



Cob Construction Appendix Approved for 2021 IRC

Date: March 18, 2020 (revised July 15-24, 2020)

The Cob Research Institute's (CRI) proposed cob building code was approved at the International Code Council's (ICC) Public Comment Hearings in Las Vegas on Oct 26, 2019. Proposal RB299-19 for the 2021 International Residential Code (IRC) - **Appendix U: Cob Construction (Monolithic Adobe)** - was approved by a 93-6 vote of attending ICC voting members (mostly building and fire officials), followed by more than the required 2/3 approval vote in the Online Governmental Consensus Vote (OGCV). This final approval was posted online by ICC on Dec 19, 2019.

This is a great step forward for the legal and safe use of cob construction!



Anthony Dente of CRI testifies at IRC Public Comment Hearing in Las Vegas - October 26, 2019

What does this mean, and what's next?

The IRC is an ICC model building code used in 49 of the 50 U.S. states as the basis for their residential building code. The IRC applies to one- and two-family dwellings, their accessory structures, and townhouses. The 2021 IRC will be published by ICC in August 2020. State and local jurisdictions begin their triennial code adoption process at various dates after ICC publishes their model codes, and it is often a year or more before these codes take effect.

For example, in California the 2019 California Residential Code, based on the 2018 IRC, went into effect Jan 1, 2020. The schedule and process for state and local adoption of the building codes varies greatly from state to state. Check with your local building department or the agency that oversees code adoption in your state.

When and how can I use the ICC approved Cob Construction Appendix?

- **Approved in the ICC Process vs Adopted by a Jurisdiction**

The Cob Construction Appendix U in the IRC was **approved** in the ICC code development process as part of the IRC **model code**. ICC model codes have great respect in the design and building industry and code community, but they have no legal standing of their own. **In order**

to be enforceable, they must be adopted by a governmental jurisdiction, usually a state, city, county, or tribal entity. (See exception under “Can I use . . .” below)

- **Amendments to the Model Codes, and Adoption of IRC Appendices**

In the adoption process, state and local jurisdictions are allowed to and often amend the model codes to meet their particular needs and circumstances. Appendices in the IRC are in a special category during this process. Each appendix must be specifically adopted by the jurisdiction to be a part of its residential building code.

- **Can I use the approved Cob Construction Appendix now, before adoption?**

Anyone can **propose on a project basis** to their local building official to use the ICC-approved Cob Construction Appendix U before adoption in their jurisdiction, including before it is published. However, waiting for its publication will increase the likelihood of acceptance, because only then will the Appendix appear as an integrated ICC document. Until then, ICC does show the approved Cob Appendix U in one document but as two pieces – the original “Proposal” and its approved “Public Comment” revisions. (This document is available at the following link: <https://tinyurl.com/yyh4fjpk>)

Proposed use of the ICC-approved Cob Appendix U before its adoption (whether before or after publication) would be done under the “alternative materials and methods” Section R104.11 in the IRC. In this process the building official has the discretion to approve materials and methods “not specifically prescribed by” the building code, if demonstrated that the alternative is “at least equivalent of that prescribed . . .”. Prior to the recent approval of Appendix U, this process has been arduous and expensive with uncertain results. The newly approved IRC Appendix U, even if not adopted by a jurisdiction, will likely make the process much easier.

Key Things to Know about the IRC Cob Appendix

- The IRC Cob Appendix U states at its beginning, “Buildings using cob walls shall comply with this code except as otherwise stated in this appendix.” This means **everything except the cob walls** (and interfaces at their top and bottom and connections to doors and windows) **must comply with the body of the IRC**. Foundations, floors, roofs, doors and windows, electrical, plumbing, mechanical, and energy conservation must all comply with those provisions in the IRC, unless alternatives are approved by the building official through Section R104.11 with an alternative materials and methods request (AMMR).
- **Complying with the energy conservation requirements of the IRC** (or your state’s energy code) **is challenging for cob walls**. A building’s thermal performance depends on both the mass and the thermal-resistance of its thermal envelope in context of the local climate. Energy codes take all of these into account. Cob walls have high thermal mass but low thermal resistance. Most energy codes consider a cob wall a “mass wall” (like concrete block, brick, or rammed earth). This reduces the thermal-resistance requirement in all climate zones, especially in warm climates. But even in warm climates, it is difficult for cob walls to comply without adding some type of insulation.

Super insulating other elements such as the roof/ceiling might help facilitate compliance. A project called CobBauge, at the University of Plymouth, England, has been experimenting with walls made of an inner core of structural cob surrounded by an insulating layer such as clay-straw or clay-hemp. This area urgently needs research, since in most cases code compliance will require good insulation strategies. If you have ideas or would like to help in this arena, please contact CRI.

- **Cob walls with straw-only reinforcing are possible with Appendix U** in regions of low seismic risk. In what the IRC calls Seismic Design Categories A and B, which encompass about 80% of the contiguous U.S. Steel reinforcing is required for cob walls in Seismic Design Categories C, D and E, and an engineered design is required in Categories D and E. Those categories are found mostly in western states but also around St. Louis and in eastern Tennessee and coastal South Carolina.
- **There is no fire-resistance rating assigned to cob walls** in the IRC Cob Appendix U, because the IRC-required ASTM fire test has not been conducted. This is in spite of cob's known high resistance to fire from tests of related earthen wall systems (like adobe and compressed earth block), and its performance in wildfires and ad hoc tests. Future ASTM testing of cob walls is planned. In the meantime the only practical limitation of no fire rating is that exterior cob walls cannot be closer than 5 feet to a property line, where a 1-hour fire-resistance rating is required.

Building With or Without a Cob Code

Since cob was reintroduced to North America in the 1990s, the lack of a cob building code created a situation where most aspiring cob builders had little choice other than to build without permits or choose a different building system. But with the recent ICC approval of IRC Appendix U this will change when the code is published in October 2020, and with subsequent adoption of Appendix U by state and local jurisdictions. The possibility of obtaining cob building permits will then become a reality.

However, it is apparent that some people will still prefer to build with cob without a building permit. The existence of Appendix U does nothing to prevent this. Some cob builders may prefer to not make use of Appendix U and the provisions for structurally sound cob construction it provides. Possible reasons may be that Appendix U is too restrictive, that building with permits is more expensive, or a general distrust of government officials and regulations.

- **Is Appendix U too restrictive?** Building codes are by their nature restrictive, not unlike speed limits on our roadways. And like speed limits, codes say what can be done (driving up to a certain speed) and what is prohibited (exceeding the limit). Both building codes and speed limits are in place for both your safety and the safety of others.

Unlike speed limits, there is a means to build something not allowed in the building code - by demonstrating equivalent safety to the building official. This is through the "alternative

materials and methods” Section R104.11 in the IRC mentioned earlier. So one can potentially do something not specifically included in Appendix U. As an ICC-approved code, and especially as a jurisdiction-adopted code, Appendix U makes it much easier for alternatives to be approved without needing to demonstrate the safety of the entire system of cob construction.

Because there are countless variations of cob construction, Appendix U cannot cover them all, especially for this initial entry into the IRC. For example, a limited number of wall systems were tested for resistance to wind and earthquake forces. Without adequate testing, a building system cannot enter the IRC. CRI is planning additional testing to give more choices in Appendix U, including use of more sustainable reinforcing materials such as bamboo. As a steward of Appendix U, CRI also welcomes ideas and requests from the design and building community to consider for future changes or additions to Appendix U. For the foreseeable future cob construction will remain as an Appendix to the IRC, as there are significant challenges to bringing cob construction into the body of the IRC.

- **Will building with a permit and Appendix U be more expensive?** The cost of a permitted cob structure will increase due to required permit drawings and permit costs. Permit costs vary greatly by jurisdiction, typically based on the cost of construction. Costs may also increase because of requirements in the Appendix U that a designer or builder would not otherwise choose. The cost of an architect or engineer is *not* required when the design follows the provisions in Appendix U. However, an engineer *is* required in the high Seismic Design Categories D and E (For example in much of CA, western OR and WA, St. Louis region, parts of ID, CO, MT, UT, SC). Only 10-15% of the U.S is in these categories. Even when Appendix U requirements are followed, one may still choose to hire a design professional to assist with code interpretation and the building’s design.

The significant benefits of these increased costs include: confidence in the safety and durability of the permitted and inspected structure; the ability to insure or finance cob projects, and to sell a property without needing to disclose an un-permitted cob structure; and freedom from worry about an un-permitted cob structure being discovered and forced to be removed.

- **The role of building officials and regulations.** Many people have had a negative experience with or a negative perception of government officials or regulations. Though imperfect, these officials and regulations are intended to serve the public health and safety. CRI encourages everyone to think of and interact with building officials as part of their community, and as an ally, not an adversary. Ask questions and stand firm if you feel an official or regulation overreaches, but cooperation usually yields the best outcome for everyone.
- **Building without a permit and code.** During the development of CRI’s cob code proposal, some members of the cob building community expressed concerns that a cob code would make it impossible for people to build with cob without permits. The new cob code will not prevent a continuation of the no-code practices of the past three decades.

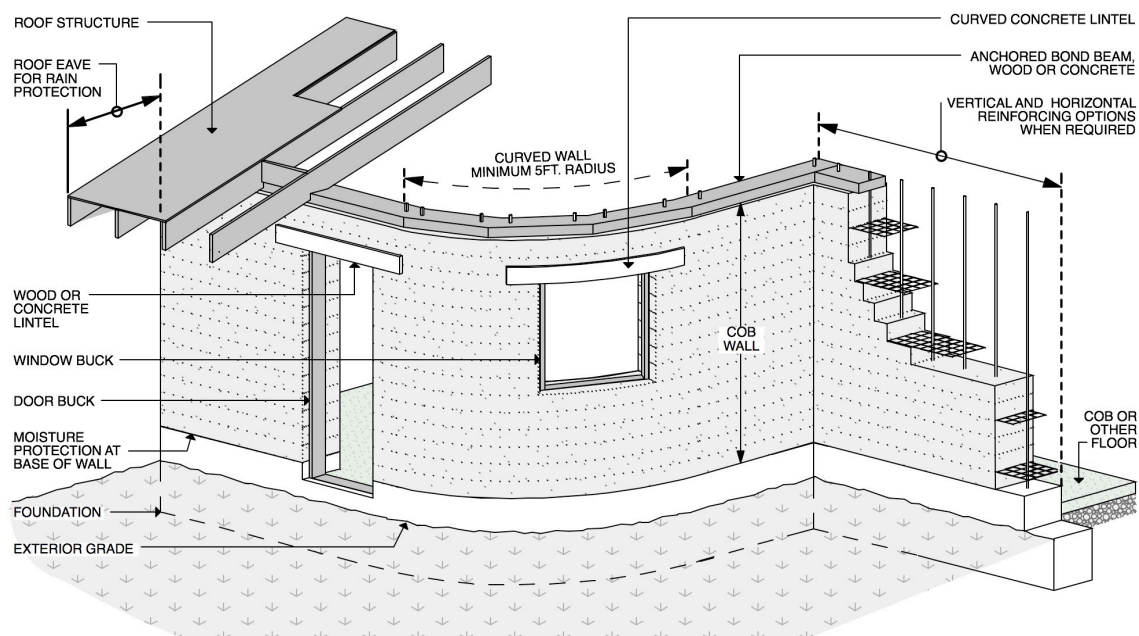
People can continue to build illegally without the code or permits if they choose. While CRI does not endorse this practice, non-permitted building activity could continue with the same benefits and the same legal and safety risks. (Note: The building code exempts some small structures from a building permit, but not in a manner that violates provisions of the code.)

Even if you choose to build a cob building without a permit, CRI hopes Appendix U can be useful to you. Though not a how-to guide, it includes requirements for building safely based on extensive structural testing. Everyone wants their buildings to be safe. The Appendix provides research-based quantifiable and performance guidelines for what until now has often been based on guesswork.

In summary, there are practical downsides to building with permits and codes, in terms of cost, time, and effort. However, it is CRI's position that the benefits of a cob building code – in terms of safety, legality, and societal appreciation and acceptance – far outweigh any downsides in the both the short and long term.

Questions?

Contact the IRC Cob Appendix lead author Martin Hammer with questions or comments: mfhammer@pacbell.net



Commentary Figure AU101.1
TYPICAL COB BUILDING COMPONENTS