

EARTHEN MASONRY CONSTRUCTION

A Building Solution for Our Future



Photo by Jason Rick



COLORADO EARTH

Letter from the Owner...

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 company is opening new possibilities for people. This opportunity reveals things that had not been seen or considered before and shows why a shift towards earthen masonry 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 Brighton, Colorado. We acquire material from a local quarry, and place it directly into our manufacturing equipment. My hope and work is for earthen construction to be recognized and utilized as credible building material for those applications and projects it best fits.

The humble earthen block serves both as a tie to our past, and 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 be part of the building industry change.

Lisa T. Morey



TABLE OF CONTENTS

I. INTRODUCTION

<i>History of Earthen Construction</i>	3
<i>Concerns with Building Industry</i>	5
<i>Benefits of Ecoblox</i>	6

II. SERVICES

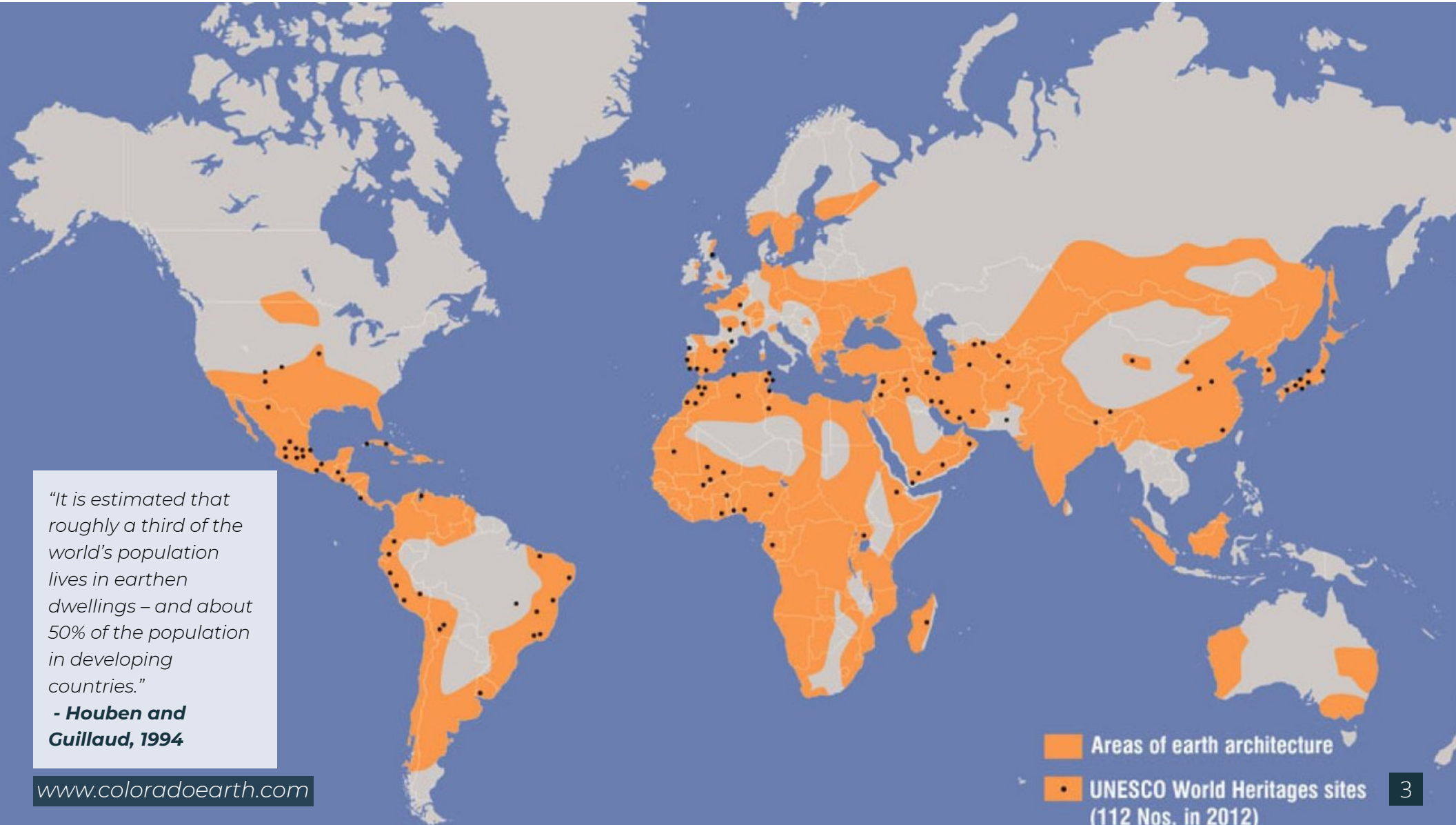
<i>Architectural Design</i>	8
<i>Block Making</i>	10
<i>Masonry Support</i>	14
<i>Boveda and Vault</i>	17

III. DESIGNS AND DETAILS

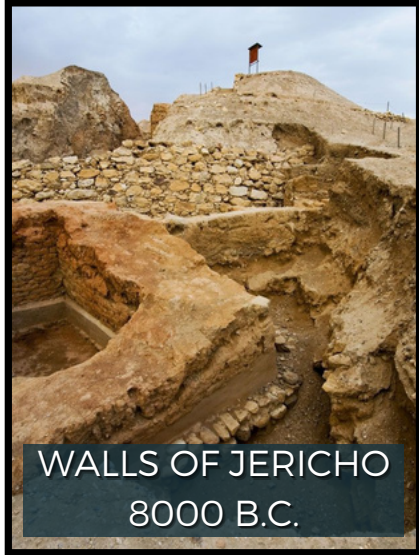
<i>Thermal Performance of EcoBlox</i>	19
<i>Specifications and Standards</i>	21
<i>Finished Product</i>	22
<i>Clients' Testimonials</i>	29

HISTORY OF EARTHEN CONSTRUCTION

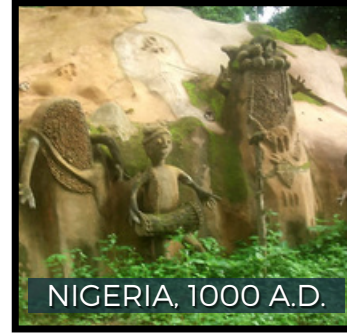
Earth Construction areas of the World ([Source: CRA Terre/enseignement](#))



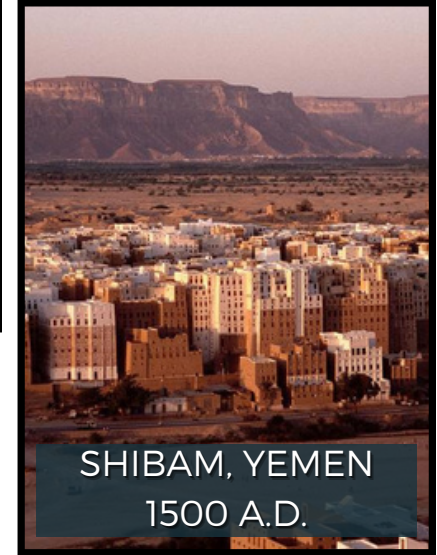
HISTORY OF EARTHEN CONSTRUCTION



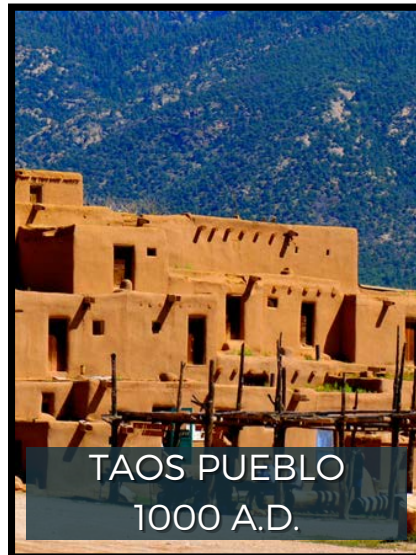
The Chinese have been building rammed (or tamped) earth since 5000 B.C. An early example is the Great Wall of China.



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



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



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



CONCERNS WITH BUILDING INDUSTRY TODAY



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.



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



Supply Chain

One thing that we are all quickly learning is that resources are becoming more difficult and more costly to acquire. Locally acquired materials provide the customer with a greater sense of assurance, require less transportation, and reduce the overall carbon footprint.

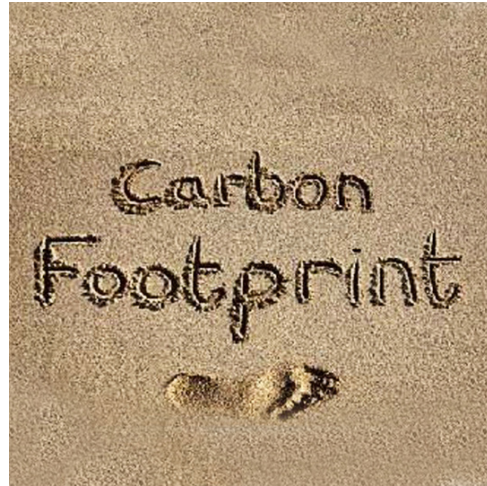


Longevity and Human Health

Studies show the average lifespan of a home is about 50 years. Many of these homes experience 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 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**

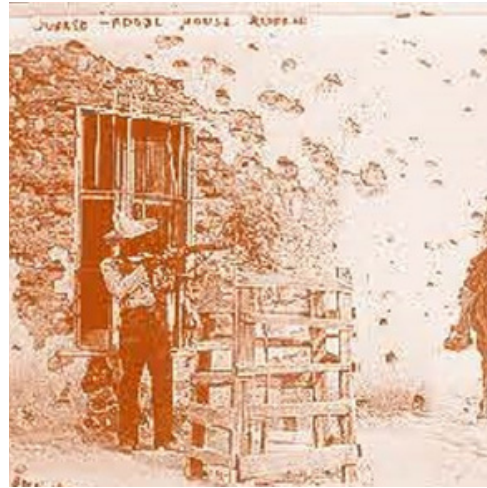
Dirt doesn't burn, and neither do our walls. ASTM Fire Rating Tested - **We are Fireproof!**



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

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

EcoBlox 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

COLORADO EARTH SERVICES

ARCHITECTURAL DESIGN



Let us help create your vision

www.coloradoearth.com

RENDERING BY CHRISTINA RANSBURY

DESIGN PROCESS

Our Design Team at Colorado Earth will walk you through the design process from beginning to end

ARCHITECTURAL DESIGN



INVESTIGATION AND RESEARCH

Site Visits, Survey, Topography, Utilities, Reports, Existing Structures, Access, Historic Relevance, Scope, Budget, Schedule, Intentions, Goals



CONCEPTUAL DESIGN

Architectural Design Preferences and Style, Bubble Diagrams and Layout, Orientation, Environment, Master Planning



SCHEMATIC DESIGN

Floor Plan Development and Elevations, Window and Door Placements, Interior Layouts, Sun Studies, Heating and Cooling Selections



PERMITTING AND CONSTRUCTION

Support with Building Department Reviews, Construction Scheduling, Builder Support



CONSTRUCTION DOCUMENTS

Building Department Checklist, Code Compliance, Final Design Submittal



DESIGN DEVELOPMENT

Cross-Sections, Details, Structural, Mechanical, and Civil Engineering, Energy Compliance

BLOCK MAKING SERVICES

COLORADO EARTH FACTORY



Colorado Earth's Standard EcoBlocks are produced at the foothills of the Flatiron Mountains in Brighton, Colorado. The blocks are **produced using sand and clay** fines from a nearby granite quarry. The raw material is considered "overburden" or a by-product of the excavation operations. Once the raw material is screened, it is delivered to the Colorado Earth facility. Added to the natural screened fines is **6.5% lime** (by weight) for stabilization, additional strength, water protection, and also to protect the walls during construction. The blocks are unfired and dry for 28 days before being delivered to the job site.

BLOCK MAKING SERVICES

COLORADO EARTH FACTORY

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



BLOCK SPECIFICATION

ECOBLOX

- Size: 6" x 12" x 3-1/2" and 4" x 12" x 3-1/2"
- Weight: 15.85 lbs and 11.78 lbs (4"x12")
- Average Compressive Strength: 1250 psi
- Modulus of Rupture 305 psi
- Average Dry Density 152 lbs/ft³
- 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.



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.



Schematic wall section created in Ekotrope, showing 3" gap between 2 CEB wythes.

CONSTRUCTION SERVICES

MASONRY SUPPORT

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

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.



ECOBLOX CONSTRUCTION

INSULATION CAVITY



Perlite is poured into the cavity to provide thermal insulation. Loose fill cellulose, or other several applications, 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/

www.coloradoearth.com

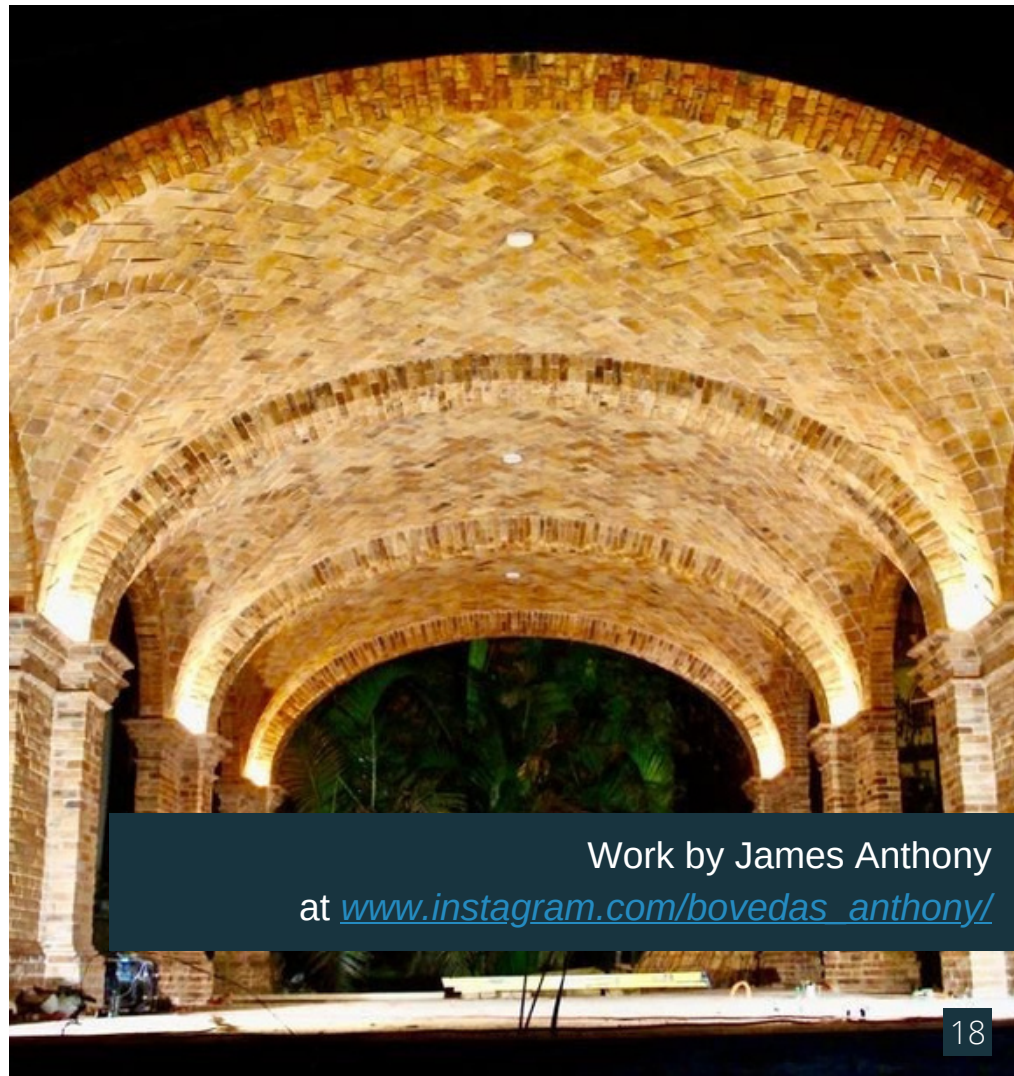




BOVEDA AND VAULT CEILING TREATMENTS

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

www.coloradoearth.com

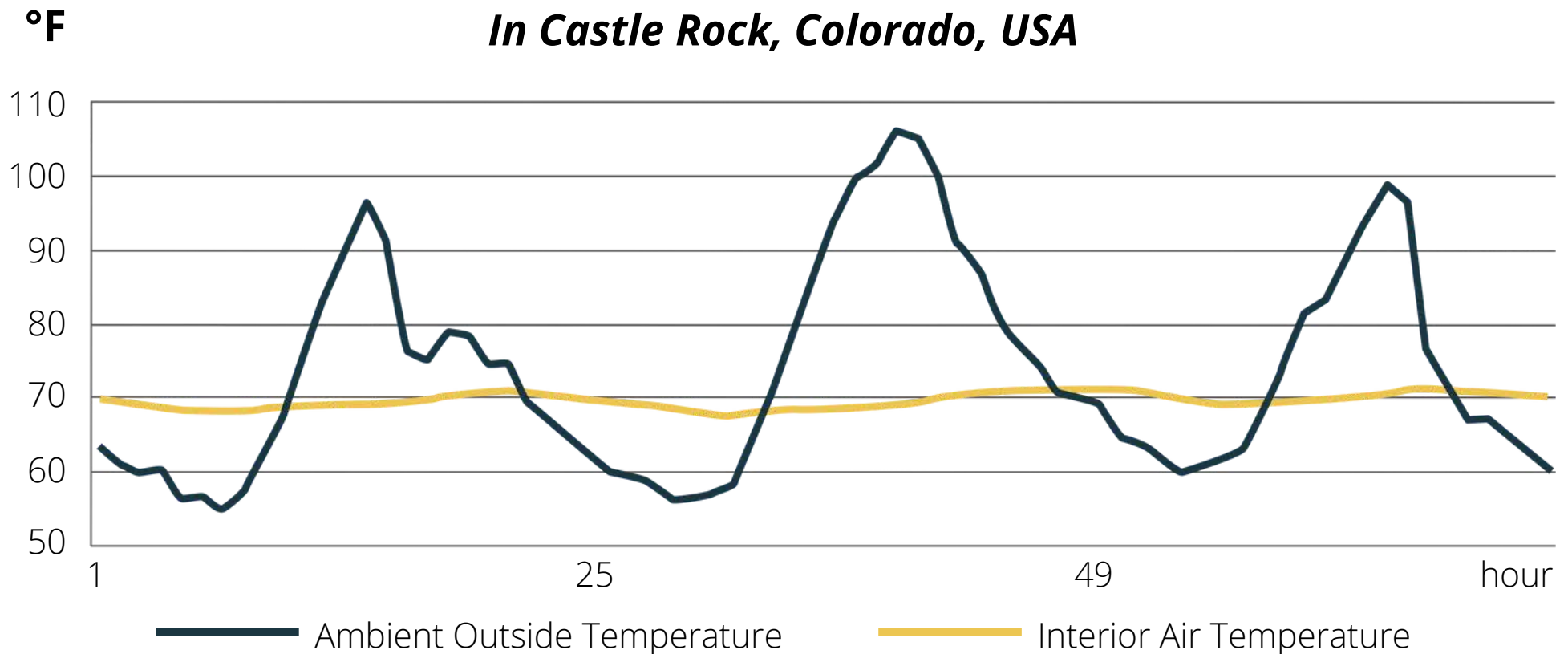


Work by James Anthony
at www.instagram.com/bovedas_anthony/

SUMMER THERMAL PERFORMANCE OF ECOBLOX

WITH NO MECHANICAL COOLING

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



To learn more about this study please visit

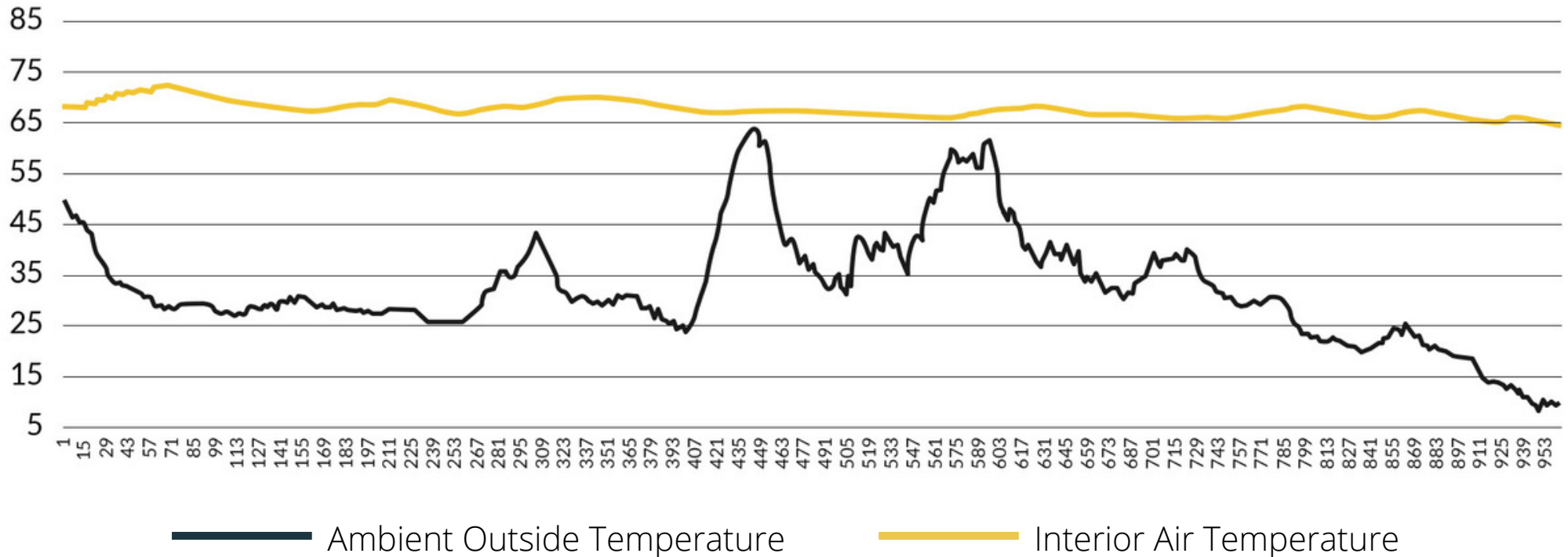
<https://www.coloradoearth.com/resources#tab-whitepapers>

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***

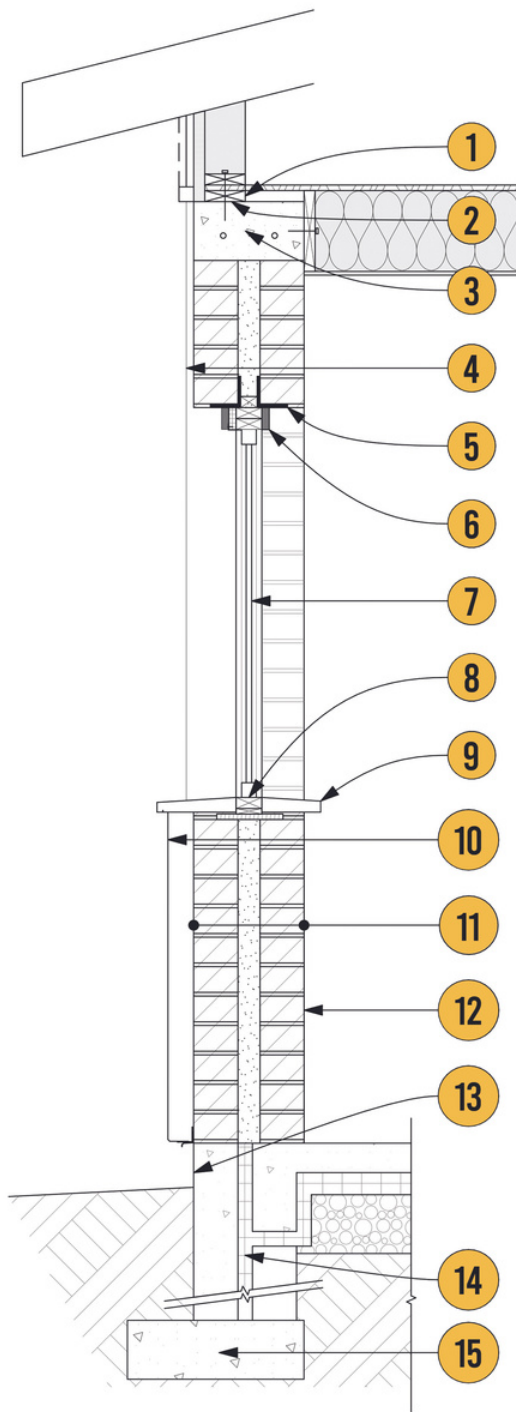


To learn more about this study please visit

<https://www.coloradoearth.com/resources#tab-whitepapers>

SPECIFICATIONS AND STANDARDS

TYPICAL ECOBLOX 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" BioLime 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 Optional 3" Thin Stone Wainscott
- 11 EcoBlox Typ. Wall Assembly : Two 6" EcoBlox + 3" Loose Fill Insulation, with Durawall for horizontal reinforcement every 4th course Reinforcing per Engineer
- 12 EcoBlox = 3-1/2" x 6" x 12" Block, 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 (See CEB White Paper)

FINISHED PRODUCT

EARTHEN MASONRY HOMES

EcoBlox as a Veneer



FINISHED PRODUCT

EARTHEN MASONRY HOMES

EcoBlox as a Veneer



FINISHED PRODUCT

EARTHEN MASONRY HOMES

EcoBlox as a Veneer



FINISHED PRODUCT

EARTHEN MASONRY HOMES



FINISHED PRODUCT

EARTHEN MASONRY HOMES



FINISHED PRODUCT

EARTHEN MASONRY HOMES



FINISHED PRODUCT

EARTHEN MASONRY HOMES

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



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




GWEN & TROY

CLIENTS' TESTIMONIALS




"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!"

CLIENTS' TESTIMONIALS



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

www.coloradoearth.com



“

"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."

”

THE TEAM

Lisa Morey PEng

Owner/Founder

Mark Scully

Preconstruction Services

Ian Smith PE

Structural Engineering

Enrico Bonilauri

Thermal Performance

Hans Preiss

Mechanical Systems

Jeff Amato

Block Yard Foreman

Elizabeth Hurtado

Architectural Design

Christina Ransbury

Architectural Design


James Anthony


*Boveda Design and
Construction*


THANK YOU!

Together we are pioneers in the building industry.

 admin@coloradoearth.com

 www.coloradoearth.com

 720 - 556 - 0473

 PO Box 17281, Golden, CO 80402

 facebook.com/CEBandADOBE

 instagram.com/coloradoearth/