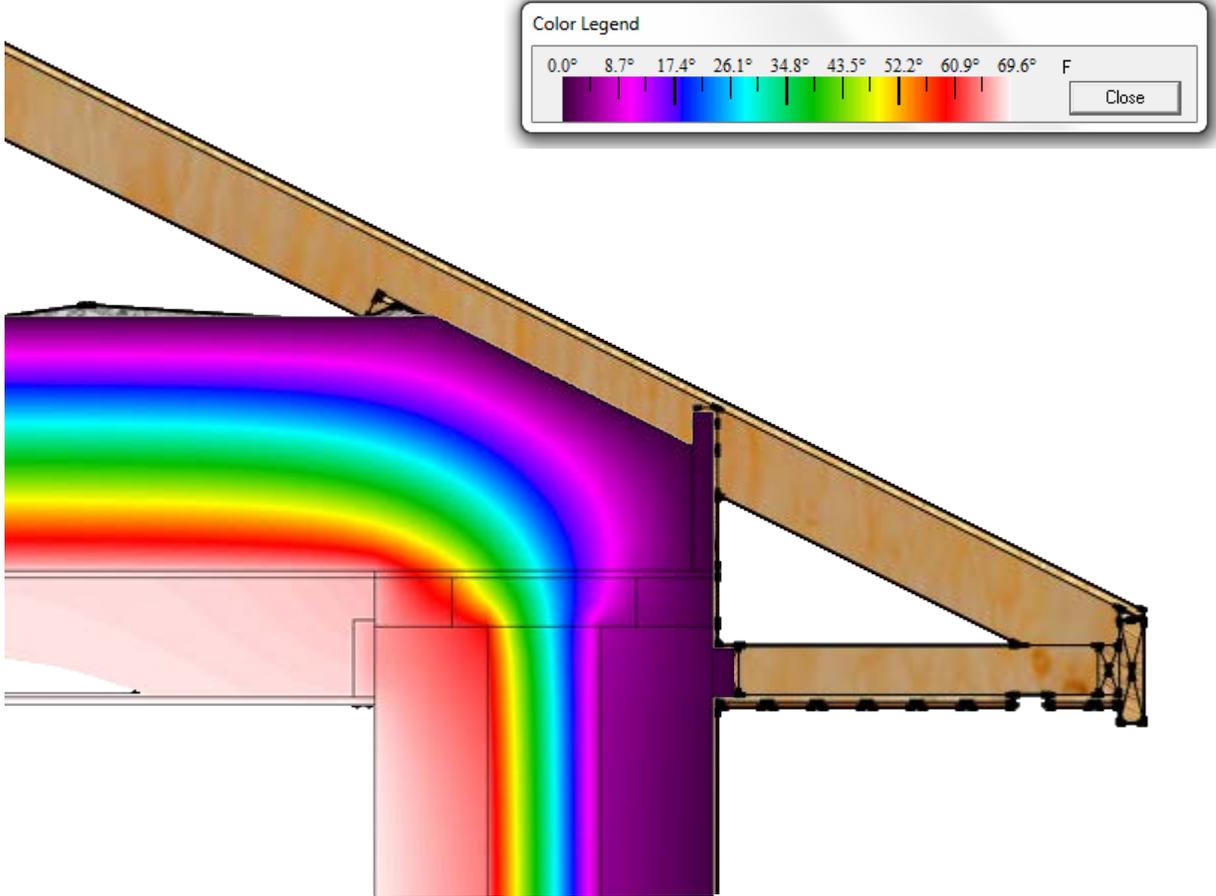
Wall section



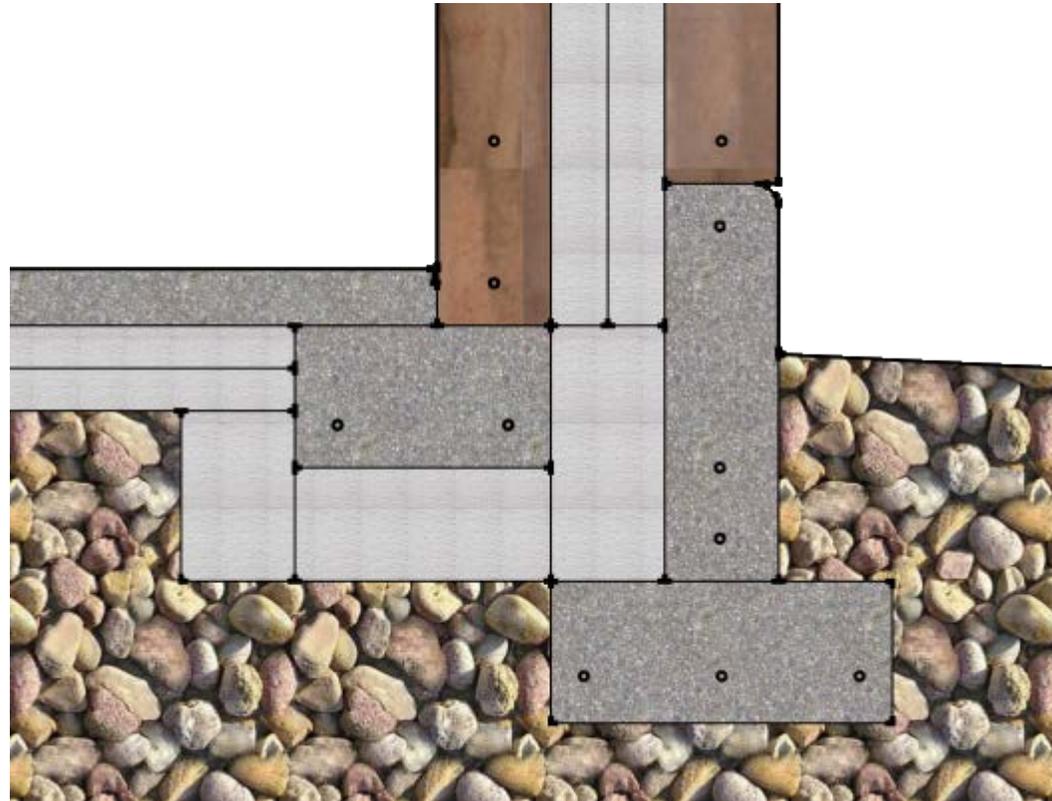
Top of wall



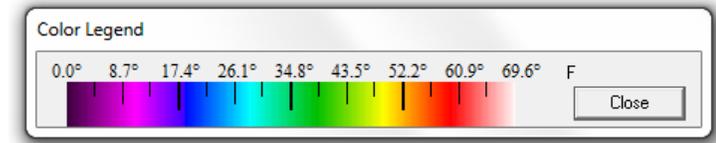
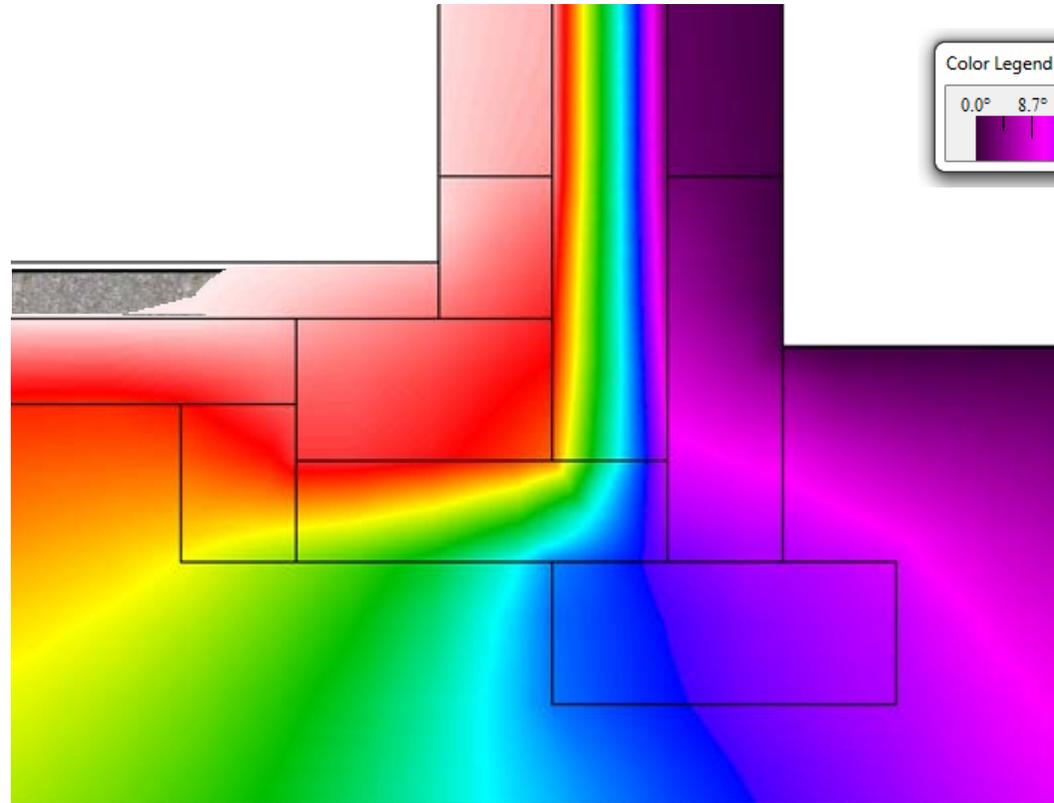
Top of wall



Bottom of wall



Bottom of wall

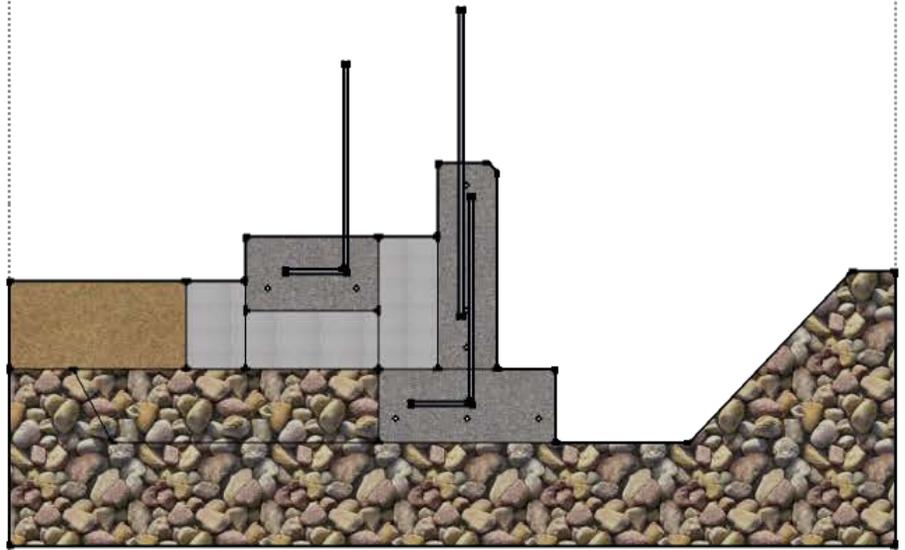


Building a rammed earth wall

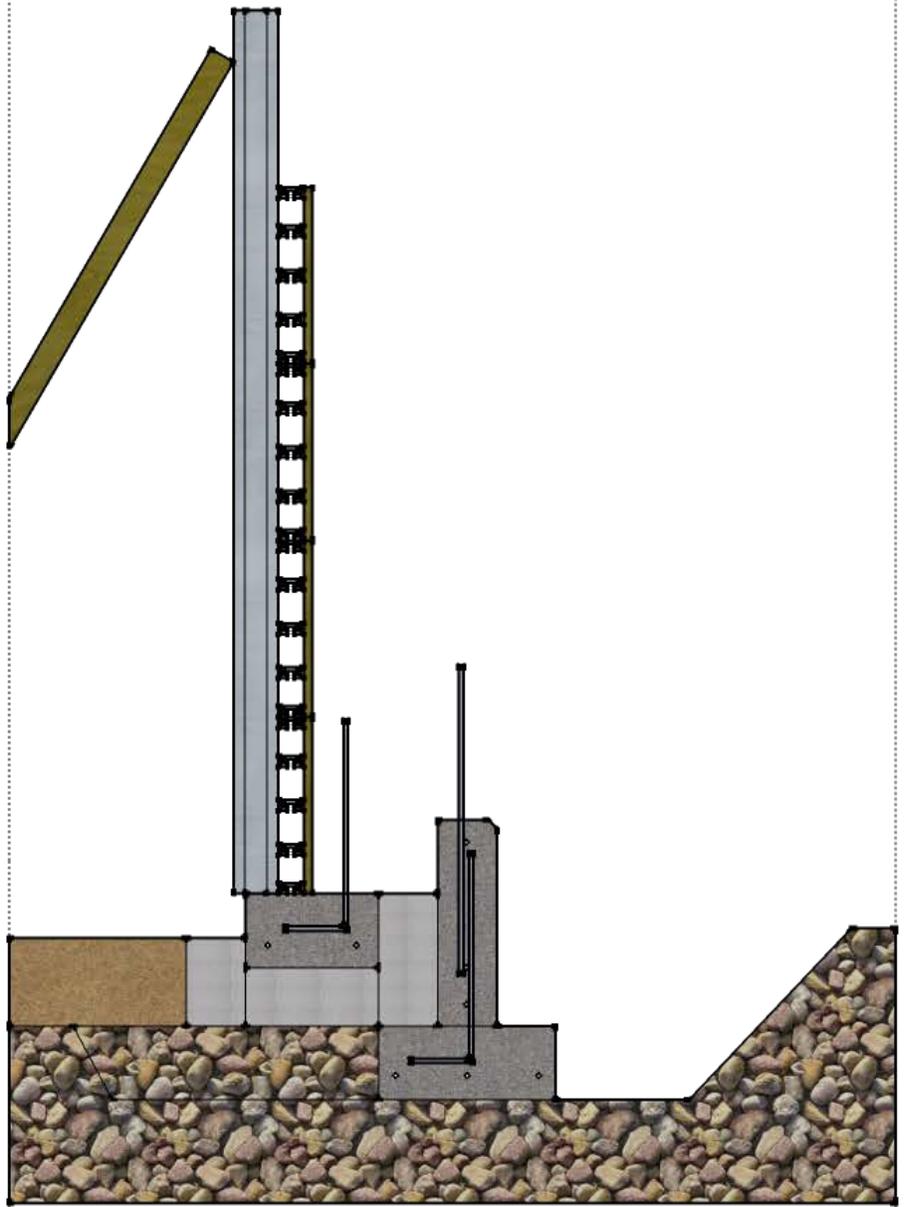
In 16 *easy* steps



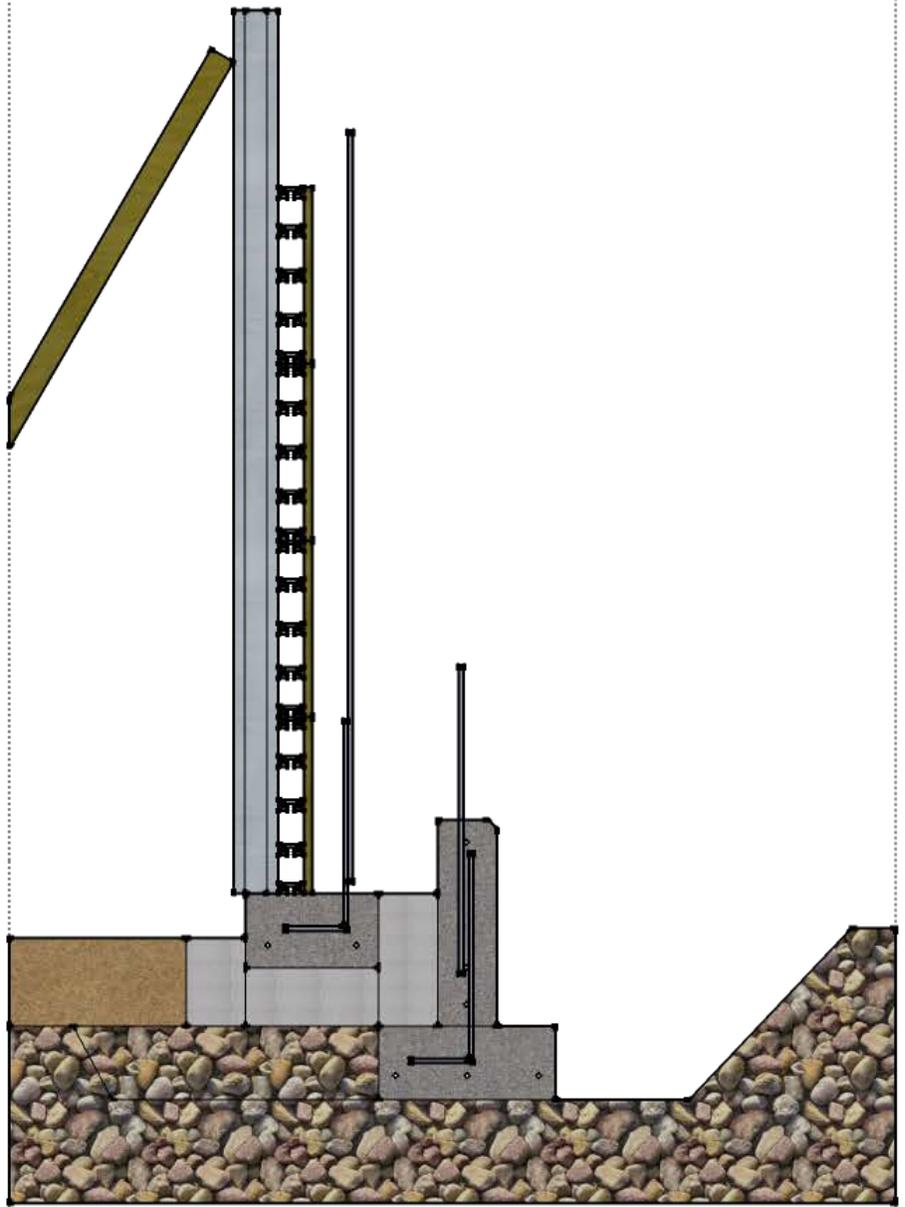
Step 1



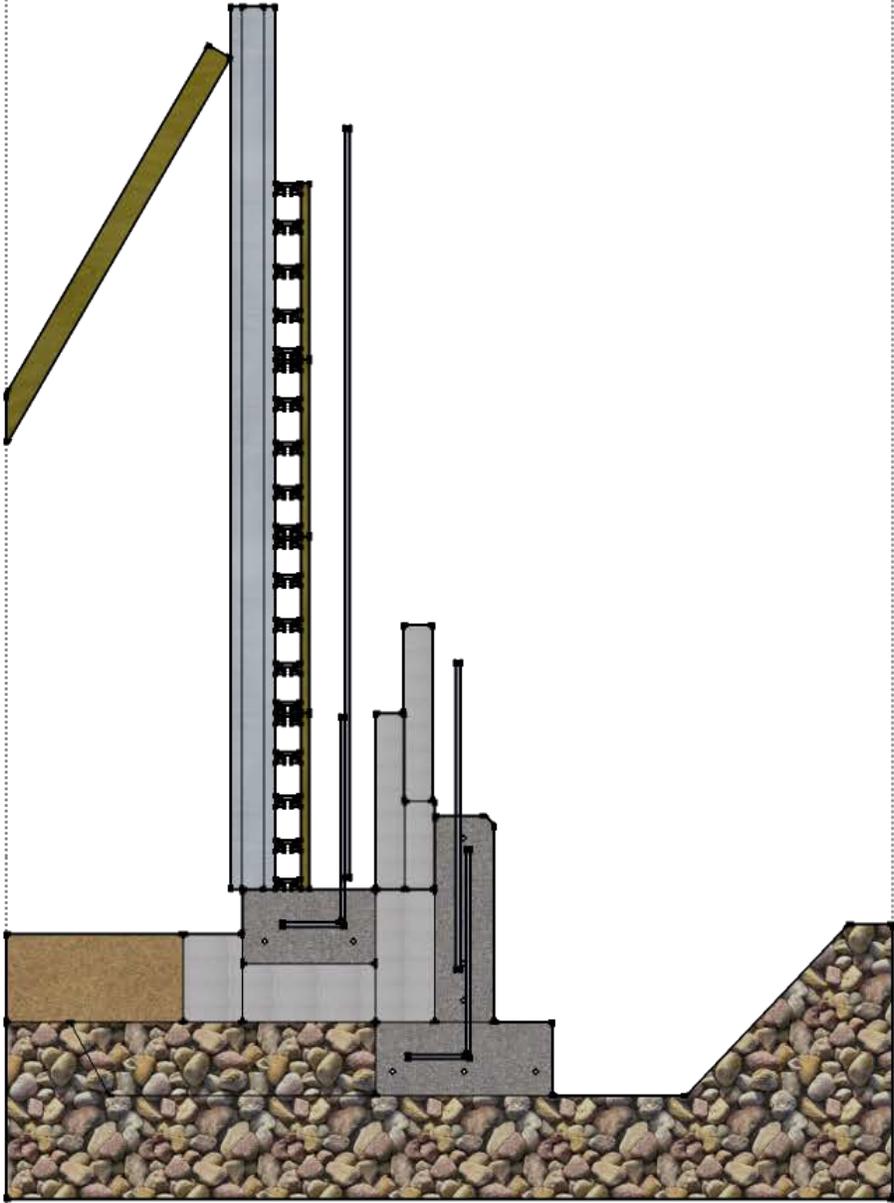
Step 2



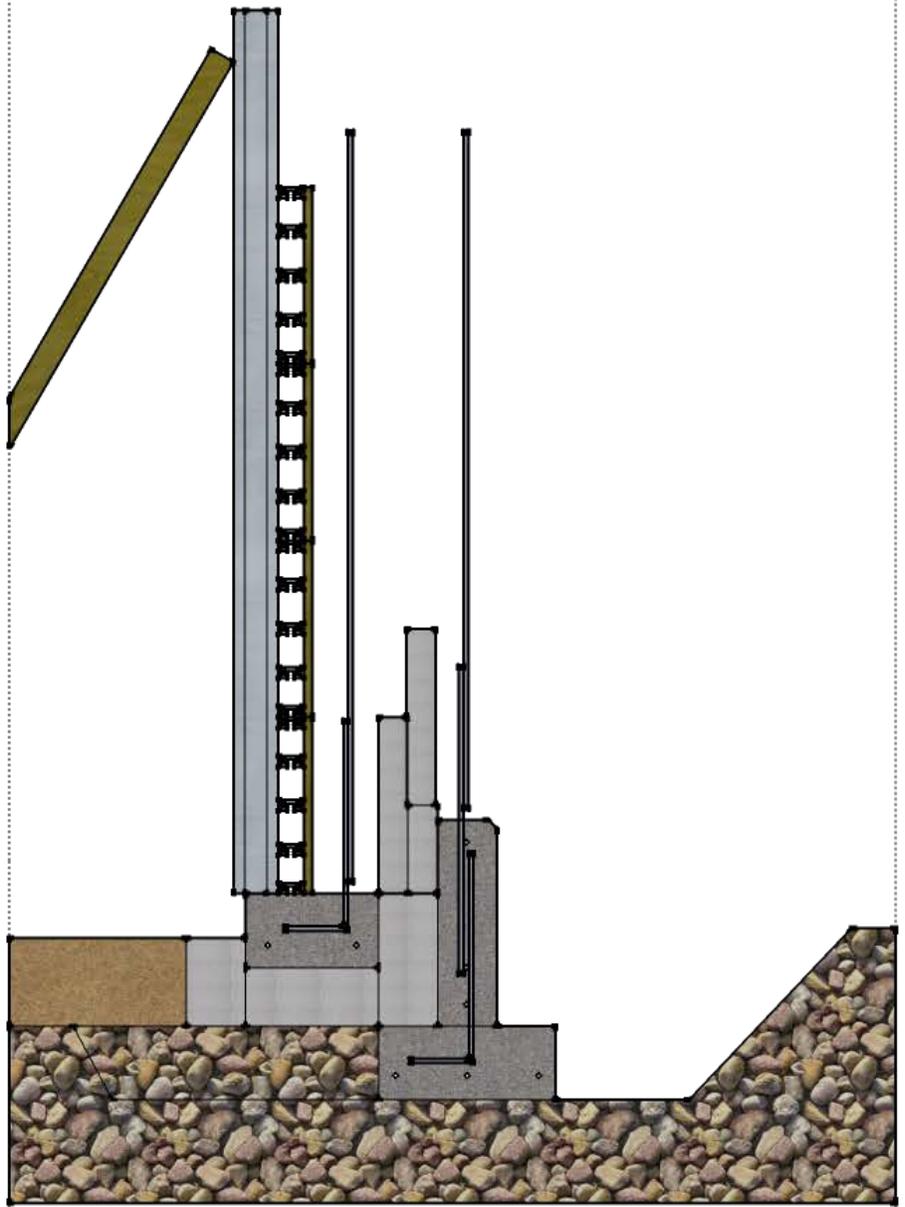
Step 3



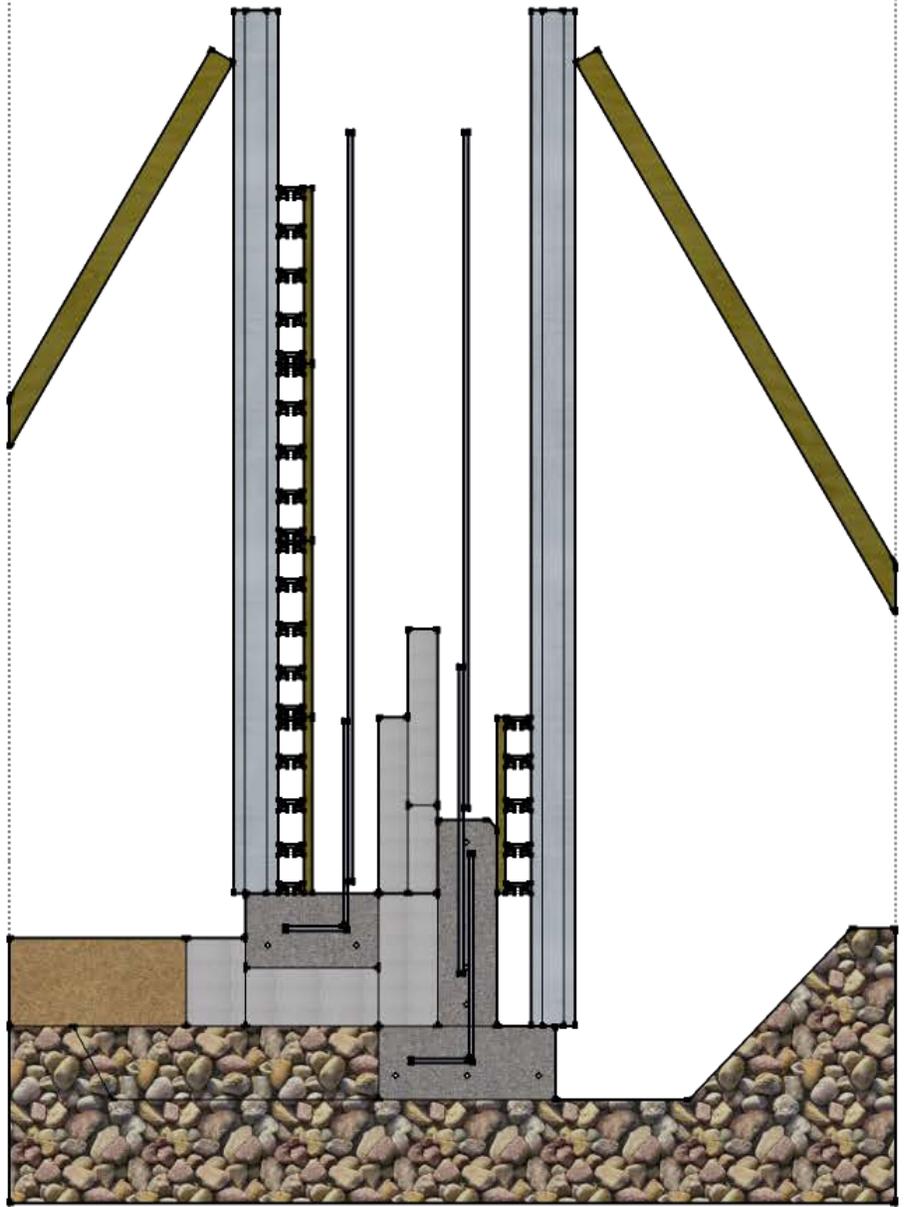
Step 4



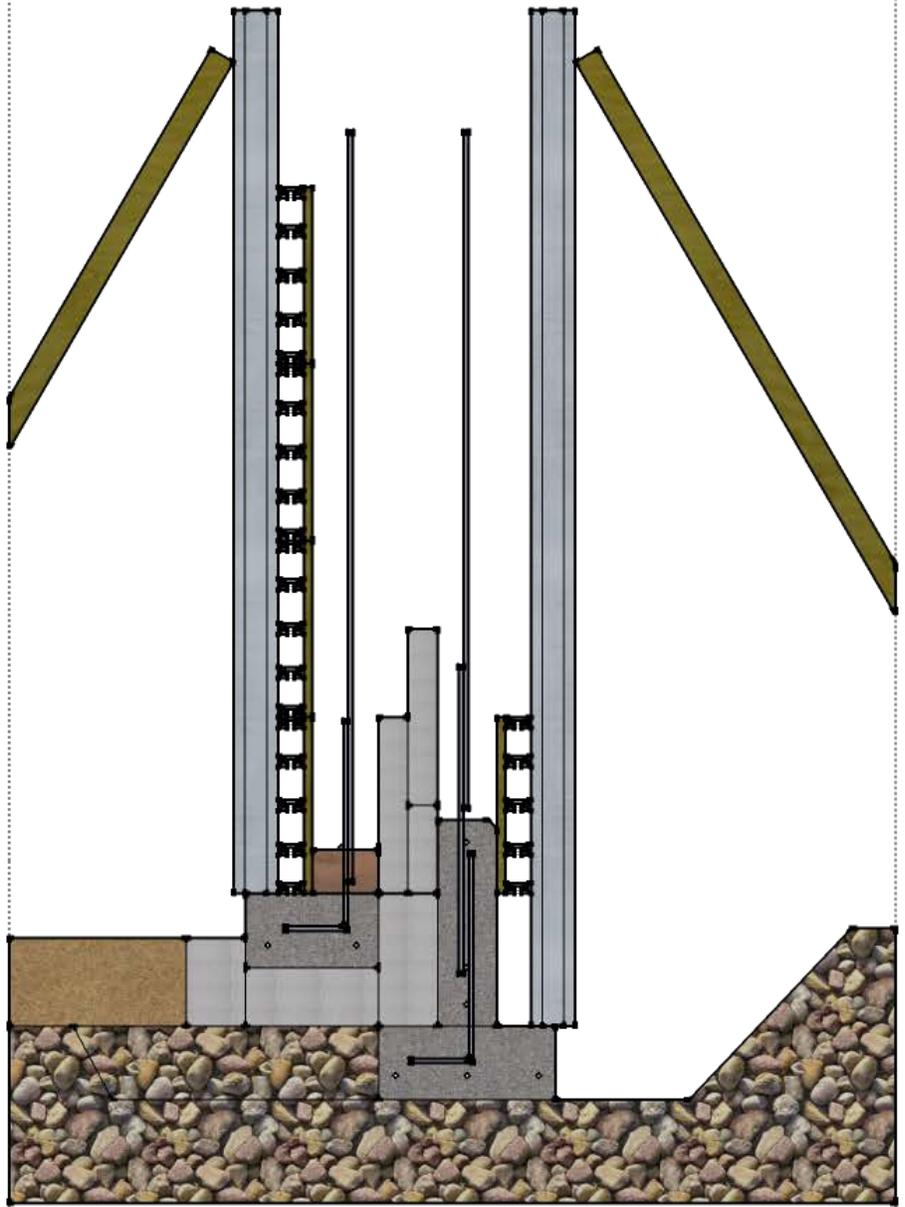
Step 5



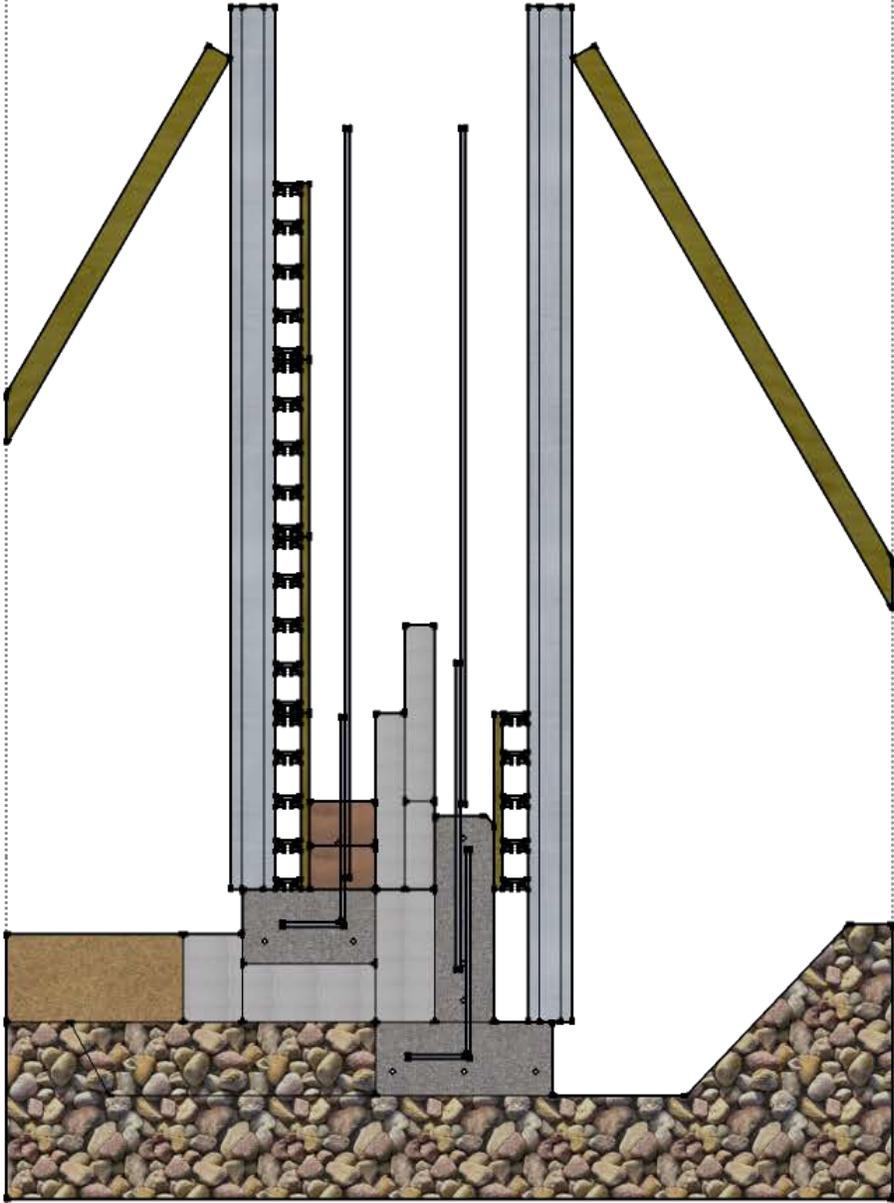
Step 6



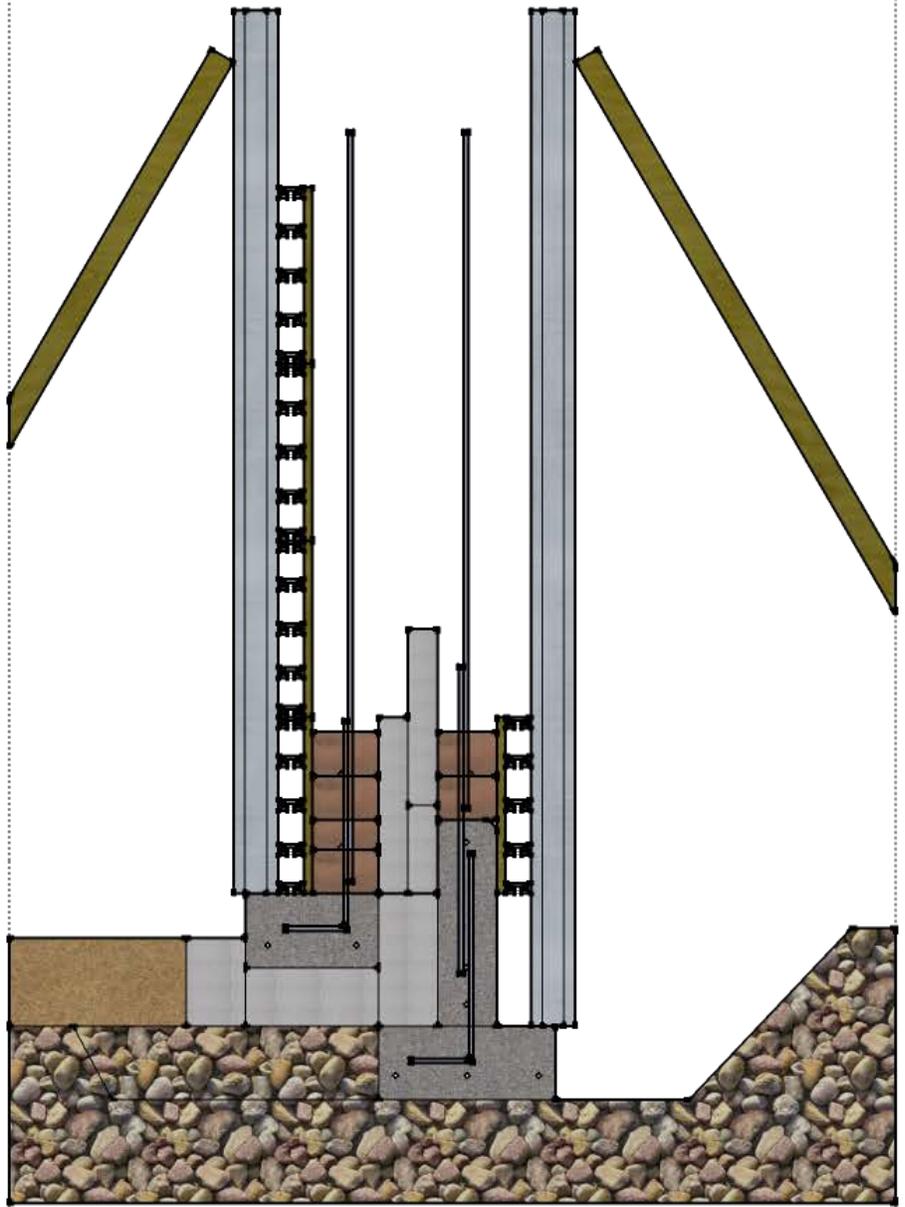
Step 7



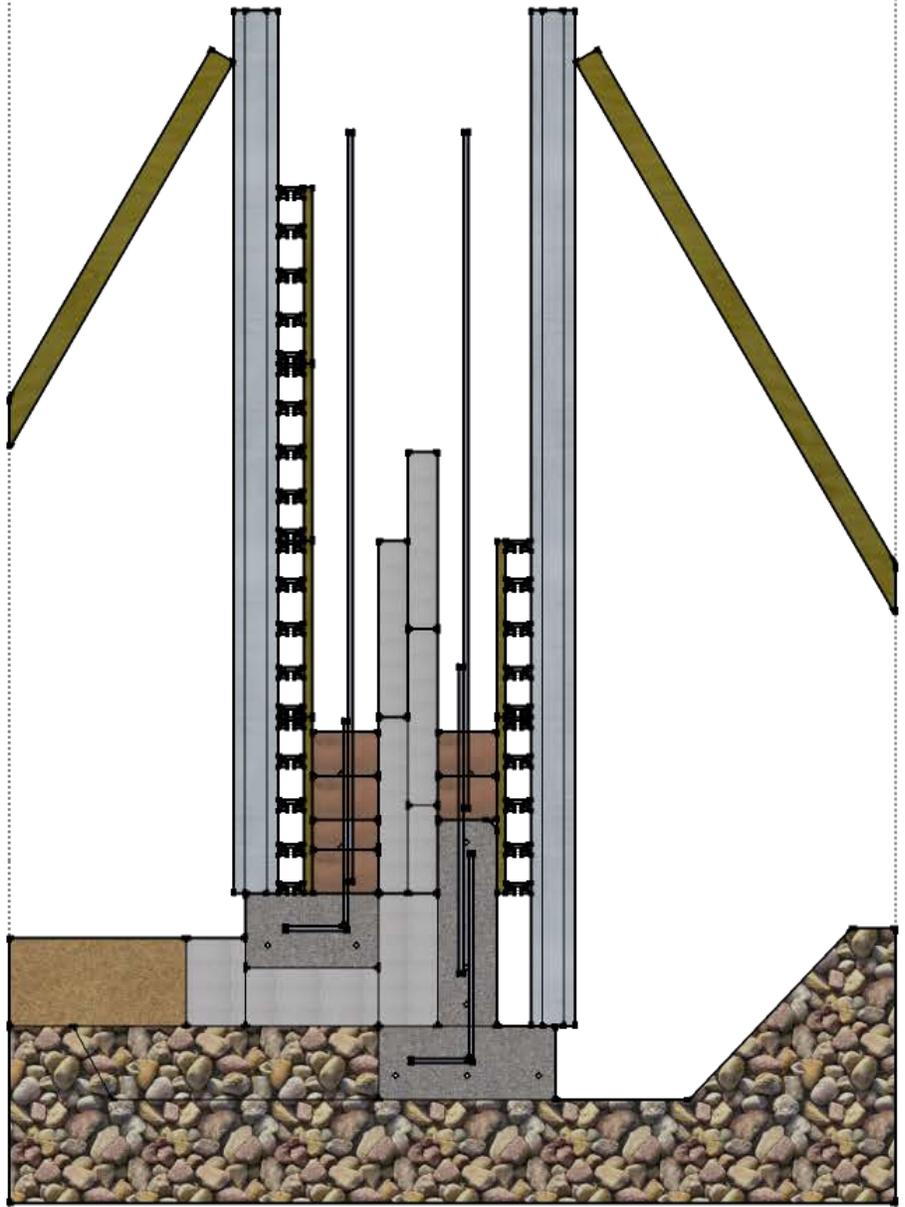
Step 8



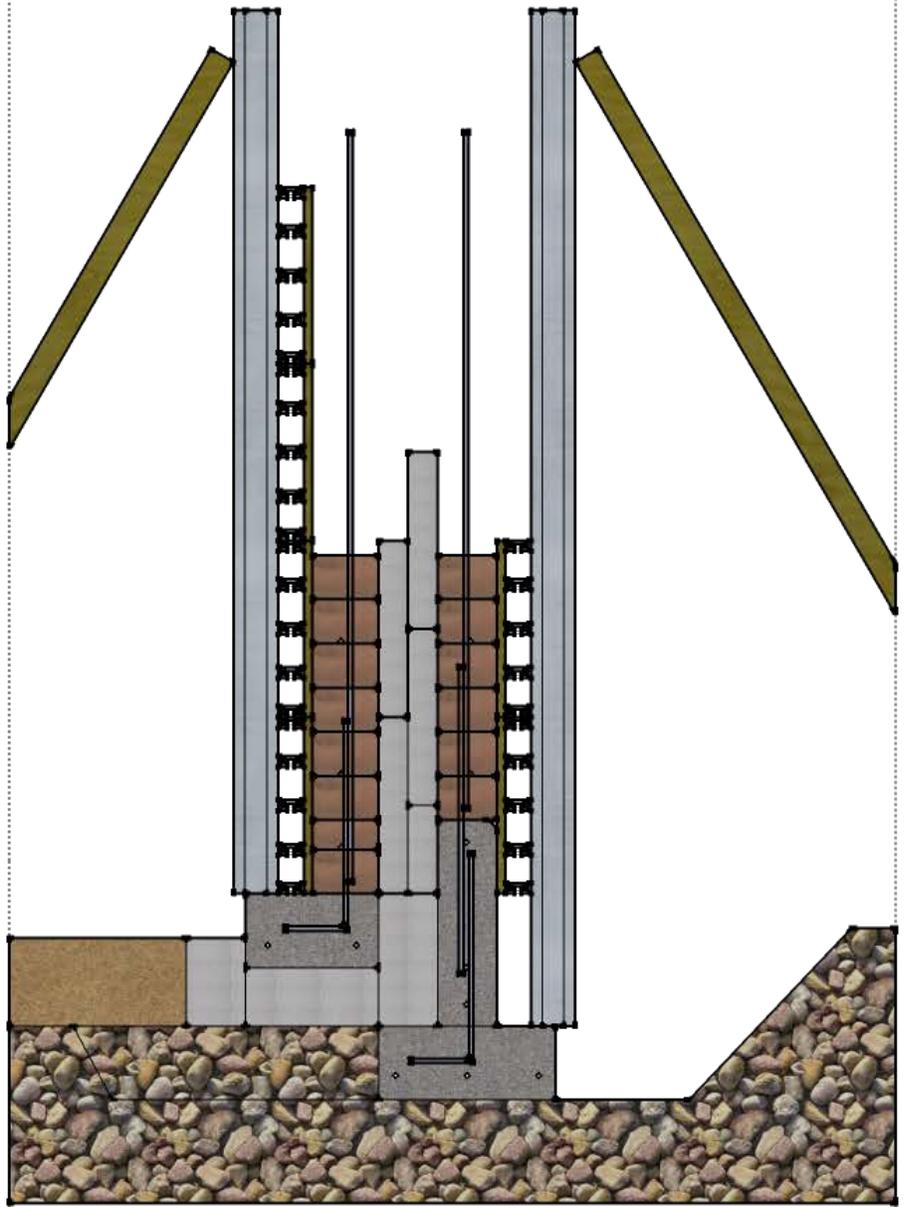
Step 9



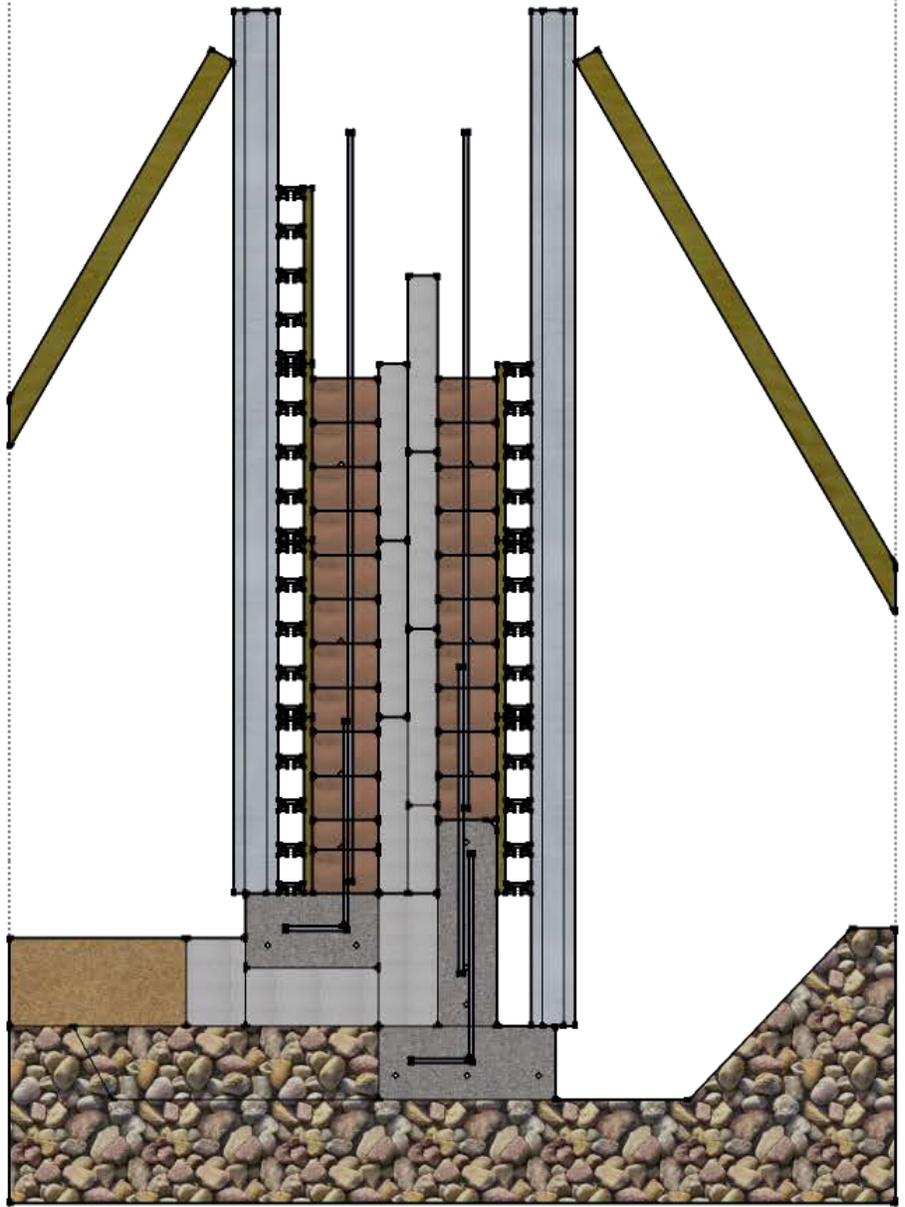
Step 10



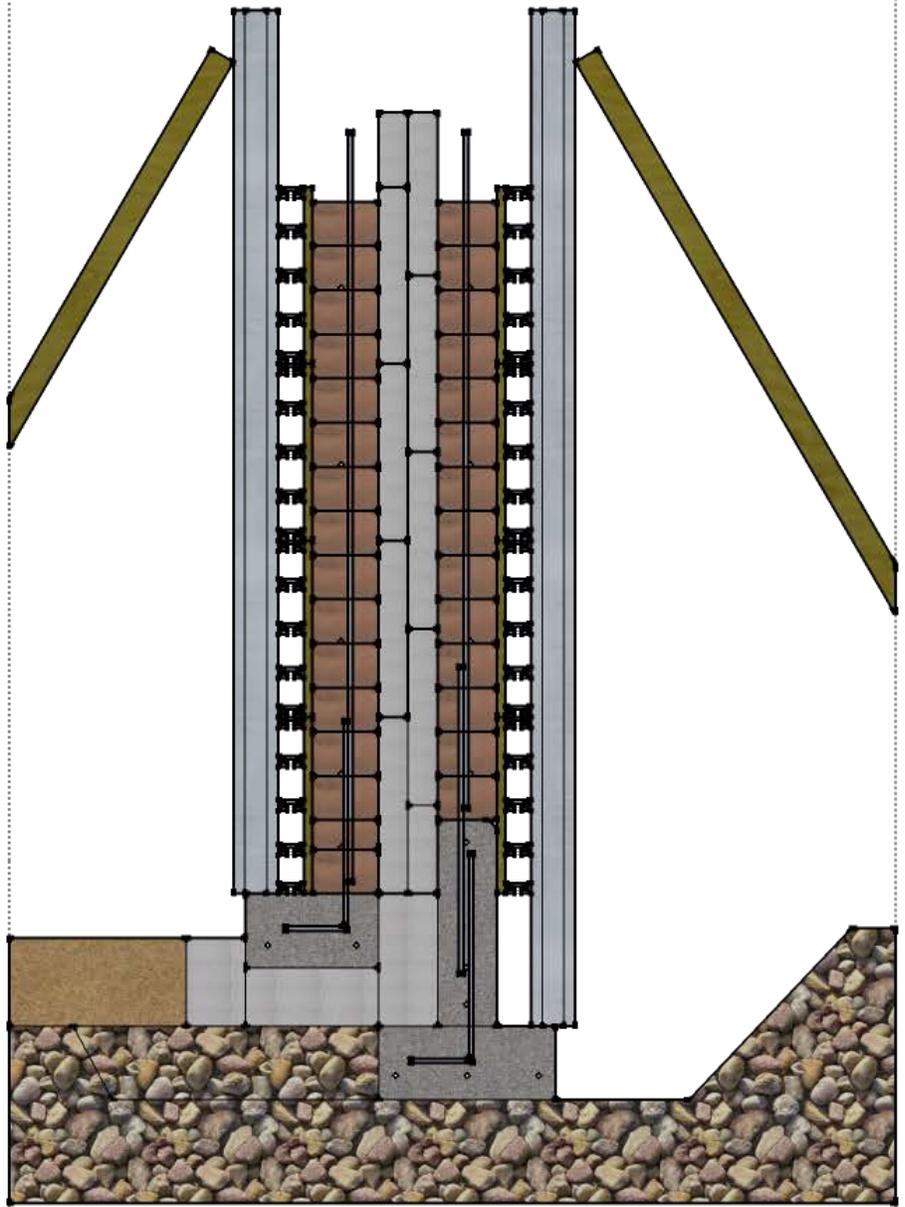
Step 11



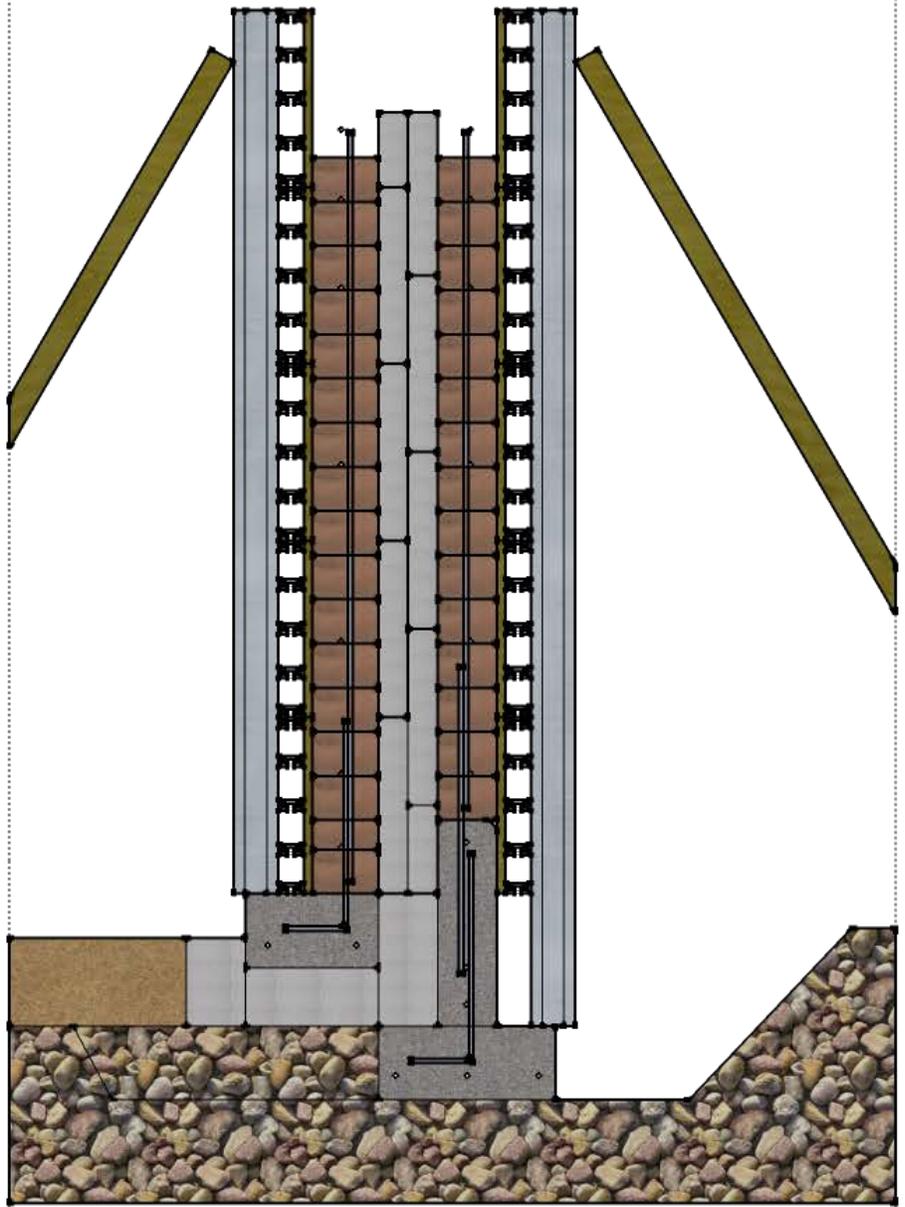
Step 12



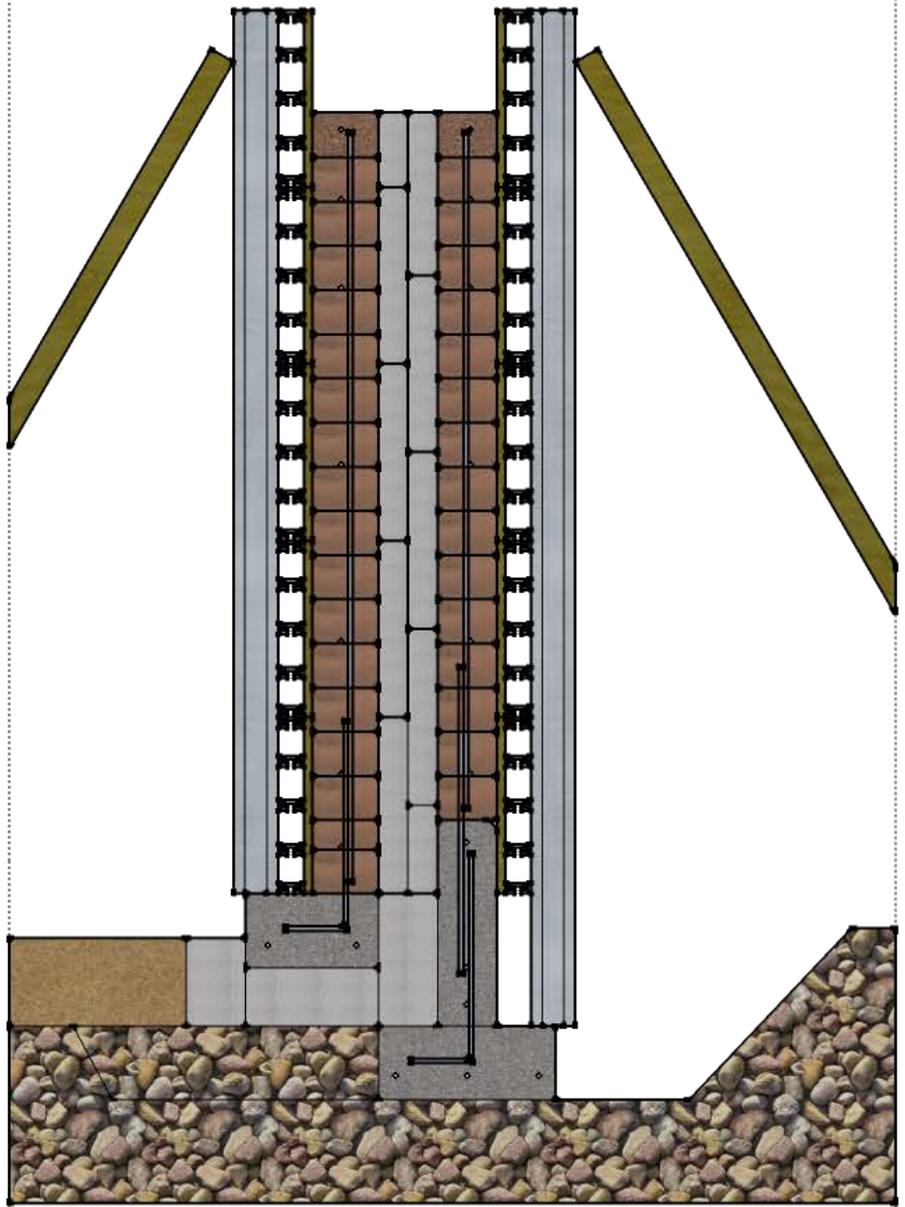
Step 13



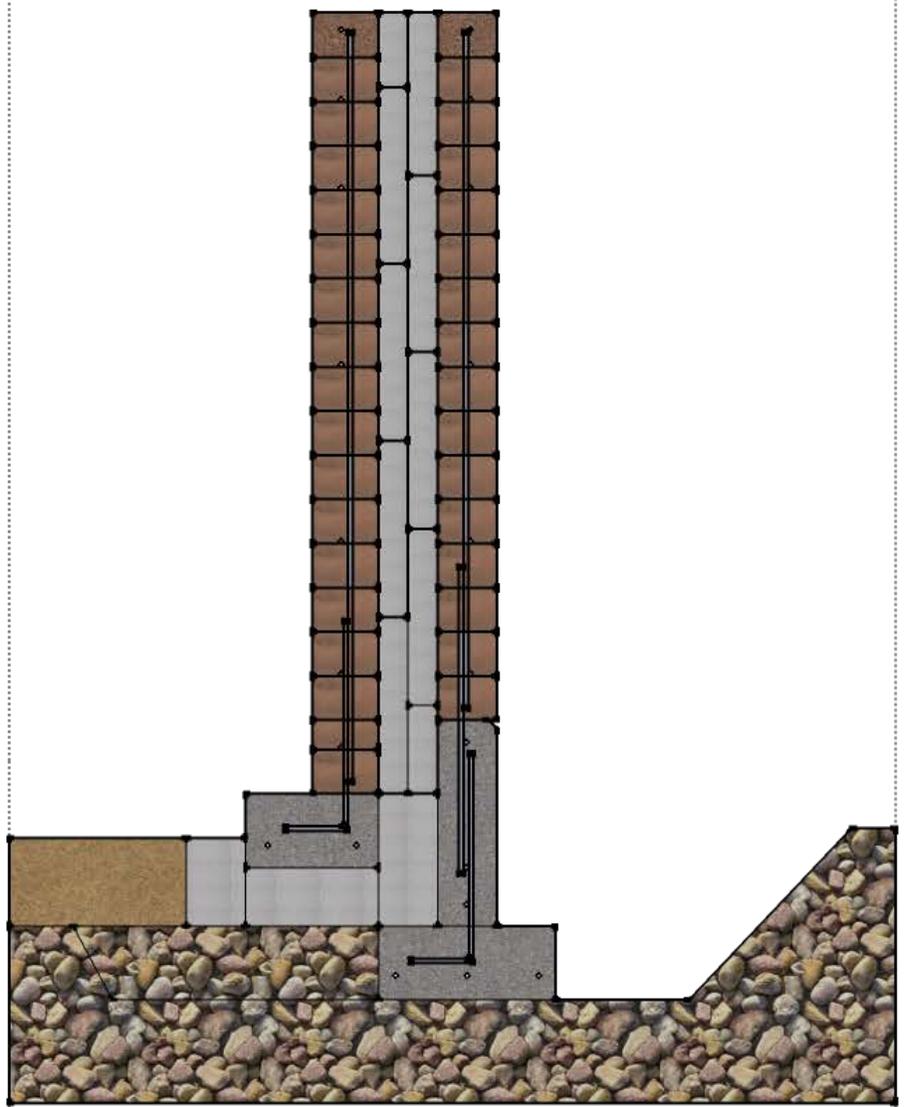
Step 14



Step 15



Step 16





Want more?

- <https://www.facebook.com/Aleutian-Housing-Authority-Rammed-Earth-Project-962358223784648/?fref=nf>
- https://www.youtube.com/watch?v=RTys-nZ5i_I
- <http://www.earthdwell.com/aleutian-living-building-challenge-design>
- http://www.frontiersman.com/news/experimental-building-project-combines-old-new-techniques/article_69f78266-64bf-11e5-ae28-a7f09237c902.html

