



The Cob Report

Cob is an ancient wall building system
using a mix of clay rich earth, sand, straw and water

Welcome to THE COB REPORT -
Issue #3 Newsletter of the
Cob Research Institute - JULY
2019

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QUAIL SPRINGS
EXPERIMENTAL
COB WALL FIRE TEST

DOUBLE YOUR DONATION

CASBA IS CONTINUING THE \$3,500 DONATION MATCH

The California Straw Building Association is extending their matching donation until we reach a total of \$3,500. All new donations to CRI will be matched by CASBA dollar for dollar. Donate during this match and your support of CRI will be doubled.

[SUPPORT CRI](#)

A NOTE FROM OUR DIRECTOR

Welcome to The Cob Report #3.

This issue focuses on CRI's recent and planned testing efforts. First we describe the in-plane testing of four cob walls completed in 2018 as a collaboration between CRI and Santa Clara University. Second is the independent CRI project to determine the insulation R-value of a cob wall. Both these projects provided vital knowledge towards the creation of CRI's recent IRC Cob Construction Appendix submission.

The issue continues with an introduction of two new CRI projects. First is the investigation of lower density cob mixes to achieve a higher R-value cob wall. Second is a fire test to achieve a certified cob wall fire-rating. When completed, these two important building code factors will be included in CRI's 2022 updated submission for the three year IRC development cycle Cob Construction Appendix.

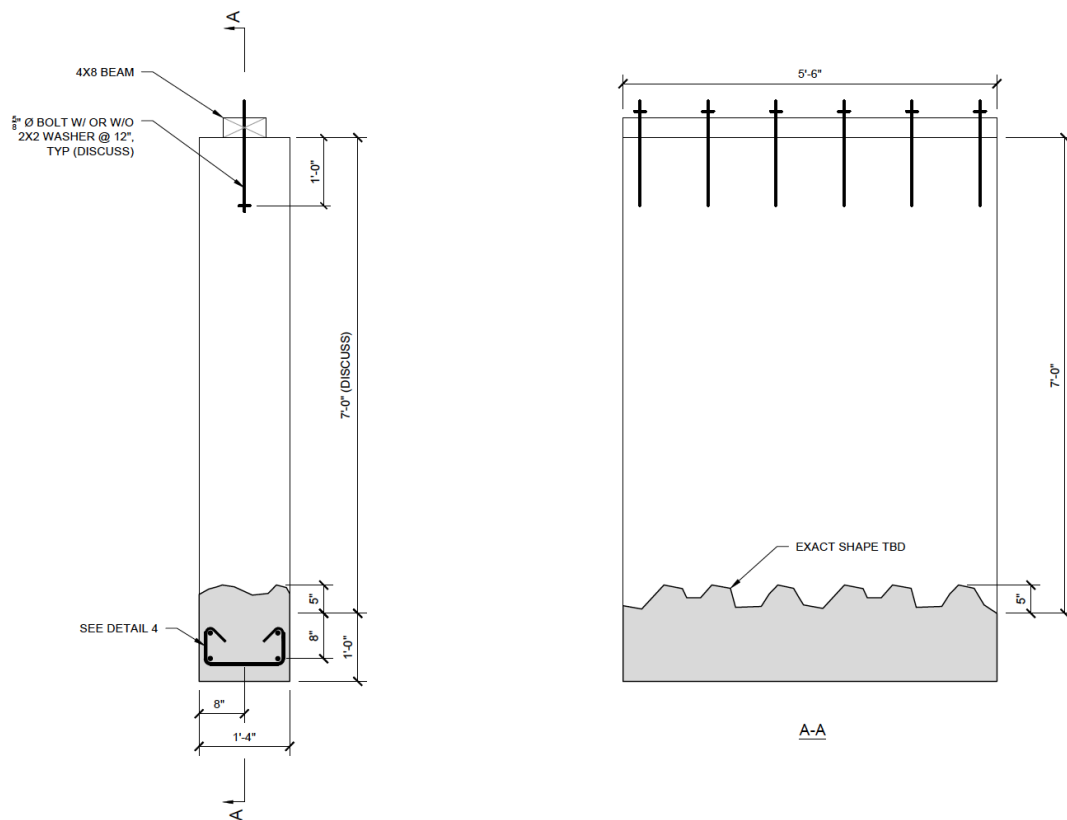
We continue with a look at CRI's current and future funding needs. I want to personally thank the more than 100 donors to our ongoing funding campaign. Your interest in CRI and support of our mission is very encouraging and you are helping us to continue the vital work of realizing a Cob Building Code !!! Please write or email telling us what CRI means to you? What can CRI do better to serve you and other cob builders? We want hear from you personally. Your questions and suggestions are welcome and wanted.

Contact me at jfordice@cobcode.org.

Thanks, and cob on!

John Fordice - CRI Director

STRUCTURAL TESTING OF FOUR COB WALL PANELS



DESIGN DRAWING OF COMMON PRACTICE TEST WALL

Beginning in the Spring of 2017, CRI collaborated with Students and Faculty of the Santa Clara University Civil Engineering Department to conduct in-plane structural tests of four cob walls.

Two teams of three students each undertook the project for their Bachelor Degree Senior Design Requirement. The first phase of the project was testing the soil and proposed cob mixes. For the second phase in winter 2017 - 2018 the students constructed and tested the four cob walls using the selected mix.

The walls were an unreinforced common practice cob wall and three reinforced cob walls with varying patterns of steel mesh or rebar reinforcement. CRI Board member Anthony Dente, a civil engineer, designed the wall reinforcing and managed the project for CRI. Valuable testing experience was gained and the test data helped Anthony in writing the structural portions of the IRC Cob Construction Appendix that CRI submitted to the ICC approval hearings in May of this year.

A detailed account of this wall testing project can be read on the CRI website at: <https://www.cobcode.org/activity-log> 04/03/2019 *CRI Summary of Santa Clara University in-line wall testing.*



TEST RESULTS

The above Before and After photographs show the result of the test loading on the unreinforced cob wall built to common practice standards. At the beginning of the test the wall is intact. As the back and forth horizontal loading progressed, there was initial hairline diagonal cracking. This was followed by more and widening diagonal cracks. The large upper horizontal crack then occurred apparently at a lift joint. At this point the wall lost integrity and began to break apart. The left portion of the wall became loose and fell out of the wall. The test was concluded at this point. The test demonstrates the dangers of unreinforced cob where-in heavy pieces of cob can fracture out of the wall. Potentially leading to building collapse.

ESTABLISHING THE INSULATION R-VALUE OF COB



R-value is a measure of a material's resistance to conductive heat flow, or its thermal insulation property. The R-value insulation property of cob has been much speculated upon but has remained largely untested.

As a part of our proposed IRC Cob Construction Appendix, CRI elected to produce and test a sample cob wall panel for R-value. The test process

selected was ASTM C 1363, the most rigorous and respected R-value test. This was performed at the Intertek Building and Construction Laboratory in Fresno, CA. For continuity with the structurally tested cob, the same cob mix was used as in the SCU test walls. Three 24" square x 13" thick cob wall panels were prepared by John Fordice at a CRI location in Berkeley, CA. Once fully dried, two panels were transported to Fresno for testing in mid-December 2018. One panel was tested with a resulting R-value of 2.85, or R 0.22 per inch.

Such a low R value confirms what is widely known, that although cob has excellent thermal mass properties, it is not a good insulation material. The low insulation value of cob will limit how and in what climates cob residences can be constructed using the proposed IRC Cob Construction Appendix. Clearly if cob is to be successfully used in the temperate climate areas of North America, some means of increasing the R value of cob walls must be developed. Luckily, testing is underway at Plymouth University in England on insulating cob with natural composite materials including lime-hemp. More on this and other insulation possibilities in a future Cob Report.

The Fresno Intertek Lab test results and a detailed pictorial essay of the sample production for the ASTM C 1363 thermal testing can be read on the CRI website at: <https://www.cobcode.org/activity-log> 12/17/2018 Cob Thermal Test #1 essay/photo record, and Intertek U-value test report.

CRI PLANS FOR FUTURE TESTING

DEVELOPING A HIGHER R-VALUE FOR COB

We known that the R-value of a material is affected by the material's density. The SCU cob mix we tested for R-value in the 2018 Fresno test is quite dense for cob (115 pcf) which was a factor in the low R-value obtained. CRI has a project underway to develop a better insulating cob material for improved cob code building options. A series of less dense cob mixes will be developed and tested using the lower cost ASTM C 518 R-value test process at the Intertek Laboratory in York, Pennsylvania. Initial plans are to develop at least five different mixes. Two of the mixes will substitute scoria volcanic sand or gravel for the sand in the mix. A third mix will replace the sand with pumice. And the fourth and fifth mixes will use a high content of finely chopped straw or paper fiber. Once these mixes are fully developed, each mix will be tested for R-value, as well as compressive strength and modulus of rupture, to establish the structural strength. The estimated cost for shipping and testing at the Pennsylvania facility is \$1000 per mix.



mix components and mold



12"x12"x3" mold - rough filled

The initial material research and sample production is currently underway at CRI in Berkeley, CA.

The laboratory testing will take place as soon as the needed funds can be raised. Look for updates on this work in future issues of The Cob Report.

COB WALL FIRE RESISTANCE TESTING

As reported in the last newsletter, CRI submitted an IRC Cob Construction Appendix that was considered at the May, 2019 ICC code hearings. A cob wall one-hour fire resistance rating was included in the proposed appendix. The rating was justified with an equivalency analysis by a fire science engineer and a university professor using related historical testing and other evidence. However, the rating was not based on ASTM test results, which was the primary reason the code proposal was disapproved.



The code proposal has another approval possibility at ICC's "Public Comment" hearings in October. In an effort to ensure approval, CRI will remove the one-hour rating from its proposal. Lack of a one-hour fire rating in the IRC Cob Construction Appendix will only prohibit building with cob closer than five feet to

a property line, and possibly using a cob wall to separate an attached auto garage or carport from a residence.

Though not essential, lack of a cob fire rating is a less than optimal for the code. To overcome this, CRI is planning to undertake the testing needed to include a fire-resistance rating in future editions of the Appendix. (It is expected that cob walls will pass two-hour or four-hour tests.) This will require constructing a 10 foot by 10 foot square cob wall and testing it according to ASTM E119 standards at a certified fire testing laboratory. There are four such laboratories in the USA. One in Washington State, and three in Texas. Preliminary proposals are being pursued at these locations. The project will include building the test wall at the selected laboratory, storage of the wall during the drying period, constructing a rolling test frame, actual test fees, personnel, lodging, and travel expenses. A preliminary budget for the project is approximately \$30,000.

Sasha Rabin and Andrew Clinard of Quail Springs Permaculture (QS) have been doing the initial planning for the project. Art Ludwig of Oasis Designs has conducted an experimental fire test at Quail Springs with favorable results. See <http://oasisdesign.net/shelter/cob/testing/#firetest>

CRI's intends to collaborate with Quail Springs to complete the project in time for submission to the next IRC code development cycle in 2022. Look for updates on this work in future issues of The Cob Report.

CRI FUNDING WALL

THANK YOU DONORS !!!

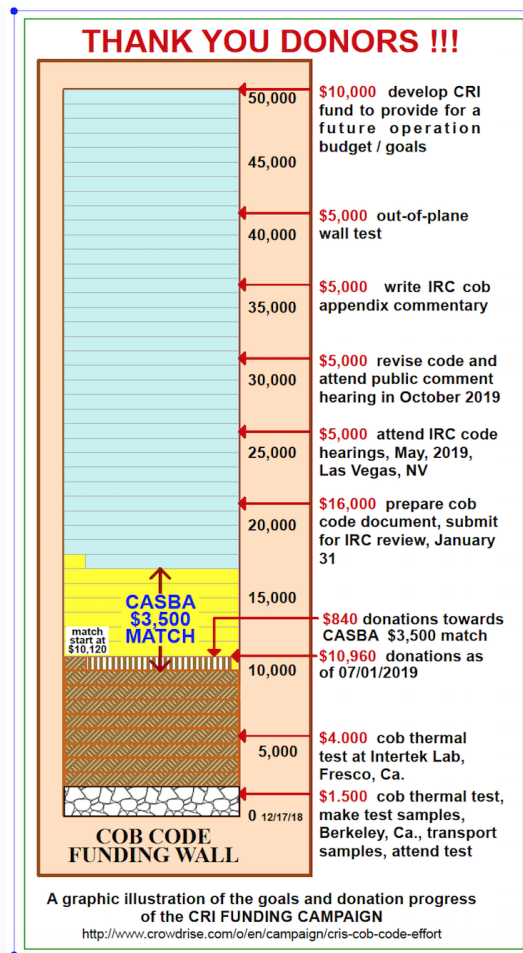
ALL OF US AT CRI WANT THANK
YOU FOR JOINING IN THE COB
CODE EFFORT - YOUR OVER
\$10,000 IN DONATIONS ARE
HELPING MAKE THE COB CODE A
REALITY

From the beginning of our CROWD
FUNDING CAMPAIGN and before
the CASBA MATCH, 116 people
have donated a total of \$9070.

Your amazing support is truly
appreciated ! A complete list
of early donors is at the end of this
edition of the COB REPORT.

Since the CASBA MATCH has been
in effect there have been TWELVE

more donations. Some are new donors and some have wonderfully come back to renew their support of CRI !!!



Here are the new **MATCH DONORS**

JACOB A - \$150
 JEANMARIE DOLLARD - \$50
 LESLIE JACKSON - \$100
 MICHAEL WRIGHT - \$10
 BOA CONSTRUCTOR - \$50
 EMILY REYNOLDS - \$100

NORM BALANGER - \$100
 GAYLE BORST - \$50
 ANN EDMINSTER - \$50
 AUSTIN DRILL - \$30
 MUDSTRAWLOVE - \$50
 TIM KRAHN - \$100

Thank you for donating to the MATCH - your donations will be doubled !!!

With the support of now over 128 donors our crowdfunding campaign CRI has raised more than \$10,000 This brings CRI 1/5 of the way to our \$50,000 goal needed to:

- Cover the costs of writing the IRC Appendix and Commentary.
- Attend and shepherd the code through ICC approval hearings in May and October of this year.
- Do needed structural, thermal, and fire-rating testing.
- Complete additional research, development, structural and thermal testing of low density cob mixes, wall reinforcing, fire- rating, and other code

improvements.

**If it is your desire to build with cob
where a building permit is required
CRI is working for you !
Support CRI to help set cob free !**

CONTINUING THE \$3500 CASBA MATCH

The good folks at CASBA, the
California Straw Building Association,
have offered a matching \$3500 donation to CRI
Please go to <https://www.cobcode.org/donate>

Double your donation !!!

Here is a chance to double your support of the IRC COB

CONSTRUCTION APPENDIX

Donate before August 31 and CASBA will match your donation dollar for
dollar.

Also we are seeking people to join in a CRI peer to peer funding
campaign. Contact us and we will work with you to increase CRI's
funding.

Donate and join at <https://www.crowdrise.com/o/en/campaign/cris-cob-code-effort>

DONATE TO CRI

The Cob Research Institute is a public interest 501(c)3 non-profit organization founded in 2008 with the mission to remove legal obstacles to building with cob.

CRI needs to be able to support a small staff to do the work of making a cob building code a reality. The needed research, testing, code development, and ultimate gaining of acceptance by the code authorities is expensive and CRI is working to do this on your behalf. Please do your part and support the CRI

effort. Become a part of the CRI team ! I'd like to thank you in advance for your generosity.

THANKING ALL OF YOU WHO DONATED BEFORE THE CASBA MATCH

Your generous support of CRI is deeply appreciated We hope you can take the next step and join the CASBA MATCH

ANTHONY DENTE - \$500
AMBER - \$50
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JOHN FORDICE - \$100
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BOB THEIS - \$50
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DENNY ABRAMS - \$500
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CLOUD FOREST INSTITUTE -
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CAMILO CADAVID - \$25
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RICH BESCO - \$25
MADDY BRICK - \$10
CAROLYN - \$25
JENINE - \$50
SAM BRYSON - \$50