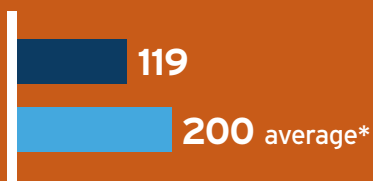


## Case Study: Pie Ranch Farmhouse Fire Rebuild

Pie Ranch, an agricultural education and sustainable advocacy non-profit, lost its historic farmhouse center in the 2020 California wildfires. The replacement structure will house farm apprentices, host events, display history, and provide office space for the organization. The new “farmhouse” structure reflects the size, form, and exterior appearance of its predecessor, while reorganizing the interior space to better serve the mix of uses. Place-based ecological and Indigenous ecological stewardship informed the building systems and material selections of site harvested strawbale insulation, earthen plaster and earthen floor, and salvaged wood. Curved, communal patio spaces and heavy wood plank details pay homage to Quiroste round houses and Yurok plank houses.

### Embodied Carbon

Cradle-to-gate, kg CO<sub>2</sub>e/m<sup>2</sup>



\*Average based on report from 2022.

### Reduction Strategies



Biobased insulation  
(strawbale, cellulose)



Earthen floor slab  
instead of concrete



Sand cement slurry  
pier foundation



Salvaged Fir  
flooring

### Carbon Storage



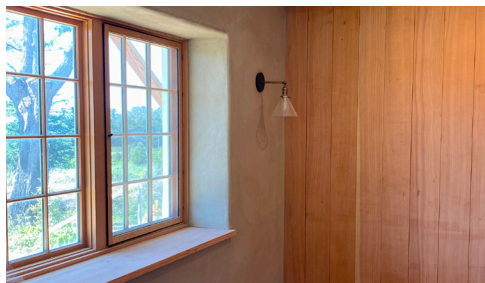
Strawbale  
insulation



Cellulose  
insulation

**10**

tons of CO<sub>2</sub> stored



“

**Pie Ranch’s vision for the fire rebuild is to honor the past, meet today’s needs, and model a sustainable future.**

Jered Lawson, Pie Ranch Director of Partnerships and Strategic Initiatives



**Operational Carbon** | The Farmhouse's appliances and mechanical systems are all electric. A future on-site solar PV system will power the house. Passive and active strategies are employed to reduce the energy demand. Solar hot water panels provide heat to radiant tubing in a sand bed under the earthen slabs and preheat the domestic hot water. Passive strategies include: awning roofs and exterior shutters to reduce heat gain, daylighting and natural ventilation with Northeast facing clerestories, thermal mass (earthen floor, plasters) to regulate temperature swings.



Electric appliances & mechanical systems



Passive strategies to reduce energy demand



On-site solar hot water system



Installation of the finish coat of the earthen floor

**Top:** The earthen floor was installed in a 3-step process: a 4" base slab is poured and allowed to dry, a 1" finish coat is poured and troweled flat and smooth, finally natural oils are applied to increase durability and water repellence. Earthen slabs are a mix of clay, sand, chopped straw, and water.

**Right:** This earthen plaster was installed in a 3-coat process: the scratch coat is worked into the strawbale, the brown coat is shaped flat and plumb, the finish coat provides a smooth finish. The scratch and brown coats used clay soil excavated during the construction of the foundation.



Application of earthen plaster over strawbale insulation

## Lessons Learned

1. Earthen slabs have far less carbon emissions than a concrete slab, while providing the thermal mass benefits.
2. Site soil conditions have a massive impact on the embodied carbon footprint (e.g. clay soils can require carbon intensive piers).
3. Sand cement slurry piers can be an effective lower carbon substitution for concrete piers in seismic zones where no retaining is required.

## Project Information

**Project name:** Pie Ranch Farmhouse Fire Rebuild

**Location:** Pescadero, CA

**Builder:** Benjamin Riordan, Cormorant Fine Craftsmen

**Architect:** Arkin Tilt Architects

**Year Built:** 2024

**Typology:** Residential, mixed-use

**Size:** 3,532 SF GFA