



1 March 2013

2013 IRC Committee
International Residential Code
500 New Jersey Avenue, NW, 6th Floor
Washington, DC 20001

Re: Proposed IRC Appendix R - Strawbale Construction

Dear Committee Members:

We would like to express our strong support for the inclusion of the proposed Appendix R – Strawbale Construction in the 2015 International Residential Code.

We are architects that have overseen the design and construction of over two dozen straw-bale construction projects over the past 15 years. We have seen the evolution of straw-bale from alternative materials and methods submittals in the early days to near universal acceptance throughout California and around the world today.

Our projects include work on the Real Goods Solar Living Center, a 5,000 sf retail showroom in Hopland, CA, built in 1995 and performing as well today as the day it opened. The straw-bale system is a key component of keeping the building cool and comfortable on 100+°F days without any mechanical air conditioning, and similarly comfortable in the wintertime. Straw-bale construction, highly insulating and featuring a measured 12-hour thermal transfer lag, is a key component of this high-performing structure.

Recently our firm was recognized by CoolCalifornia.org (a CA state agency aiming to curb greenhouse gas emissions), in part for our use and promotion of straw-bale buildings. An annually renewable resource and agricultural by-product, straw-bales have very little embodied energy, and actually sequester carbon when used as a building material.

Inclusion of straw-bale as a part of the building code will make this user-friendly building system available to a broader population, and right at this time when it is sorely needed from a comfort and climate-preservation perspective.

Please contact either or us at our office if you have any further questions or concerns.

Sincerely,

Anni Tilt, AIA
Principal

David Arkin, AIA, LEED AP
Principal



Civil Engineering Department
500 El Camino Real
Santa Clara, CA 95053

March 5, 2013

IRC Committee Members
International Code Council
500 New Jersey Avenue, NW, 6th Floor
Washington, DC 20001

Re: Proposed Appendix on Strawbale Construction

Dear Committee Members:

I teach and conduct research in the area of earthquake-resistant structural engineering, and have helped develop code provisions as a member of the Seismic Provisions subcommittee of ACI 318 and as a member of the Building Seismic Safety Council Provisions Update Committee. In 2001, I conducted reversed cyclic tests of strawbale wall assemblies while at the University of Illinois as part of a larger testing program run by the Ecological Building Network. More recently I have overseen the testing of components of strawbale wall systems (e.g., mesh/plaster assemblies) at Santa Clara University, where I currently teach.

I strongly support adoption of the proposed IRC Appendix on strawbale construction, for the following reasons:

- The proposed Appendix represents substantial improvements in knowledge of straw bale construction, developed in research and practice by architects, engineers, builders, and researchers over the last 10 to 15 years.
- The proposed language itself is well developed, having been refined with significant input and review from many licensed design professionals and several professional organizations.
- The proposed Appendix is a significant improvement over the provisions contained in the current patchwork of codes and guidelines used in 6 cities/counties and 3 states (California, Nevada, and Oregon).

Strawbale construction has many desirable properties as a building material, particularly as a “green” or sustainable material. From my firsthand experience with full-scale tests of strawbale wall assemblies, strawbale construction has excellent seismic-resisting qualities; it is a ductile, energy-absorbing system with a soft core capable of providing gravity load resistance to very large drifts. It is a welcome and timely alternative to conventional building systems.

Sincerely,

A handwritten signature in blue ink, appearing to read "Mark Aschheim", followed by a horizontal line.

Mark Aschheim, Ph.D. P.E.
Professor and Chair
Fellow, American Concrete Institute
Member, Earthquake Engineering Research Institute
Member, Structural Engineers Association of California
Licensed Civil Engineer (California, C 55308)



February 28, 2013

2013 IRC Committee
International Residential Code
International Code Council

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Berkeley CA 94710
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510-528-5394

Re: proposed IRC Appendix R - Strawbale Construction

I write this letter in strong support of the inclusion of "Appendix R - Strawbale Construction," in the International Residential Code. I am very familiar with the proposed section, and I helped develop many of its structural provisions, including:

Section and Table AR105.4 Out-of-plane resistance and unrestrained wall dimensions.
Table AR106.12 Allowable Superimposed Vertical Loads for Plastered Load-Bearing Strawbale Walls
Table 106.13(1) Plastered Strawbale Braced Panel Types
Table AR106.13(2) Bracing Requirements for Strawbale Wall Panels Based on Wind Speed
Table AR106.13(3) Bracing Requirements for Strawbale Wall Panels Based on Seismic Design Category
Section AR106.14 Resistance to wind uplift forces.

The development of these tables and sections was based on testing data from university and laboratory tests, as well as years of collective experience by me and a number of colleagues, designing buildings with plastered strawbale walls to resist the building's gravity loads and wind and seismic lateral loads.

The values in the tables were obtained by applying well-established means of translating data from the testing of building materials and systems into allowable load values to be used in the structural engineering of buildings per established building codes. This includes applying appropriate factors of safety.

Over the last 12 years I have engineered the structural systems for 22 strawbale buildings, which includes 21 residential buildings and one public building, the Gateway Facility at Arastradero Preserve in Palo Alto, California. I participated in the in the design, observation, and documentation of structural testing for strawbale structures in the 2001 Ecological Building Network strawbale testing program, and was in particular charge of the out-of-plane testing. I also designed and conducted a project specific out-of-plane strawbale wall test for a strawbale residence in Mill Valley in 2000.

The inclusion of the proposed Strawbale Construction appendix in the IRC, would be of great benefit to architects, engineers, and code officials for future strawbale buildings. Its provisions are well developed and prescribe practices that meet the level of established building codes for other materials and systems. It would be a vast improvement over a mix of obsolete strawbale codes that are in use in various jurisdictions in the United States.

Sincerely,

Kevin Donahue, Structural Engineer, California S.E. 4071





Feb. 28, 2013

RE: Proposed Appendix R - Strawbale Construction for the International Residential Code

Dear IRC Committee Members,

I have reviewed the proposed Appendix R - Strawbale Construction and strongly support its inclusion in the final version of the International Residential Code. Strawbale construction has been shown to be an ecological, structurally sound and durable construction method. I am an ardent advocate for its inclusion in building codes as this will help ensure its acceptance, implementation and construction in a safe and approved manner.

As a licensed civil engineer with a structural engineering practice in Truckee, California, I have engineered over 20 strawbale projects in California, including single and multi-story houses, garages, a home office, school outbuilding and agricultural shed.

I am also the C.T.O. of the organization Pakistan Straw Bale and Appropriate Building (PAKSBAB), founded in the aftermath of the devastating 2005 Kashmir Earthquake. PAKSBAB has developed low-cost strawbale construction methods and to date has built 38 load-bearing strawbale houses in northern Pakistan.

In 2008-2009 PAKSBAB performed a seismic research project to determine the capacity of four clay plastered, load-bearing, strawbale wall assemblies under in-plane cyclic loading, and the performance of a 14' x 14' x 10' full-scale strawbale building using bi-axial shake table simulation. The Earthquake Engineering Research Institute helped fund the project and the tests were conducted at the Network for Earthquake Engineering Simulation facility at the University of Nevada, Reno. The house was subjected to a series of eight simulated earthquakes of increasing intensity and survived accelerations of 0.8g. More information about the project can be found on the research page of our website at www.paksbab.org.

Strawbale construction is an innovative and viable building method ideally suited for these environmentally challenging times. Please help to expand the building industry's choices by adopting these provisions into the IRC.

Sincerely,

Darcey Donovan, P.E.
CA Lic.# C59754
NV Lic.# 15599

February 27, 2013

2013 IRC Committee
International Code Council

Re: proposed Appendix R - Strawbale Construction for the International Residential Code

This letter is a statement of strong support for inclusion of the proposed appendix.

I have been designing building structures for 35 years, and over the past 18 have worked on 45 straw bale structures both residential and commercial. Through the non-profit I founded, the Ecological Building Network (EBNet), I have had the pleasure of watching and fostering the advent of straw bale construction in the following ways:

- 2001 With a quarter million dollars in support from the State of California and other sources, EBNet conducted and published seismic, wind, fire and moisture tests of straw bale structures. That work is summarized and discussed in the subsequent publication, *Design of Straw Bale Buildings*.
- 2011 EBNet has written and introduced a new standard to ASTM Committee E60, *Guide to the Use of Agricultural Resource Materials in Construction*. That draft standard is now in the first round of balloting.

Though most often used in residential low-rise construction, straw bale walls have already demonstrated value when used in low and mid-rise commercial and other structures; there are already many examples of offices, stores, postal facilities, schools, garages and more. They demonstrate that it is possible to wean our buildings from foreign oil both by insulating very well (R30 per the State of California), and by deriving the insulation material itself from the farmer's field – not petroleum. They are extremely effective at resisting both earthquake forces and fire, and can play a huge role in a new green construction industry.

Thus I urge the Committee's approval these provisions.

Sincerely,



Bruce King, PE

Director, Ecological Building Network

February 28, 2013

International Code Council
500 New Jersey Avenue, NW, 6th Floor
Washington DC, 20001

Re: Proposed IRC Appendix R: Strawbale Construction

Dear IRC Committee Members,

I support the inclusion of the proposed appendix on strawbale Construction.

As a licensed architect (C29381) and a licensed engineer (CE, C66144), I have worked on a range of building types: schools, assembly halls, multifamily housing, high-rise structures, and single family residences. My work includes materials such as, concrete, steel, wood, strawbale, rammed earth, reclaimed materials, and SIPs.

My experience with straw bale construction has been structural design. My past projects include two conference facilities. One of these projects relied on the bale walls as the lateral force resisting system. The other project is located in a high seismic region in California and is close to the San Andreas Fault. The residential projects include two story projects and buildings using the bales as the lateral system. I have also designed a strawbale building in the Caribbean using IBC requirements for hurricane regions.

I have reviewed the proposed Appendix, and I fully support the contents.

Straw bale construction has the unique quality of utilizing a natural waste material which is generated in the numerous and varied agricultural regions of the United States. The generation of the material will not cease. Pristine ecologies are not disrupted in the acquisition of these structural fibers.

I have worked on the design of buildings for close to 20 years, and the design professionals and contractors researching and working with straw bale construction have shown an impressive thoroughness in understanding moisture mechanics, material mechanics, and other physical properties of the materials and systems in straw bale assemblies. This understanding exceeds the knowledge and abilities of similar professionals working in other materials. I solidly support the efforts and work of the individuals generating the content of the proposed code.

Sincerely,



Henri Mannik, Architect, CE

130228-irc sb letter hmae

March 6, 2013

IRC Structural Committee

Re: Appendix R- Strawbale Construction for the International Residential Code

Dear IRC Committee members,

I write this letter in strong support of the inclusion of Strawbale Construction in the International Residential Code. I am familiar with the proposal, and have provided input over its years of development.

I have structurally engineered nine strawbale buildings, including three commercial or institutional projects. I have also engineered a strawbale school and numerous residential buildings in China in response to the 1998 Hibi earthquake. I participated in the design, observation, and documentation of structural testing for strawbale wall systems in the 2001 Ecological Building Network strawbale testing program, and was in co-charge of the monotonic and reversed-cyclic in-plane tests at the University of Illinois. In 2004 I oversaw in-plane cyclic testing of a strawbale wall at California Polytechnic University. I also designed and conducted a project-specific strawbale vault test for the Harrison Residence in 2000. The Harrison Residence won a 2002 Excellence in Structural Engineering Award from the Structural Engineers Association of Northern California.

From the observation of testing, analysis of testing results, and my experience engineering and seeing the construction of strawbale buildings, I have come to see that strawbale construction when properly designed and constructed has excellent seismic-resisting qualities. It is a ductile, energy-absorbing system with inherent redundancy. Even when pushed to its limit it does not fail catastrophically. These are very valuable qualities for seismic-resisting systems.

I strongly encourage the inclusion of the proposed Strawbale Construction in the IRC. It would be of great benefit to engineers, architects, and code officials for future strawbale buildings. It would be a vast improvement over a mix of obsolete strawbale codes currently in use in various jurisdictions in the US.

Please call if you have any questions.

Sincerely,



David Mar, SE
Principal

Strawbale Support Letter 3.6.13.odt

IRC Committee Members and Other Interested Parties

International Residential Code

Re: proposed Appendix R - Strawbale Construction for the International Residential Code

I fully support inclusion of Appendix R - Strawbale Construction into the International Residential Code. As a registered architect in my 3rd decade in the profession I have worked on wide variety of commercial, residential and institutional buildings ranging from large State Office Buildings and Regional Operations Centers for financial institutions to multi-family complexes and custom homes. Based on my years of experience, I feel that straw bale construction can be a valid alternative to traditional construction methods and have utilized it in my practice for almost 2 decades.

In 1993 I started a small firm specializing in site specific sustainable design through which I have gained experience with many high insulation wall systems, including straw.

In 1996 I helped organize and lead a committee that wrote the Straw Bale Code currently used by the City of Austin Texas. I also helped organize and lead the Straw Bale Association of Texas in the mid 1990's and designed Austin's first 5 star rated home in 1997 (a 2 story post and beam straw bale). A few years ago, I was a member of the team that built and tested the wall assemblies used to achieve an 2hr rating (ASTM 119 full scale fire test) for cement stucco'd straw bale walls.). I provide resources to interested parties about straw bale construction and occasionally speak about high performance wall systems for the City of Austin Green Builder Program.

Straw bale construction has been an ever growing part of my practice. Since the late 90's I've designed over to 20 straw bale buildings including a straw bale photography studio/ office/wedding rental space and 2 straw bale concept buildings for the U.S. Army at Fort Hood (one a 1 story training facility of approximately 5000 s.f. and the other a 120,000 s.f. multi-story office building utilizing jumbo bales.)

I have seen straw bales used as insulation in a multi story office building in Canada and considered for a shopping center in California. There is a straw bale office building in Waxahachie Texas (built around 1999). The Army projects have spanned a 10 year period as the military continues to come back to straw as a very intriguing wall system option.

I first worked on a straw bale building in 1993 and have seen this material go from Hippie fringe to mainstream. I think the 2 hr ASTM test has truly opened the door for straw bale construction and I expect to see much more interest in the commercial sector in the near future. With the many straw bale successes out there and with the ever increasing cost of energy, the interest in straw bale construction will only continue to rise.

The IRC has the opportunity to provide a positive framework, grounded in science and caution, for straw bale construction worldwide. As a professional who designs these buildings and a parent who is raising 2 children in one, I wholeheartedly support inclusion of Appendix R - Strawbale Construction in the International Residential Code.

Sincerely

Ben Obregon Architect RA #14030 Texas
Principal

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March 11, 2013

**2013 IRC Committee
International Residential Code**

Re: Proposed Appendix R – Strawbale Construction for the International Residential Code

Committee:

I am writing in support of the inclusion of the subject section into the IRC. My support comes from experience with both the existing IRC code structure and hands-on experience with straw bale construction.

My experience with the code ranges from permitting many of the first bale structures in counties across Colorado to implementing ICC code requirements in U.S. Army Corp of Engineering projects in Afghanistan. I have *built* over 30 custom bale structures for clients ranging from single family residences to commercial and institutional projects. The commercial and institutional projects were grocery stores, agricultural facilities and schools.

In addition to my work designing and building bale structures I have overseen or been involved with a number of tests on bale structures including the first comprehensive compression testing on plastered bale walls in 1999 at the University of Colorado, Boulder. At Odisea we have performed numerous small-scale tests on individual bales, plaster materials, and combinations thereof.

As stated above, I am writing in support of the inclusion of the proposed Appendix R into the IRC. I have reviewed and made contributions to the draft version and believe it meets the standards of the ICC requirements.

Including bale construction into the building codes will signal a fundamental change in the way materials and systems are reviewed and approved by our building officials. Natural materials, including cellulose fibers (straw) and earth, must be part of the larger context of “green” building codes, otherwise they will continue to push the limits of sustainable construction outside of the mainstream where their full potential will remain marginalized.

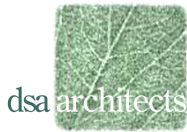
Should you have any questions regarding the content of this letter, please do not hesitate to contact me at jeff@odiseanet.com or (970) 704-5828. Thank you for your time and consideration in this matter.

Sincerely,



Jeff Ruppert, P.E. (Colorado Lic #32762, California Lic #76296)
Principal





February 27, 2013

2013 IRC Committee
International Code Council

Re: proposed Appendix R - Strawbale Construction

Dear Committee members,

I strongly support of the proposed inclusion of Appendix R – Strawbale Construction in the International Residential Code. I am very familiar with the proposed appendix, and have provided substantial review and input for all of its content throughout its development.

Daniel Smith & Associates is an architectural firm with experience in a wide range of sustainable building design practices, with particular focus and experience with strawbale construction. Since 1994 we have designed 40 strawbale buildings, including 3 commercial or institutional projects. The non-residential projects include the Trinity Springs bottling plant in Idaho, the Shorebird Nature Center in Berkeley, California, and the Presentation Center welcoming center and dining hall in northern California. The latter project is LEED Gold-certified, and won an AIA Sustainability Award in 2007.

Internationally I have designed a strawbale residence in Ireland, and have assisted in the design of strawbale housing in Mongolia, of a strawbale seismic-resisting building system in earthquake-affected Pakistan, and a prototype house in Haiti after its 2010 earthquake.

I participated in the design, observation, and documentation of testing for strawbale wall systems in the 2001 Ecological Building Network strawbale testing program, and am a contributing author to the resulting book *Design of Straw Bale Buildings*. A straw bale vault test led by structural engineer David Mar was facilitated by and conducted at my office in 2000.

I encourage the inclusion of the proposed Strawbale Construction appendix in the IRC. It would be of great benefit to architects, engineers, and code officials for future residential strawbale buildings. It would be a vast improvement over the out-dated and seriously flawed strawbale codes currently in use in various jurisdictions in the US.

Sincerely,

A handwritten signature in black ink that reads "Dan Smith".

Daniel Smith, Architect
California License # C-10243, LEED-AP

**The Benningfield Group
400 Plaza Drive, Suite 120
Folsom, CA 95630**

February 27, 2013

IRC Committee Members
International Residential Code

Re: Proposed Appendix R - Strawbale Construction – in the International Residential Code

Dear IRC Committee members,

I write this letter in strong support for the inclusion of Appendix R – Strawbale Construction in the International Residential Code, and in particular, all details related to Thermal Insulation.

My professional experience in the realm of building includes years as a licensed contractor, plans examiner, building inspector, and chief building inspector for Humboldt County, California; as a contributing author of the State of California's Building Energy Efficiency Standards in 1992, 2001, and 2005; and working with the California Energy Commission (CEC) to revise the state's Title 24 Building Energy Efficiency Standards since 1986 (as a Chief Building inspector (1986-89), then CEC staff (1989-98), then as a consultant to the CEC (1998-present)).

I have direct knowledge of strawbale construction through the construction of my own strawbale house, and I have particular knowledge and expertise of the thermal insulating properties of strawbale wall assemblies. This is via my work with the California Energy Commission, where I managed a 1996 ASTM 236 Hot Box test of a plastered strawbale wall assembly in California, and through my involvement with a 1998 ASTM 236 Hot Box Test at the Oak Ridge National Laboratory in Tennessee.

I was one of the technical advisors for the Oak Ridge test, and used the results as the basis of a report I wrote for the California Energy Commission (CEC). The report led the CEC to determine what thermal resistance value to assign for strawbale walls in California's Title 24 Building Energy Efficiency Standards. These values (R-30 for plastered strawbale walls whether the bales are laid flat or on-edge) are conservative because the actual R-values the Oak Ridge test yielded were closer to R-33. The assembly and unit R-values in Chapter 24, Section 2408 Thermal Insulation of the proposed IRC are entirely consistent with a conservative interpretation of the Oak Ridge test, and are consistent with the values the CEC has used in its Title 24 Energy Standards since 1998.

I support the full inclusion of Appendix R – Strawbale Construction in the IRC.

Sincerely,

Nehemiah Stone

Principal
The Benningfield Group
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(916) 221-3110 ext 11
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February 27, 2013

2013 IRC Committee
International Code Council

Re: proposed Appendix R - Strawbale Construction

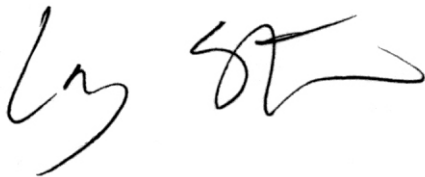
To whom it may concern,

I am writing in support for inclusion of the proposed appendix on Strawbale Construction in the International Residential Code. Our firm has been designing buildings for 25 years, and we have designed 5 strawbale buildings - one residential, two institutional and two unbuilt projects over the past 10 years. Our first strawbale building was the Dining Hall at Camp Arroyo, an environmental Education Camp in Livermore, CA. At 7,500 sf, the building was the largest strawbale structure in California when it was built in 2001. It has performed extremely well over the last decade and maintains a very even temperature year around. The project won a National AIA Top Ten Green Project award and a PG&E Savings by Design award. We followed that with a strawbale home in Healdsburg, CA that also was an AIA Top Ten Green Project winner in 2003. Lastly we designed a strawbale complex for a retreat center in the Sierra foothills, with a two-story strawbale dormitory. We have also designed other residential strawbale projects that were not built.

Strawbale is an excellent building material in the right application. It is one of the lowest impact materials available in terms of CO₂ emissions – due to the low embodied CO₂ emissions of the strawbale and the reduced operating emissions due to the high insulating value.

Our firm has a great deal of experience with sustainable, low-impact materials. In 1996, I researched and wrote ReSourceful Specifications – Guideline specifications for Environmentally Considered Materials and Methods. The Specifications were originally written for the Alameda County Waste Management Authority and later incorporated into the GreenSpec Directory, published by BuildingGreen.com. With input from Bruce King and other early pioneers of Strawbale construction, we included an early draft for a strawbale specification in the Guideline Specifications.

I have reviewed the proposal for Appendix R – Strawbale Construction – and fully support its inclusion into the IRC. This is important work and I urge you to approve it.



Larry Strain, FAIA, LEED AP
Principal, Siegel & Strain Architects