coloradoEARTH
adobe and earth blocks

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# ecoBlocks Technical Data Sheet:

## Block Description:

Colorado Earth's Standard ecoBlocks are produced 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% cement (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.

ecoBlock

Quarry site: Golden, Colorado

Production Facility: Golden, Colorado

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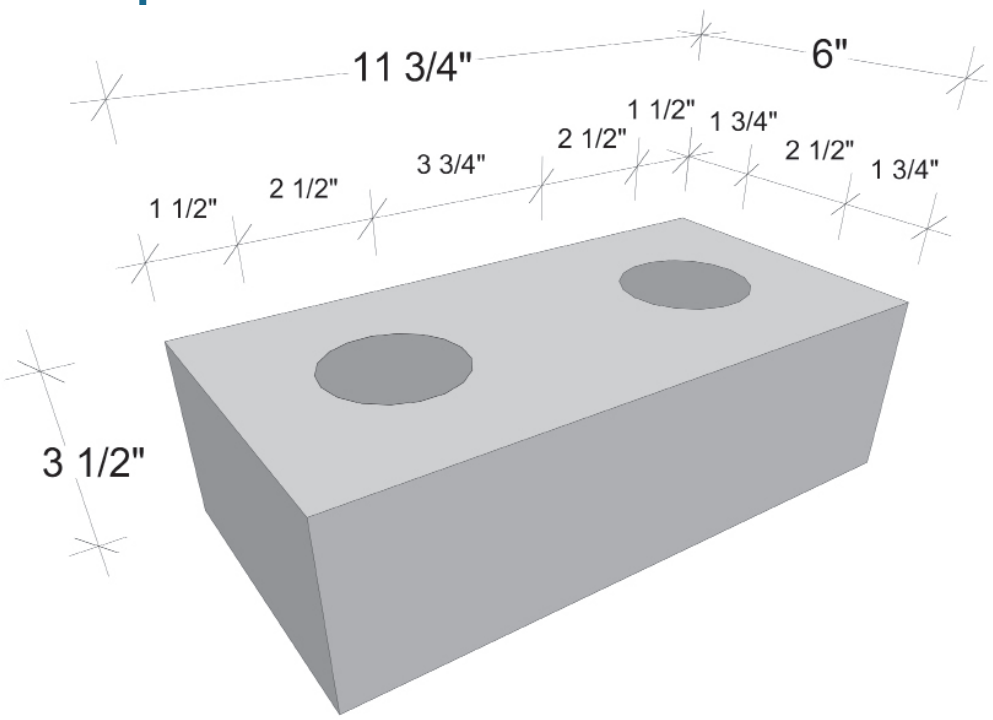
# TECHNICAL SPECIFICATIONS

## Technical Specifications:




Size: 6" x 11-3/4" x 3-1/2" (height can vary from 2" to 5")
Weight: 15.85 lbs average
Compressive Strength: 1250 psi average
Modulus of Rupture: 305 psi average
Dry Density: 161.7 pcf average (normal weight)
Thermal Conductivity: 0.35 W/mK
R: 0.42/in or 2.52 for 6" wide block

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

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# BUILDING CODE REQUIREMENTS

## 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 complicance is met through either the prescriptive or performance method. We recommend the Preformance method for colder climates. (*See Table 01 below for Prescriptive Performance compliance.)

| Compliance of CEB Wall Assemblies With The 2021 IECC, Maximum Assembly U-values | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Ref. Table R402.1.2 'Maximum Assembly U-factors And Fenestration Requirements'. Note B) Mass walls with more than half of the insulation on the inside of the wall. | | | | | | | | | | |
| Climate Zone | | 0 | 1 | 2 | 3 | 4 except Marine | 5 and Marine 4 | 6 | 7 | 8 |
| Max U-value By 2021 Code [BTU/h*ft2**F] | | 0.17 | 0.17 | 0.14 | 0.12 | 0.087 | 0.065 | 0.057 | 0.057 | 0.057 |
| A | 10" CEB Wall + Exterior Mineral Wool | Pass | Pass | Pass | Pass | Pass | Not Pass | Not Pass | Not Pass | Not Pass |
| B | 2x 6" CEB Wall + 3" Perlite | Pass | Pass | Pass | Pass | Pass | Not Pass | Not Pass | Not Pass | Not Pass |
| C | 2x 6" CEB Wall + 4" Perlite | Pass | Pass | Pass | Pass | Pass | Pass | Pass | Pass | Pass |

Table 01: Compliance of the CEB assemblies considered here with the maximum allowed assembly U-values of the 2021 IECC:

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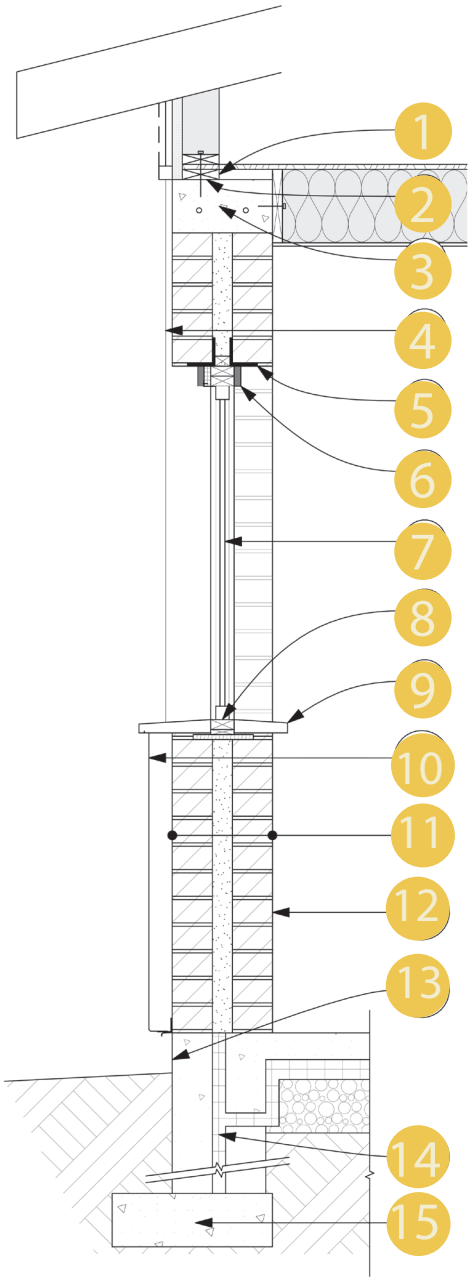
# TYPICAL WALL SECTION

## Typical ecoBlock Wall Section Detail:

### Legend:

1. 2x6 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"x4" Angle Irons or Timber Lintels
6. 1" x 3" Window Trim Top & Sides (Exterior & Interior)
7. Window/ Door centered within Buck
8. Wood Buck (2)2x4s at Top & Sides; (1)1x4 & (1)2x4 at Bottom
9. 2" Stone Sill (Exterior & Interior) set on Mortar
10. 3"Thin Stone Wainscott Typ.
11. SCEB Typ. Wall Assembly : Two 6" SCEB + 3" Loose Fill Cellulose, Reinforcing per Engineer
12. SCEB = 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)



# ecoBlocks in Construction:

All walls require a concrete bond beam at the top of the wall, and between floor levels. A timber ledger can be placed in the wall during construction to hang kitchen cabinets or other heavy objects. Electrical boxes are placed directly in the masonry wall at desired and planned locations. The earthen masonry walls are typically finished with a lime based exterior plaster, and a variety of colors and hues.

Interior walls under construction.

Exterior walls under construction with formwork for poured, reinforced concrete bond beam at the top of the wall and between floor levels.

Electrical box placed in the wall during construction with conduit placed between the two whythes of blocks.

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# ENVIRONMENTAL BENEFITS

## Environmental Benefits:

### Reduced Carbon Footprint
Life Cycle Analysis shows a reduction in overall carbon footprint

### Fireproof
Dirt doesn't burn
ASTM E119 Fire Rating Test

### Low Maintenance
Plaster finishes can last indefinitely and there is no need to ever paint!

### Reduced Energy Use
Studies show 50% less energy use for heating and cooling when compared to traditional wood frame

### Healthy Interior Environment
Using lime plaster as a finish has a pH in which mold can't grow

### Acoustics
8 dBA difference when compared to traditional wall
-this equates to a halving effect of outside noises.

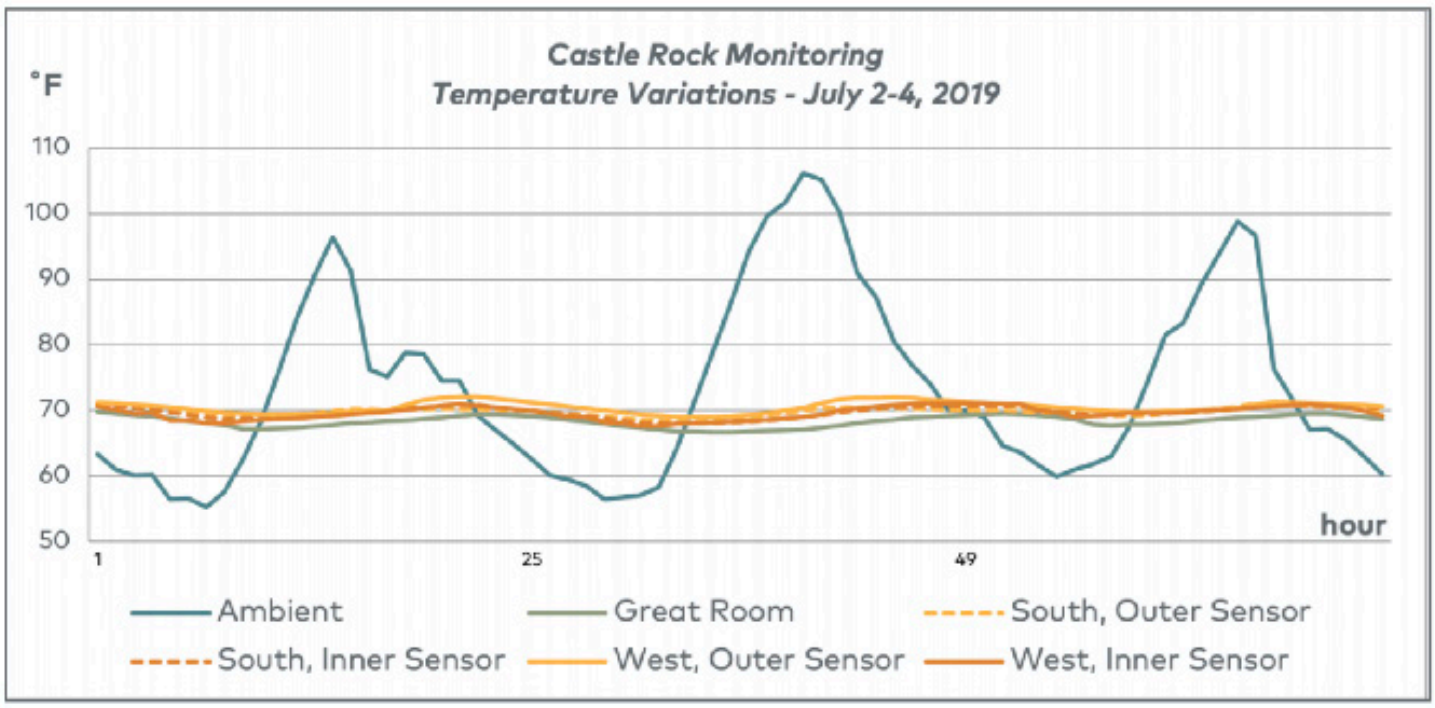
# Energy Performance:

A thermal performance study was carried out on a residence by Colorado Earth in Castle Rock, Colorado. The thermal mass of the earth blocks help to keep interior temperatures constant despite exterior fluctuations in both summer and winter.

For more information on this study visit www.coloradoearth.com

## Summer Performance:

Earthen masonry walls show the exterior temperature fluctuations (in blue) with the interior temperature remaining fairly constant (in orange) with no mechanical cooling used.



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# ENERGY PERFORMANCE

## Winter Performance:

Winter  Performance of a residence using earth blocks show exterior temperatures (in blue). Sensors were placed in the blocks and temperature of these sensors is shown in orange. The green line shows interior temperatures of the Great Room which have been affected by passive solar gains coming into the space from the south-facing windows. These higher temperatures cause the inner sensor in the wall to absorb heat from the interior air, thus showing the effect of thermal mass as a thermal storage battery.