EARTHEN MASONRY CONSTRUCTION

A Building Solution for Our Future

Ecoblox by Colorado Earth used as a veener in Montecito, California
Promoting earthen construction in North America has been one of the most challenging and inspiring experiences of my life. Some things are instant loves, like the first sight of your child, or the ocean, or gelato, and they become life anchors that you couldn’t let go of even if you tried. The pursuit and practice of earthen construction has been like this for me, a love that comes with purpose and drive.

The thrilling part of owning and operating an earth block yard is opening new possibilities for people. This opportunity reveals things that had not been seen or considered before and shows why a shift away from conventional building materials should occur. In addition, there is pride in knowing that the block walls will be standing for hundreds or even thousands of years, as can be seen in historical earthen structures around the world.

I was introduced to adobe in New Zealand, the country that has produced the most comprehensive and detailed earthen construction code in the world, and where I initially practiced designing and building homes out of “mud bricks”. I am now designing, manufacturing and constructing EcoBlox, a lime, stabilized compressed earth block in Golden, Colorado. Situated alongside a local quarry, the overburden material from their excavation activities is delivered to the block yard site just a few hundred yards away and placed directly into our manufacturing equipment.

While being inspired, the challenges are substantial to sell this “new” building material in a North American market. Competing with established manufacturers and industry habits presents major challenges. My hope and work is for earthen construction to be recognized and utilized as a credible building material for those applications and projects it best fits.

Though earthen construction has been around for thousands of years, it gives us a means to be pioneers in supporting better management of our natural resources and regeneration of our environment. The humble earthen block serves both as a tie to our past, and a demonstration of a better future that uses innovation, building science, intuition and common sense to guide us on a path beyond conventions of traditional building methods.

Thank you for being part of this journey and for helping to change in the building industry.
# I. INTRODUCTION

- History of Earthen Construction  
- Concerns with Building Industry  
- Benefits of Ecoblox

# II. SERVICES

- Architectural Design  
- Block Making  
- Masonry Support  
- Boveda and Vault

# III. DESIGNS AND DETAILS

- Thermal Performance of EcoBlox  
- Specifications and Standards  
- Clients' Testimonials  
- Finished Product
HISTORY OF EARTHEN CONSTRUCTION

Earth Construction areas of the World (Source: CRATerre/ENSAG/Auroville)

“It is estimated that roughly a third of the world’s population lives in earthen dwellings – and about 50% of the population in developing countries.”
- Houben and Guillaud, 1994

www.coloradoearth.com
HISTORY OF EARTHEN CONSTRUCTION

WALLS OF JERICHO
8000 B.C.

The Chinese have been building rammed (or tamped) earth since 5000 B.C. An early example is the Great Wall of China.

CHINA, 5000 B.C.

ARG-E BAM, IRAN
200 A.D.

Remains in Eredo include a 100-mile long earthen wall where Africans built the largest city in the medieval world.

NIGERIA, 1000 A.D.

SHIBAM, YEMEN
1500 A.D.

BEEHIVE HOMES
SYRIA
3700 B.C.

The Egyptians used what is considered an early form of concrete, mud and straw to form bricks, and gypsum and lime to make mortars.

3000 B.C.

TAOS PUEBLO
1000 A.D.

The Great Mosque of Djenné is considered by many architects one of the greatest achievements of Sudano-Sahelian architectural style.

MALI, 1200 A.D.

MEXICO CITY
MEXICO
2017 A.D.

www.coloradoearth.com
CONCERNS WITH BUILDING INDUSTRY TODAY

High Embodied Carbon Building Materials
The production of concrete generates 8% of global warming emissions. If concrete were a country, it would be the third largest emitter after the United States and China.
Source: King, Bruce, Build Beyond Zero, 2022

Fires are on the Rise
Sadly we are seeing an increase in fires destroying communities around the nation. Traditional wood frame construction does not protect people and their belongings in the event of a fire.

Longevity and Human Health
Studies show the average lifespan of a home is about 50 years. Many of these homes experience issues with water damage, which includes water vapor in the air. A humid environment can cause metal to rust and wood to rot, as well as issues with our own health.
BENEFITS OF ECOBLOX

One of the Lowest Embodied Energy building materials on the market - reducing our planet's overall Carbon Footprint.

Breathable Walls absorb and release water vapor and pollutants creating healthier Indoor Air Quality.

Dirt doesn't burn, and neither do our walls. ASTM Fire Rating Tested - We are Fireproof!

Our product is 100% biodegradable - after a long period of use, it is returned to its natural state.

www.coloradoearth.com
BENEFITS OF ECOBLOX

Though we hope this is not of a concern, it is good to know that our walls are **Bulletproof**, literally.

Side-by-side testing shows that earthen walls use approx 50% **Less Energy** that traditional wood frame walls.

EcoBloxx Walls provide almost twice the **Sound Loss** when compared to a framed wall. Which means your son can learn to play the drums.

Exterior Lime Plaster can **Last Indefinitely** when applied properly.

www.coloradoearth.com
COLORADO EARTH SERVICES
ARCHITECTURAL DESIGN

Let us help create your vision

www.coloradoearth.com
Our Design Team at Colorado Earth will walk you through the design process from beginning to end.
Colorado Earth's Standard EcoBlocks are products at the foothills of the Flatiron Mountains in Golden, Colorado. The blocks are produced using sand and clay fines from a nearby granite quarry. The raw material is considered "overburden" or a byproduct of the excavation operations. Once the raw material is screened, it is delivered to the Colorado Earth facility, less than 1.5 miles away, reducing costs and transportation impacts.

Added to the natural screened fines are 6.5% lime (by weight) for stabilization, additional strength, but most importantly for protection prior to and during construction.

Once the masonry walls are protected with a suitable sealer or plaster finish, the walls will last indefinitely with little to no maintenance.
BLOCK MAKING SERVICES

COLORADO EARTH FACTORY

EcoBlox are produced in Golden, Colorado and delivered to your site.

www.coloradoearth.com
BLOCK SPECIFICATION

ECOBLOX

- Size: 6" x 12" x 3-1/2"
- Weight: 15.85 lbs
- Average Compressive Strength: 1250 psi
- Modulus of Rupture 305 psi
- Average Dry Density 161.7 pcf
- Average Moisture Content 4%
- Thermal Conductivity: 0.35 W/mk
- R value: 0.42/in

The blocks have been tested in accordance with ASTM test methods and meet the physical property requirements of the IBC section 2109.

www.coloradoearth.com
BUILDING CODE REQUIREMENTS

- Building Codes for earthen masonry are set forth in the IBC Chapter 21 - Section 2109 - Empirical Design of Adobe Masonry.

- All plans prepared by Colorado Earth are analyzed and designed by a professional engineer based on specifications and procedures of TMS 402 and IRC R606 (IRC 2018 Chapter 6 Wall Construction - Section R606 General Masonry Construction) to meet the intent of the Building Code.

- Earthen Construction is also found in the New Mexico Earthen Building Materials Code under Title 14 - Chapter 7 Part 4.

ENERGY COMPLIANCE:

Energy compliance is met through either the prescriptive or performance method. We recommend the Performance method for colder climates.

*(See Table 01 below for Prescriptive Performance compliance.)*
CONSTRUCTION SERVICES

MASONRY SUPPORT

We will help connect you with skilled masons and builders able to support your project.

www.coloradoearth.com
ECOBLOX CONSTRUCTION

DOUBLE WALL SYSTEM

Double wall construction with a 3” gap for loose-fill insulation. Electrical fixtures are placed in the wall during construction, and the two layers of block are tied together with Durawall.
Perlite is poured into the cavity to provide thermal insulation. Loose fill cellulose can also be used in the cavity.
BOVEDA AND VAULT

CEILING TREATMENTS

Where masonry is art - let us explore the beauty of masonry with you to incorporate domes, vaults and arches.

Work by James Anthony
at www.instagram.com/bovedas_anthony/
BOVEDA AND VAULT

CEILING TREATMENTS

Masonry ceilings are structurally sound while providing fire protection and an aesthetic continuity to the earthen masonry walls.

Work by James Anthony at www.instagram.com/bovedas_anthony/

www.coloradoearth.com
SUMMER THERMAL PERFORMANCE OF ECOBLOX WITH NO MECHANICAL COOLING

Temperature Variations - July 2-4 2019
In Castle Rock, Colorado, USA

°F

<table>
<thead>
<tr>
<th>Hour</th>
<th>Ambient Outside Temperature</th>
<th>Interior Air Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>50</td>
<td>65</td>
</tr>
<tr>
<td>25</td>
<td>70</td>
<td>70</td>
</tr>
<tr>
<td>49</td>
<td>75</td>
<td>75</td>
</tr>
<tr>
<td>50</td>
<td>50</td>
<td>60</td>
</tr>
</tbody>
</table>

To learn more about this study please visit
https://www.coloradoearth.com/resources#tab-technicaldata
WINTER THERMAL PERFORMANCE OF ECOBLOX WITH NO MECHANICAL HEATING

Solar gain and a wood-burning stove was used to heat the home

Temperature Variations - Nov 20-27, 2019
In Castle Rock, Colorado, USA

To learn more about this study please visit
https://www.coloradoearth.com/resources#tab-technicaldata
SPECIFICATIONS AND STANDARDS
TYPICAL WALL SECTION

LEGEND

1. 2 x 6 Plates over Bond Beam
2. Sill Seal between Bottom Plate & Bond Beam connection
3. Concrete Bond Beam per Engineer, 8" Typ.
4. 1" Lime Plaster @ Exterior
5. 4" x 4" Angle Irons or Lintels
6. 1" x 3" Window Trim Top & Sides (Exterior & Interior)
7. Window/Door centered within Buck
8. Wood Buck (2) 2 x 4s at Top & Sides; (1) 1 x 4 & (1) 2 x 4 at Bottom
9. 2" Stone Sill (Exterior & Interior) set on Mortar
10. 3" Thin Stone Wainscott (optional)
11. Ecoblox Typ. Wall Assembly: Two 6" EcoBlox + 3" Loose Fill Insulation
12. 3-1/2" x 12" Ecoblox, 1/2" Mortar
13. 6" min. spacing between Grade and Finish Floor
14. 2" or 3" Foam Insulation @ Footings
15. Foundation per local codes and engineering

www.coloradoearth.com
CLIENTS' TESTIMONIALS

"Having an Earth Block Home is just a huge peace of mind"
- Gwen

"It was big on the fireside I mean it’s pretty straightforward, I mean dirt doesn’t burn"
- Troy
"I like the texture and the way they reflect light. Also the feeling of a dense surrounding. Warmth."

"I love the general appearance of my adobe walls. They give the interior a quiet, calm atmosphere. Also, no ants or rodents in the walls."

"I like the rich color and the way they buffer the light in the day and appear to soften up the electric lights at night. They warm up nicely from sun and feel like a freshly baked potato on a cold winter’s night... can’t be beaten for heat sink effects!"

www.coloradoearth.com
"I like the feeling of solidity and the sense of mass. I also like that I will never need to paint."

"Earth walls give a living environment like no other building material. It's difficult to explain in words because the effect is a subtle feeling you get by being in them: serene, warm, solid, less noise, healthier, secure."
FINISHED PRODUCT

EARTHEN MASONRY HOMES

www.coloradoearth.com
FINISHED PRODUCT

INTERIOR

EcoBlox can be finished with a natural plaster or a thin slurry wash to seal the blocks

www.coloradoearth.com
THE TEAM

Lisa Morey PEng  
Owner/Founder

Enrico Bonilauri  
Thermal Performance

Elizabeth Hurtado  
Architectural Design

Mark Scully  
Preconstruction Services

Hans Preiss  
Mechanical Systems

Christina Ransbury  
Architectural Design

Ian Smith PE  
Structural Engineering

Jeff Amato  
Block Yard Foreman

James Anthony  
Bovedo Design and Construction

THANK YOU!
Together we are pioneers in the building industry.

admin@coloradoearth.com  
720 - 556 - 0473

www.coloradoearth.com  
PO Box 17281, Golden, CO 80402

facebook.com/CEBandADOBE  
instagram.com/coloradoearth/