

MAG Building Codes Committee
Code Amendments and Standards
Updated Documents from May 2012 meeting

At the May 16, 2012 MAG Building Codes Committee meeting, the committee voted to table eight of the items until the June 20, 2012 meeting to allow members to further research these items. The results of this additional research is listed below and provided in this packet.

- Item number 7, regarding the utility companies installing lighting on private property outside of municipal building codes. Further research is needed, and this item will be continued to the next available meeting.
- Item number 8, regarding model standards for fireplaces, wood stoves, and other solid fuel burning devices. This standard was originally based on a federal standard, which has not been changed. Item number 8 appears to not need to be updated.
- Item number 9 and Item number 11, regarding plastic tags on wood trusses. Result of an informal survey of MAG member agencies is presented.
- Item number 10, regarding strawbale construction. Updated standard from the City of Tucson is presented.
- Item number 19 and Item number 20, regarding standards for the installation of photovoltaic solar panels on residential and commercial developments. Further research is needed, and these items will be continued to the next available meeting.
- Item number 24, regarding the use of foam products for fireblocking. A summary of findings is presented.

MARICOPA ASSOCIATION OF GOVERNMENTS
FIREPLACE STANDARD
October 23, 1997

Purpose:

The purpose of this Standard is to regulate fireplaces, woodstoves, or other solid-fuel burning devices to reduce the amount of air pollution caused by particulate matter and carbon monoxide.

Effective Date:

The effective date of the regulations and prohibitions set forth in this Standard shall take effect no earlier than December 31, 1998.

Definitions:

For purposes of this Standard, the following words and terms shall be defined as follows:

FIREPLACE means a built in place masonry hearth and fire chamber or a factory-built appliance, designed to burn solid fuel or to accommodate gas or electric log insert or similar device, and which is intended for occasional recreational or aesthetic use, not for cooking, heating, or industrial processes.

SOLID FUEL includes but is not limited to wood, coal, or other nongaseous or nonliquid fuels, including those fuels defined by the Maricopa County Air Pollution Control Officer as "inappropriate fuel" to burn in residential woodburning devices.

WOODSTOVE means a solid-fuel burning heating appliance including a pellet stove, which is either freestanding or designed to be inserted into a fireplace.

Installation Restrictions:

- a) On or after the effective date, no person, firm or corporation shall construct or install a fireplace or a woodstove, and the Building Official shall not approve or issue a permit to construct or install a

fireplace or a woodstove, unless the fireplace or woodstove complies with one of the following:

1. A fireplace which has a permanently installed gas or electric log insert.

2. A fireplace, woodstove or other solid-fuel burning appliance which has been certified by the United States Environmental Protection Agency as conforming to 40 Code of Federal Regulations Part 60, Subpart AAA as in effect on July 1, 1990.

3. A fireplace, woodstove or other solid-fuel burning appliance which has been tested and listed by a nationally recognized testing agency to meet performance standards equivalent to those adopted by 40 Code of Federal Regulations Part 60, Subpart AAA as in effect on July 1, 1990.

4. A fireplace, woodstove or other solid-fuel burning appliance which has been determined by the Maricopa County Air Pollution Control Officer to meet performance standards equivalent to those adopted by 40 Code of Federal Regulations Part 60, Subpart AAA as in effect on July 1, 1990.

5. A fireplace which has a permanently installed woodstove insert which complies with subparagraphs 2, 3, or 4 above.

b) The following installations are not regulated by this Standard and are not prohibited by this Standard:

1. Furnaces, boilers, incinerators, kilns, and other similar space heating or industrial process equipment.

2. Cookstoves, barbecue grills, and similar appliances designed primarily for cooking.

3. Fire pits, barbecue grills, and other outdoor fireplaces.

Fireplace or Woodstove Alterations Prohibited:

- a) On or after the effective date, no person, firm or corporation shall alter or remove a gas or electric log insert or a woodstove insert from a fireplace for purposes of converting the fireplace to directly burn wood or other solid fuel.

- b) On or after the effective date, no person, firm or corporation shall alter a fireplace, woodstove or other solid fuel burning appliance in any manner that would void its certification or operational compliance with the provisions of this Standard.

Permits Required:

In addition to the provisions and restrictions of this Standard, construction, installation or alteration of all fireplaces, woodstoves and other gas, electric or solid-fuel burning appliances and equipment shall be done in compliance with provisions of the Construction Code and shall be subject to the permits and inspections required by the Construction Code.

MAG Historical Document #9 and #11 – Standard Marking of Trusses (Use of Composite Tags affixed to face of the truss bottom cord)

Findings:

Survey of Jurisdictions enforcing this standard

1. Does your jurisdiction require/enforce the use of a composite (weather resistant) tag attached to the face of the bottom cord of the truss with a metal plate connector to identify the Manufacturer, design loads and spacing of trusses?
2. Do you require the bearing points to be marked with composite tags?

Results:

10 responses to survey

1. 8 do not enforce the use of composite tags to identify the mfr, design loads, spacing of truss, and bearing points, but do require Approved Truss Design Drawings on site during inspection.
2. 2 do not require the first item (composite tag identifying the Manufacturer, design load, and truss spacing) but require the bearing points to be marked. (other than at the end of heel locations).

Third Party Inspections

- Truss Plant Quality Audit reports indicate that Stamp legibility is one of the items inspected by third party agencies. "Tags" are noted in the report, if they are used for compliance.
- TPI 1 may require manufacturer's identification, truss ID, Bearing points to be identified. (I did not have access to TPI 1 to verify this)

Code summary

- 1994 / 1997 UBC required marking of truss mfr, design load and spacing of truss at mid-span of truss
- 1994 UBC required bearing points to be marked
- 1994 UBC allowed truss calcs in lieu of marking
- 2006 / 2009 / 2012 IBC do not have marking requirements
- 2006 / 2009 / 2012 IBC require truss design drawings to be submitted to the Building Official for review
- All code additions reference TPI 1: National Design Standard for Metal Plate Connected Wood Truss Construction – latest addition

Code References:

1994 UBC section 2343.6 / 1997 section 2321.4 Marking. Each truss shall be legibly branded, marked or otherwise have permanently affixed thereto the following information located within 2 feet of the center of the span on the face of the bottom chord:

1. Identity of the company manufacturing the truss.
2. The design load.
3. The spacing of trusses.

1994 UBC section 2343.7.4.2 Bearing locations. Trusses having bearing locations other than at the end of heel locations shall have bearing points clearly marked in a manner which permits verification during and after installation.

1994 UBC 2343.7.4.4 Alternatives. In lieu of marking trusses, it shall be acceptable to document the location of special bearing conditions, permanent bracing, and orientation of trusses by means of engineering drawings, erection plans and/or special details.

2006 IBC 2303.4.1.2 Truss design drawings.

The written, graphic and pictorial depiction of each individual truss shall be provided to the building official and approved prior to installation. Truss design drawings shall also be provided with the shipment of trusses delivered to the job site. Truss design drawings shall include, at a minimum, the information specified below:

1. Slope or depth, span and spacing;
2. Location of joints;
3. Required bearing widths;
4. Design loads as applicable;
5. Top chord live load (including snow loads);
6. Top chord dead load;
7. Bottom chord live load;
8. Bottom chord dead load;
9. Concentrated loads and their points of application as applicable;
10. Controlling wind and earthquake loads as applicable;
11. Adjustments to lumber and metal connector plate design value for conditions of use;
12. Each reaction force and direction;

13. Metal connector plate type, size, thickness or gage, and the dimensioned location of each metal connector plate except where symmetrically located relative to the joint interface;
14. Lumber size, species and grade for each member;
15. Connection requirements for:
 - 15.1. Truss to truss;
 - 15.2. Truss ply to ply; and
 - 15.3. Field splices.
16. Calculated deflection ratio and maximum vertical and horizontal deflection for live and total load as applicable;
17. Maximum axial tensile and compression forces in the truss members; and
18. Required permanent individual truss member bracing and method per Section 2303.4.1.5, unless a specific truss member permanent bracing plan for the roof or floor structural system is provided by a registered design professional.

2009 / 2012 IBC 2303.4.1.1 Truss design drawings.

The written, graphic and pictorial depiction of each individual truss shall be provided to the building official for approval prior to installation. Truss design drawings shall also be provided with the shipment of trusses delivered to the job site. Truss design drawings shall include, at a minimum, the information specified below:

1. Slope or depth, span and spacing;
2. Location of all joints and support locations;
3. Number of plies if greater than one;
4. Required bearing widths;
5. Design loads as applicable, including;
 - 5.1. Top chord live load;
 - 5.2. Top chord dead load;
 - 5.3. Bottom chord live load;
 - 5.4. Bottom chord dead load;
 - 5.5. Additional loads and locations; and

- 5.6. Environmental design criteria and loads (wind, rain, snow, seismic, etc.).
6. Other lateral loads, including drag strut loads;
7. Adjustments to wood member and metal connector plate design value for conditions of use;
8. Maximum reaction force and direction, including maximum uplift reaction forces where applicable;
9. Metal-connector-plate type, size and thickness or gage, and the dimensioned location of each metal connector plate except where symmetrically located relative to the joint interface;
10. Size, species and grade for each wood member;
11. Truss-to-truss connections and truss field assembly requirements;
12. Calculated span-to-deflection ratio and maximum vertical and horizontal deflection for live and total load as applicable;
13. Maximum axial tension and compression forces in the truss members; and
14. Required permanent individual truss member restraint location and the method and details of restraint/bracing to be used in accordance with Section 2303.4.1.2.

Section R614 - Earthen Wall Structures

R614.1 General. Earthen wall structures in Seismic Design Category A, B or C with basic wind speed of 90 mph or less with wind exposure category of A, B, or C may be designed and constructed in accordance with the provisions of this Section R614.

This Section shall supersede the limitations of Section R301.2.2 and structures complying with the provisions of Section R614 shall have complied with the seismic requirements of this code.

Exception: Structures with any site conditions may be designed with accepted engineering practice for earthen wall structures and the provisions of the IBC Section 2114 as amended.

R614.1.1 Earthen materials. This section shall establish minimum standards for safety for construction of earthen materials structures, collectively known as adobe, rammed earth, and hydraulic pressed unit construction.

R614.1.2 Professional registration not required. When the empirical design provisions of this section are used to design wall systems, project drawings, typical details and specifications are not required to bear the seal of an architect or engineer, unless otherwise required by the state law of the jurisdiction having authority or as required by Section R614.1.3.

R614.1.3 Professional registration required. When the earthen structure is over 12 feet (3638 mm) in height, as measured by Table R602.3.1, or is over 1 story, the plans and specifications shall be prepared by a registered professional architect or engineer licensed in the state for which the project is to be constructed. All such projects shall be designed in accordance with accepted engineering practice for earthen wall structures and in accordance the International Building Code Section 2114 as amended.

R614.2 Dimensions of earth walls. The actual measured thickness of earthen walls shall conform to the requirements of Section R614.

R614.2.1 Thickness and Height. The minimum thickness and maximum height of earthen walls and parapets shall be in accordance with Tables R614.2.1 (1 to 6) based upon the S_d value for the site of the project. Wall thickness shall be measured from face to face of walls with concave joints. Walls with rake joints shall be measured surface of joint to surface of joint. The thickness of wall sections shall not be combined without full cross bonding of the masonry units throughout the wall.

Exception: Walls supported only at ground level and only supported at the base of the wall shall be limited to a height of ½ that allowed by Tables R614.2.1 (1 to 6).

Table R614.2.1 (1)

Seismic Sites with Sds

0.00 TO 0.25

Assuming zero tension out-of-plane

	10	11	12	Actual Wall Thickness (in) 13	14	15	16	18	20	22	24
	Maximum Wall Heights (inches)										
EXTERIOR	NP	83	99	116	135	144	144	144	144	144	144
INTERIOR	127	140	144	144	144	144	144	144	144	144	144
PARAPET	NP	22	24	26	28	30	32	36	40	44	48
	Bond Beam Size and Steel Requirements All Bond Beams 8" Minimum Height										
EXTERIOR WALL NO PARAPET											
TYPE "A"	2- #4	2- #4	2- #5	2- #5	2- #5	2- #5	2- #4	2- #4	2- #4	2- #4	2- #4
TYPE "B"	2- #5	2- #5	2- #5	4- #4	4- #4	4- #4	2- #5	2- #4	2- #4	2- #4	2- #4
TYPE "C"	NP	NP	NP	NP	NP	4- #5	4- #4	2- #4	2- #4	2- #4	2- #4
EXTERIOR WALL with FULL PARAPET											
TYPE "A"	2- #4	2- #4	2- #5	2- #5	2- #5	2- #5	2- #4	2- #4	2- #4	2- #4	2- #4
TYPE "B"	2- #5	2- #5	2- #5	4- #4	4- #4	4- #4	2- #5	2- #4	2- #4	2- #4	2- #4
TYPE "C"	NP	NP	NP	NP	NP	4- #5	4- #4	2- #4	2- #4	2- #4	2- #4
INTERIOR WALL w/ infill between beams											
TYPE "A"	2- #4	2- #4	2- #5	2- #5	2- #5	2- #5	2- #4	2- #4	2- #4	2- #4	2- #4
TYPE "B"	2- #5	2- #5	2- #5	4- #4	4- #4	4- #4	2- #5	2- #4	2- #4	2- #4	2- #4
TYPE "C"	NP	NP	NP	NP	NP	4- #5	4- #4	2- #4	2- #4	2- #4	2- #4

NP = This wall not permitted.

Table R614.2.1 (2)

0.25 TO 0.30

Seismic Sites with Sds

Assuming zero tension out-of-plane

	10	11	12	Actual Wall Thickness (in) 13	14	15	16	18	20	22	24
				Maximum Wall Heights (inches)							
EXTERIOR	NP	83	99	116	135	144	144	144	144	144	144
INTERIOR	106	116	127	137	144	144	144	144	144	144	144
PARAPET	NP	22	24	26	28	30	32	36	40	44	48
				Bond Beam Size and Steel Requirements All Bond Beams 8" Minimum Height							
EXTERIOR WALL NO PARAPET											
TYPE "A"	2- #4	2- #5	2- #5	2- #5	4- #4	4- #4	2- #5	2- #4	2- #4	2- #4	2- #4
TYPE "B"	2- #5	4- #4	4- #4	4- #5	4- #5	4- #5	4- #4	2- #5	2- #4	2- #4	2- #4
TYPE "C"	NP	NP	NP	NP	NP	4- #5	4- #5	2- #5	2- #4	2- #4	2- #4
EXTERIOR WALL with FULL PARAPET											
TYPE "A"	2- #4	2- #5	2- #5	2- #5	4- #4	4- #4	2- #5	2- #4	2- #4	2- #4	2- #4
TYPE "B"	2- #5	4- #4	4- #4	4- #5	4- #5	4- #5	4- #4	2- #5	2- #4	2- #4	2- #4
TYPE "C"	NP	NP	NP	NP	NP	4- #5	4- #5	2- #5	2- #4	2- #4	2- #4
INTERIOR WALL w/ infill between beams											
TYPE "A"	2- #4	2- #5	2- #5	2- #5	4- #4	4- #4	2- #4	2- #4	2- #4	2- #4	2- #4
TYPE "B"	2- #5	4- #4	4- #4	4- #5	4- #5	4- #5	4- #4	2- #5	2- #4	2- #4	2- #4
TYPE "C"	NP	NP	NP	NP	NP	4- #5	4- #5	2- #5	2- #4	2- #4	2- #4

NP = This wall not permitted.

BOND BEAM LOAD	46	61	79	100	125	125	108	80	42	0	0
BOND BEAM LOAD	81	103	130	160	194	204	198	194	183	171	203
BOND BEAM LOAD	84	100	118	137	150	151	152	155	158	161	164

Table R614.2.1 (3)

Seismic Sites with Sds

0.30 TO 0.35

Assuming zero tension out-of-plane

	10	11	12	Actual Wall Thickness (in) 13	14	15	16	18	20	22	24
				Maximum Wall Heights (inches)							
EXTERIOR	NP	83	99	116	127	136	144	144	144	144	144
INTERIOR	91	100	109	118	127	136	144	144	144	144	144
PARAPET	NP	22	24	26	28	30	32	36	40	44	48
				Bond Beam Size and Steel Requirements All Bond Beams 8" Minimum Height							
EXTERIOR WALL NO PARAPET											
TYPE "A"	2- #5	2- #5	2- #5	4- #4	4- #4	4- #5	4- #5	4- #4	2- #5	2- #4	2- #4
TYPE "B"	4- #4	4- #4	4- #5	4- #5	4- #5	4- #5	4- #5	4- #4	2- #5	2- #4	2- #4
TYPE "C"	NP	NP	NP	NP	NP	4- #6	4- #6	4- #5	4- #4	2- #5	2- #4
EXTERIOR WALL with FULL PARAPET											
TYPE "A"	2- #5	2- #5	2- #5	4- #4	4- #4	4- #4	2- #5	4- #4	2- #5	2- #4	2- #4
TYPE "B"	4- #4	4- #4	4- #5	4- #5	4- #5	4- #5	4- #5	4- #4	2- #5	2- #4	2- #4
TYPE "C"	NP	NP	NP	NP	NP	4- #6	4- #6	4- #5	4- #4	2- #5	2- #4
INTERIOR WALL w/ infill between beams											
TYPE "A"	2- #5	2- #5	2- #5	4- #4	4- #4	4- #5	4- #5	4- #4	2- #5	2- #4	2- #4
TYPE "B"	4- #4	4- #4	4- #5	4- #5	4- #5	4- #5	4- #5	4- #4	2- #5	2- #4	2- #4
TYPE "C"	NP	NP	NP	NP	NP	4- #6	4- #6	4- #5	4- #4	2- #5	2- #4

NP = This wall not permitted.

BOND BEAM LOAD	53	71	92	117	137	157	176	156	127	88	40
BOND BEAM LOAD	94	121	151	186	218	250	281	289	291	287	277
BOND BEAM LOAD	86	103	120	140	160	182	203	206	210	213	216

Table R614.2.1 (4)

Seismic Sites with Sds

0.35 TO 0.40

Assuming zero tension out-of-plane

	10	11	12	Actual Wall Thickness (in) 13	14	15	16	18	20	22	24
	Maximum Wall Heights (inches)										
EXTERIOR	NP	83	95	103	111	119	127	143	144	144	144
INTERIOR	79	87	95	103	111	119	127	143	144	144	144
PARAPET	NP	22	24	26	28	30	32	36	40	44	48
	Bond Beam Size and Steel Requirements All Bond Beams 8" Minimum Height										
EXTERIOR WALL NO PARAPET											
TYPE "A"	2- #5	2- #5	4- #4	4- #4	4- #4	4- #5	4- #5	4- #5	4- #4	2- #5	2- #5
TYPE "B"	4- #4	4- #5	4- #5	4- #5	4- #5	4- #5	4- #5	4- #5	4- #5	4- #4	2- #5
TYPE "C"	NP	NP	NP	NP	NP	4- #6	4- #6	4- #6	4- #5	4- #5	2- #5
EXTERIOR WALL with FULL PARAPET											
TYPE "A"	2- #5	2- #5	4- #4	4- #4	4- #4	4- #5	4- #5	4- #5	4- #4	2- #5	2- #5
TYPE "B"	4- #4	4- #5	4- #5	4- #5	4- #5	4- #5	4- #5	4- #5	4- #5	4- #4	2- #5
TYPE "C"	NP	NP	NP	NP	NP	4- #6	4- #6	4- #6	4- #5	4- #5	2- #5
INTERIOR WALL w/ infill between beams											
TYPE "A"	2- #5	2- #5	4- #4	4- #4	4- #4	4- #5	4- #5	4- #5	4- #4	2- #5	2- #5
TYPE "B"	4- #4	4- #5	4- #5	4- #5	4- #5	4- #5	4- #5	4- #5	4- #5	4- #4	2- #5
TYPE "C"	NP	NP	NP	NP	NP	4- #6	4- #6	4- #6	4- #5	4- #5	2- #5

NP = This wall not permitted.

BOND BEAM LOAD	61	81	101	118	137	157	179	227	211	181	142
BOND BEAM LOAD	108	138	168	198	229	263	299	379	399	409	412
BOND BEAM LOAD	89	105	123	143	163	186	209	260	268	272	276

Table R614.2.1 (5)

Seismic Sites with Sds

0.40 TO 0.45

Assuming zero tension out-of-plane

	10	11	12	Acutal Wall Thickness (in) 13	14	15	16	18	20	22	24
				Maximum Wall Heights (inches)							
EXTERIOR	NP	78	85	92	99	106	113	127	141	144	144
INTERIOR	70	78	85	92	99	106	113	127	141	144	144
PARAPET	NP	22	24	26	28	30	32	36	40	44	48
				Bond Beam Size and Steel Requirements All Bond Beams 8" Minimum Height							
EXTERIOR WALL NO PARAPET											
TYPE "A"	2- #5	2- #5	4- #4	4- #4	4- #4	4- #5	4- #5	4- #5	4- #5	4- #5	4- #4
TYPE "B"	4- #5	4- #5	4- #5	4- #5	4- #5	4- #5	4- #5	4- #5	4- #6	4- #5	4- #5
TYPE "C"	NP	NP	NP	NP	NP	4- #6	4- #6	4- #6	4- #6	4- #6	4- #5
EXTERIOR WALL with FULL PARAPET											
TYPE "A"	2- #5	2- #5	4- #4	4- #4	4- #4	4- #5	4- #5	4- #5	4- #5	4- #5	4- #4
TYPE "B"	4- #5	4- #5	4- #5	4- #5	4- #5	4- #5	4- #5	4- #5	4- #6	4- #5	4- #5
TYPE "C"	NP	NP	NP	NP	NP	4- #6	4- #6	4- #6	4- #6	4- #6	4- #5
INTERIOR WALL w/ infill between beams											
TYPE "A"	2- #5	2- #5	4- #4	4- #4	4- #4	4- #5	4- #5	4- #5	4- #5	4- #5	4- #4
TYPE "B"	4- #5	4- #5	4- #5	4- #5	4- #5	4- #5	4- #5	4- #5	4- #6	4- #5	4- #5
TYPE "C"	NP	NP	NP	NP	NP	4- #6	4- #6	4- #6	4- #6	4- #6	4- #5

NP = This wall not permitted.

BOND BEAM LOAD	68	85	101	118	137	157	179	227	280	274	243
BOND BEAM LOAD	121	149	177	208	241	276	314	398	491	530	548
BOND BEAM LOAD	91	108	126	146	167	189	213	265	322	339	343

Table R614.2.1 (6)

0.45 TO 0.50

Seismic Sites with Sds

Assuming zero tension out-of-plane

	10	11	12	Actual Wall Thickness (in) 13	14	15	16	18	20	22	24
				Maximum Wall Heights (inches)							
EXTERIOR	NP	70	76	82	89	95	101	114	127	140	144
INTERIOR	63	70	76	82	89	95	101	114	127	140	144
PARAPET	NP	22	24	26	28	30	127	36	40	44	48
				Bond Beam Size and Steel Requirements All Bond Beams 8" Minimum Height							
EXTERIOR WALL NO PARAPET											
TYPE "A"	2- #5	2- #5	4- #4	4- #4	4- #4	4- #5	4- #5	4- #5	4- #5	4- #5	4- #5
TYPE "B"	4- #5	4- #5	4- #5	4- #5	4- #5	4- #5	4- #5	4- #5	4- #6	4- #6	4- #5
TYPE "C"	NP	NP	NP	NP	NP	4- #6	4- #6	4- #6	4- #6	4- #6	4- #6
EXTERIOR WALL with FULL PARAPET											
TYPE "A"	2- #5	2- #5	4- #4	4- #4	4- #4	4- #5	4- #5	4- #5	4- #5	4- #5	4- #5
TYPE "B"	4- #5	4- #5	4- #5	4- #5	4- #5	4- #5	4- #5	4- #5	4- #6	4- #6	4- #5
TYPE "C"	NP	NP	NP	NP	NP	4- #6	4- #6	4- #6	4- #6	4- #6	4- #6
INTERIOR WALL w/ infill between beams											
TYPE "A"	2- #5	2- #5	4- #4	4- #4	4- #4	4- #5	4- #5	4- #5	4- #5	4- #5	4- #5
TYPE "B"	4- #5	4- #5	4- #5	4- #5	4- #5	4- #5	4- #5	4- #5	4- #6	4- #6	4- #5
TYPE "C"	NP	NP	NP	NP	NP	4- #6	4- #6	4- #6	4- #6	4- #6	4- #6

NP = This wall not permitted.

BOND BEAM LOAD	70	85	101	118	137	157	179	227	280	338	345
BOND BEAM LOAD	129	156	185	218	252	290	330	417	515	623	683
BOND BEAM LOAD	93	110	129	149	170	193	217	269	327	390	417

R614.2.2 Maximum length. The maximum length of any earthen wall laterally braced by Bond Beams per Section R614.5.2 shall be 20 feet (6,096 mm) between perpendicular bracing walls. Any wall in excess of 20 feet (6,096 mm) shall be designed in accordance with the amended IBC as noted in Section R614.1 above, (See Section R614.7 for required lengths of solid shear panels in walls.), or braced by a roof diaphragm roof system as required by Section R614.5.2.3.

R614.3 Support conditions. Earthen walls shall be supported on a solid concrete, solid masonry foundation system the width of which shall be not be less than 1/2 inch narrower than the earthen wall which it supports. Earthen structures shall not be less than 6 inches above adjacent grade.

R614.3.1 Moisture barrier. A moisture barrier equal to 30 lbs. asphalt impregnated building paper, or equivalent moisture resistant barrier, shall be installed between the supporting foundation and the earthen wall material.

R614.4 Allowable stresses. Allowable compressive, tensile and shear stresses in earthen walls shall not exceed the values prescribed in Table R614.4. In determining the stresses in masonry, the effects of all loads and conditions of loading and the influence of all forces affecting the design and strength of the several parts shall be taken into account. Bolts in shear shall be limited to those values in IBC Table 2109.8.3.1.

R614.4.1 Combined units. In walls composed of different kinds or grades of units, materials or mortars, the maximum stress shall not exceed the allowable stress for the weakest of the combination of units, materials and mortars of which the wall is composed. The net thickness of any facing unit of earthen materials used to resist stress shall not be less than 3 inches (76.2 mm).

When dissimilar materials, (e.g. concrete masonry or steel) are used to support earth wall construction, such elements shall be structurally isolated from other earth wall elements. The design shall recognize, with specific detailing, the effects shrinkage of the earth wall construction may have on the structural integrity of the structure.

Table R614.4

ALLOWABLE STRESSES FOR EMPIRICAL DESIGN OF EARTHEN WALL STRUCTURES

STRENGTH OF UNIT, GROSS AREA		ALLOWABLE STRESSES	
		GROSS CROSS-SECTIONAL AREA	NOTE 1
Compression	300 psi	Normal Loading	30 psi
		Concentrated Loading	30 psi
Modulus of rupture	55 psi	Allowable Tension without tensile reinforcing	0 psi
Shear	N/A	With Special Inspection	8 psi
		Without Special Inspection	4 psi
Modulus of Elasticity	60, 000 psi	Allowable deflection	Less than 1/2%

For SI: 1 pound per square inch = 6.895 kPa.

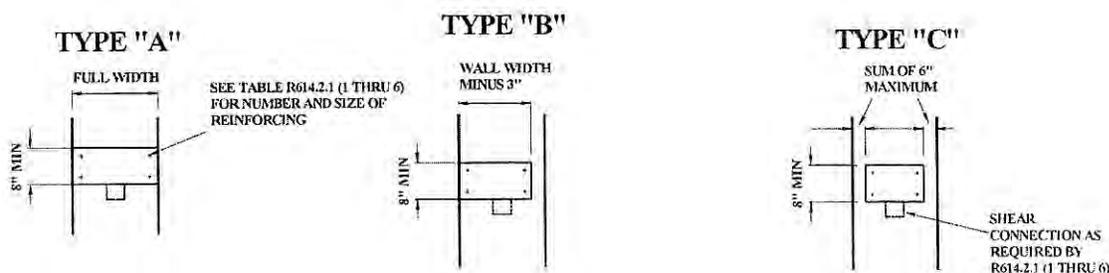
Notes:

1. Gross cross-sectional area shall be calculated on the actual rather than the nominal dimensions.

R614.5 Lateral support. Earthen walls constructed of earthen units shall be bonded and tied to intersecting earthen walls and laterally supported in the vertical direction in accordance with one of the methods in Section R614.5.2 or Section R614.5.3.

R614.5.2 Bond Beams. A continuous concrete bond beam system embedded in the earthen walls, designed to provide lateral support for the walls without the aid of additional bracing elements such as roof diaphragm. Bond beams shall be not less than the width of the wall minus 6 inches (152.4 mm) and a height of not less than 8 inches. Bond beams shall be reinforced as required by Tables R614.2.1 (1 to 6). Bars shall be placed not more than 1 ½" from the inside face of the form or veneer block as indicated in Figure R614.5.2.1.

Figure R614.5.2.1



R614.5.2.2.1 Bond beam anchorage. Bond beams shall be anchored to earthen walls at intervals of not over 48 inches (1219 mm) by a connection with shear strength of not less than 200 lbs. per lineal foot plus an additional 25 lbs. per lineal foot for every inch of thickness in excess of 16" thick.

R614.5.3 Roof diaphragm. A roof diaphragm complying with other provisions of this code adequate to provide not less than 200 lbs. per lineal foot of lateral support may be used to brace earthen walls. Earthen walls shall be anchored to roof diaphragms with connections to resist loads of not less than 200 lbs. per lineal foot plus an additional 25 lbs. per lineal foot for every inch of thickness in excess of 16" thick. This anchorage shall be tie beams as specified in Section R614.5.3.2 or other anchorage methods of equal strength.

R614.5.3.1 Tie beams. A tie beam is a concrete or masonry beam built into the earthen wall for the purpose of anchoring the roof diaphragm and transferring the lateral perpendicular and parallel forces. Tie beams shall be provided for all earthen walls laterally braced by a roof diaphragm. Tie beams shall be anchored to the roof diaphragm system as required by other provisions in this code at intervals not exceeding 4 feet (1219 mm).

Tie beams shall be not less than ½ the width of the earthen wall, a minimum of 8 inches (203.2 mm) high and reinforced with 2 - #4 reinforcing bars.

R614.5.3.2 Tie beam anchorage. Tie beams shall be anchored to earthen walls at intervals of not over 48 inches (1219 mm) by a connection with shear strength of not less than 200 lbs. per lineal foot plus an additional 25 lbs. per lineal foot for every inch of thickness in excess of 16" thick.

R614.6 Lintels. Earthen walls over openings shall be supported by steel lintels, reinforced concrete or masonry lintels or earthen arches designed to support load imposed. Lintels shall not be supported by rigid structural columns, frames or posts with rigidities greater than the earthen wall unless the design allows for the potential for differential settlements.

Small openings less than 12" may be constructed without structural lintels.

R614.7 Shear walls. Earthen walls subject to in-plane loads shall be designed with at least one earthen wall shear panel, at least 4 feet long, free of openings, with a length as computed by formula R614.7-1.

$$\text{Equation R614.7-1- } L = (\text{Sqrt PL} \times \text{Sds} \times 4)$$

Where:

L = Length of shear panel

PL = Sum of overall length of walls perpendicular to the panel.

Sds = Sds factor as determined by Section 1615 of the International Building Code.

R614.8 Jambs at openings. Portions of walls between openings or corner shall be constructed with lengths of not less than 1 ½ times the thickness of the wall in which they occur.

R614.9 Piers. The thickness of isolated earthen piers shall be not less than 1 ½ times those wall thickness values indicated in Table R614.2.1(1 to 6). When structural posts or columns are provided within the pier ties or attachments shall be provided to the earthen wall system to laterally secure it as required by Section R614.11.

R614.9.1 Pier Cap. A solid concrete cap shall be provided at the top of load bearing piers under all concentrated loads. The cap shall cover not less than 50% of the top of the pier.

R614.10 Chases. Chases and recesses in earthen walls shall not be deeper than one-half the thickness of the wall thickness. The maximum length of a horizontal chase or horizontal projection shall not exceed 4 feet (1219 mm), and shall have at least 8 inches (203.2 mm) of masonry in back of the chases and recesses and between adjacent chases or recesses and the jambs of openings.

Chases and recesses in earthen walls shall be designed and constructed so as not to reduce the required strength or required fire resistance of the wall and in no case shall a chase or recess be permitted within the required area of a pier. Masonry directly above chases or recesses wider than 12 inches (304.8 mm) shall be supported on noncombustible lintels.

R614.11 Stack bond. When the earthen wall is constructed of units, (e.g. adobe brick), units shall not be laid in stack bond. Units shall, in all locations throughout the wall system, overlap the courses below by not less than one-third the dimension of the units.

R614.12 Metal reinforcement. In addition to bonding earthen walls shall be anchored at their intersections, all walls shall be reinforced with joint reinforcement at vertical intervals of not more than 16 inches (406.4 mm). Horizontal reinforcement shall be continuous at the intersections. Reinforcement shall be not more than 4 inches narrower than the wall thickness.

R614.13 Veneer. All veneers using earthen materials shall be installed in accordance with this section. Such veneers shall be installed with a noncombustible foundation, over concrete masonry, a backing of wood or cold-formed steel and shall be limited to the first story above grade and be not less than 4 inches (101.6 mm) or greater than 8 inches (203.2 mm) in thickness. Veneers shall not exceed a height of over 20 times their thickness without structural vertical support.

R614.13.1 Anchorage. Earth units shall be anchored to the supporting wall with a corrosion-resistant veneer tie system mechanically attached to continuous horizontal joint reinforcement continuously installed in the veneer bed joint not less than 16 inches (406.4 mm) on center vertically. When earth mortar systems are used the tie system shall prevent the accumulation of mortar at the base of the veneer. Conventional brick ties shall not be used to anchor earth units.

R614.13.2 Air space. The veneer shall be separated from the sheathing by an air space of a minimum of 1 inch (25.4 mm) but not more than 2 inches (50.8 mm). A moisture-resistant barrier or 15 lb. asphalt-saturated felt as required by Section R703.2 shall be provided except when veneer is applied over concrete masonry or concrete backing.

R614.13.3 Flashing. Approved corrosion-resistive flashing shall be provided in the exterior wall envelop in such a manner as to prevent entry of water into the wall cavity or penetration of water into the building structural framing components. The flashing shall extend to the surface of the exterior wall finish and shall be installed to prevent water from reentering the exterior wall envelope. Flashing shall be located beneath the first course of veneer, and at other points of support, including structural floors, shelf angles and lintels. Approved corrosion-resisting flashing shall be installed at all of the following locations:

1. At top of all exterior window and door openings in such a manner as to be leak proof.
2. At the intersection of chimneys or other masonry construction with frame or stucco walls, with projecting lips on both sides under stucco copings.
3. Under and at the ends of masonry, wood or metal copings and sills.
4. Where exterior porches, decks or stairs attach to a wall or floor assembly of wood-frame construction.
5. At wall and roof intersections.

R614.13.4 Weep holes. Weep holes shall be provided in the outside withe of masonry walls at a maximum spacing of 33 inches (838.2 mm) on center. Weep holes shall not be less than 3/16 inches (4.76 mm) in diameter. Weep holes shall be located immediately above the flashing.

R614.13.5 Plaster veneer. Both interior and exterior faces of earthen walls which are to be plastered with cement plaster shall be lathed and plastered in accordance the Section R703.6.1.

R614.14 Buttresses. Earthen walls used as buttresses shall not extend beyond an average length perpendicular to the wall to be braced a distance of 6 feet (1829 mm) without consideration to out-of-plane bending of the buttress.

R614.15 Gable end walls. Gable end walls shall be constructed using veneer construction as required by Section R703.7 or shall be provided with lateral bracing to prevent overturn designed in accordance with the IBC as modified.

R614.16 Ledgers. Ledgers shall not be used to support vertical live and dead loads in excess of 75 lbs. per lineal foot.

R614.17 Construction documents. In addition to the provisions of Section R106 all plans for earthen structures shall include the following:

1. The Sds number of the site.
2. The wind speed and site exposure coefficient of the site.
3. The material standard to which the earthen materials will comply.
4. The foundation supporting system and moisture barrier material.
5. The length, height and thickness in the actual dimensions of all earthen walls and parapets.
6. The bond beam or tie beam construction and attachment method to the earthen wall.
7. Lintel design, construction and end bearing area.
8. Veneer dimensions, attachment methods, moisture barrier and supporting structure.
9. Flashing materials and installation.
10. Metal reinforcement type and location.

R614.18 Corbeled wall elements. The maximum corbeled projection beyond the face of the wall shall not be more than one fourth of the wall thickness.

R614.19 Material standards. The materials used in earthen wall structures shall comply with the following material standards. For each of the tests prescribed in these standards, five full size sample units shall be selected at random from each lot of units of fraction thereof produced. Mass wall systems such as rammed earth shall provide five tests for each required standard test series.

R614.19.1 Manufacturers of earthen materials. Established manufacturers of earthen materials shall certify compliance with these standards. Copies of their periodic testing shall be supplied to the building official when requested. Literature, advertising and other information supplied by the manufacturer to designers and users of earthen materials shall include the actual dimensions of units, not nominal dimensions.

R614.19.2 Onsite earthen materials. Earthen units, mortar, rammed earth wall materials mined, mixed, formulated, and/or molded on site shall be tested for compliance with these standards. For individual structures, a set of tests shall be provided for the first 2500 square feet of wall and an additional test for each additional 2500 square feet or portion thereof in the structure. At least one set of tests shall be made for each structure and for each 2500 square feet of patio wall. The fabricator of the materials used in the project shall certify in writing to the building official compliance with these standards. The certification shall include the number of units site molded, size of the units, volume

of material used as mortar, dates of fabrication, and results of testing of the material. If materials from established manufacturers and onsite materials are used in the project, copies of records including sources, quantities, and location of use within the structure shall be provided to the building official upon request.

R614.19.3 Categories of earthen materials. Type I, II, III, and IV earthen materials are approved for use in construction of projects designed in accordance with the IBC and Table R614.19.3.2.

Exception: Type I adobe shall only be used for repairs and small additions in which new walls do not exceed 10% of the surface area of existing walls of Type I construction and for structures constructed of a similar material system and for projects requiring this class of materials to meet historic guidelines.

R614.19.3.1 Required plaster veneer. Adobe of Type I and II shall be protected on the exterior with exterior plaster meeting the requirements of IBC Section 2512 applied over wire lath. Type I and II adobe shall not be used within 4 inches (101.6 mm) of the floor or at the top of parapet walls or near potential sources of water which may affect the stability of the earth wall system. Other Types of adobe may be left unplastered and may be used without separation from the floor.

R614.19.3.2 Adobe units and mortar. Moisture resistant stabilized adobe units and mortar shall meet the following testing standards as indicated in Table. Type S Portland cement mortar may be used for Type II, III, and IV adobe in lieu of earth mortar.

Table R614.19.3.2

<i>Material Type</i>	Dry Compression R614.19.3.2.1	Wet Compression R614.19.3.2.2	Modulus of Rupture R614.19.3.1.3	Absorption <2.5% R614.19.3.2.4	Absorption <5.0% R614.19.3.2.5	Moisture Content R614.19.3.2.6
I	X		X			X
II	X		X		X	X
III	X		X	X		X
IV		X	X			X

X Indicates that material must pass the test standards prescribed in this Section.

R614.19.3.2.1 Dry compression strength. Determine the compressive strength of the required number of samples as required by Section R614.19. in accordance with the following procedures.

R614.19.3.2.1.1 Dry the Specimen. Dry the specimen at a temperature of 85° F.+15° F. (29° C. +- 9°) in an atmosphere having relative humidity of not more than 50 percent. Weigh the specimen at one-day intervals until constant weight is attained.

R614.19.3.2.1.2 Cap the Specimen. The specimen may be suitably capped with calcined gypsum mortar or the bearing surfaces may be rubbed smooth and true. Then calcined

gypsum is used for capping, conduct the test after the capping has set and the specimen has been dried to constant weight in accordance with Item 1 of this section.

R614.19.3.2.1.3 Test the Specimen. Test the specimens in the position in which the earthen unit is designed to be used. And bed on and cap with a felt pad not less than 1/8 inch (3.2mm) or more than ¼ inch (6.4 mm) in thickness.

R614.19.3.2.1.4 Testing Equipment. The loading head shall completely cover the bearing area of the specimen and the applied load shall be transmitted through a spherical bearing block of proper design. The speed of the moving head of the testing machine shall not be more than 0.05 inch (1.27 mm) per minute.

R614.19.3.1.5 Reporting Results. Calculate the average compressive strength of the specimens tested and report this as the compressive strength of the block. Units shall have an average dry compressive strength of 300 psi (2068 kPa) and no individual unit may have a strength of less than 250 psi. (1724 kPa).

R614.19.3.2.2 Wet compression strength. Determine the compressive strength of the required number of specimen as required by Section R614.19. in accordance with the following procedures.

R614.19.3.2.2.1 Cap the Specimen. The specimens may be suitably capped with a capping material compatible with water saturation or the bearing surfaces may be rubbed smooth and true.

R614.19.3.2.2.2 Wetting the Specimen. Submerge the specimen under water for not less than 8 hours or longer as required until fully saturated.

R614.19.3.2.2.3 Test the Specimen. Immediately test the specimen in the position in which the earthen unit is designed to be used. And bed on and cap with a felt pad not less than 1/8 inch (3.2 mm) or more than ¼ inch (6.4 mm) in thickness.

R614.19.3.2.2.4 Testing Equipment. The loading head shall completely cover the bearing area of the specimen and the applied load shall be transmitted through a spherical bearing block of proper design. The speed of the moving head of the testing machine shall not be more than 0.05 inch (1.27 mm) per minute.

R614.19.3.2.2.5. Reporting Results. Calculate the average compressive strength of the specimens tested and report this as the compressive strength of the block. Adobe units shall have an average wet compressive strength of 300 psi (2068 kPa). Five samples shall be tested and no individual unit may have a wet compressive strength of less than 250 psi. (1724 kPa).

R614.19.3.2.3 Modulus of rupture. Adobe units shall have an average modulus of rupture of 50 psi (345 kPa) when tested in accordance with the following procedure. Five samples

shall be tested and no individual unit shall have a modulus of rupture of less than 35 psi (241 kPa).

R614.19.3.2.3.1 Support conditions. A cured unit shall be simply supported by 2-inch-diameter (50.8 mm) cylindrical supports located 2 inches (50.8 mm) in from each end and extending the full width of the unit.

R614.19.3.2.3.2 Loading conditions. A 2-inch-diameter (50.8 mm) cylinder shall be placed at mid-span parallel to the supports.

R614.19.3.2.3.3 Testing procedure. A vertical load shall be applied to the cylinder at the rate of 500 pounds per minute (37 N/s) until failure occurs.

R614.19.3.2.3.4 Modulus of rupture determination. The modulus of rupture shall be determined by the formula:

$$\text{Equation 2116.3.2.3.4-1 } Fr = 3WLs/2bt^2$$

Where, for the purposes of this section only:

B = Width of the test specimen measured parallel to the loading cylinder, inches (mm).

Fr = Modulus of rupture, psi (Mpa).

Ls = Distance between supports, inches (mm).

T = Thickness of the test specimen measured parallel to the direction of load, inches (mm).

W = The applied load at failure, pounds (N).

R614.19.3.2.4 Absorption less than 2.5%. A 4-inch (101.6 mm) cube, cut from an adobe unit fired to a constant weight in a ventilated oven at 212 degrees F to 239 degrees F, shall not absorb more than 2 ½ percent moisture by weight when placed upon a constantly water-saturated, porous surface for 7 days. A minimum of five specimens shall be tested and each specimen shall be cut from a separate unit.

R614.19.3.2.5 Absorption less than 5.0%. A 4-inch (101.6 mm) cube, cut from an adobe unit fired to a constant weight in a ventilated oven at 212 degrees F to 239 degrees F, shall not absorb more than 2 ½ percent moisture by weight when placed upon a constantly water-saturated, porous surface for 7 days. A minimum of five specimens shall be tested and each specimen shall be cut from a separate unit.

R614.19.3.2.6 Additional Requirements. All earthen units shall meet the following requirements.

R614.19.3.2.6.1 Moisture content requirements. Earthen units shall have a moisture content not exceeding 4 percent by weight at the time of use.

R614.19.3.2.6.2 Shrinkage cracks. All earthen units shall not contain more than three shrinkage cracks and any single shrinkage crack shall not exceed 3 inches (76.2 mm) in length or 1/8 inch (3.2 mm) in width.

R614.19.3.2.6.3 Soil requirements. Soil used for moisture resisting adobe units and mortar shall be chemically compatible with the stabilizing material. The soil shall contain sufficient clay to bind the particles together without the aid of stabilizers. The soil shall contain not more than 0.2 percent of water-soluble salts.

R614.19.3.3 Cement Stabilized Rammed Earth. Cement stabilized Rammed Earth shall meet the following standards. The installer of the wall system shall comply with the requirements of Section 2114.14.2 for frequency of testing.

R614.19.3.3.1 Testing before Construction. The installer of cement stabilized Rammed Earth shall provide the following testing before issuance of a building permit.

R614.19.3.3.2 Materials from a Licensed Sand and Gravel Producer. A copy of Proctor ASTM D 698 shall be provided for each soil type and source or combination of sources. Periodic testing as provided by the supplier may be supplied to meet this requirement. The soil shall contain not more than 0.2 percent of water-soluble salts.

R614.19.3.3.3 Material Mined and Mixed on Site. A copy of ASTM D 698, ASTM C 117, ASTM C 136, and ASTM D 4318 shall be provide for each soil type and source or combination of sources. Such tests shall be repeated as required to assure that all materials to be used have been tested and are represented by the tests. The soil shall contain not more than 0.2 percent of water-soluble salts.

R614.19.3.3.4 Testing required during Construction. The installer of cement stabilized Rammed Earth shall provide the following tests made during the construction process. A certified testing laboratory shall provide field density tests for comparison to the pre-construction Proctor ASTM D 698, percent moisture ASTM D 2216, dry density ASTM D 698, and percent moisture ASTM D 1556. Cement Stabilized Rammed Earth walls shall meet or exceed 95% maximum dry density (ASTM D 698). Samples taken from the wall shall exceed 300 psi compression (ASTM D 1633) 14 days after placement.

Section R802.11.1 Uplift Resistance. AMEND by DELETING first two paragraphs and REPLACING as follows:

Roof assemblies which are subject to wind uplift pressures shall have roof rafters or trusses attached to their supporting wall assemblies by connections capable of providing the resistance required in Table R802.11 but not less than 365 pounds. A continuous load path shall be provided to transmit the uplift forces from the rafter or truss ties to the foundation.

ADD new Section M1307:

M1307.6 Liquefied Petroleum Appliances. LPG appliances shall not be installed in an attic, pit or other location that would cause a ponding or retention of gas.

Section G2415.9 Minimum burial depth. DELETE G2415.9 & G2415.9.1 and REPLACE as follows:

Underground piping systems shall be installed a minimum depth of 12 inches (304.8 mm) below grade for metal piping and 18 inches (457 mm) for plastic piping with caution tape 6 inches (152.5 mm) above plastic pipes.

ADD new section P2602.1.1:

Section 2602.1.1 Individual metering in new multi-family residential units. The water supply to all new multi-family residential buildings shall be individually metered for each dwelling unit. The metering may be private or utility installed.

Section P2603.6.2 Sewer Depth. INSERT [number] as “12” in both locations.

Section P3003.2 Prohibited joints. REVISE section by DELETING the period at the end of item 5 and ADDING, “unless the solvent-cement is listed for the purpose.”

Section P3008.1 General. REVISE section by DELETING paragraph and ADDING new text to read:

Where the finish floor elevation is less than 12 inches above the elevation of the next upstream manhole in the public sewer or private sewer collection system, a backwater valve shall be installed in the building drain or branch of the building drain serving that floor. Floors discharging from above that reference point shall not discharge through the backwater valve. Backwater valves shall be provided with access.

Section E3306.3: Minimum size of conductors. REPLACE the words “No 12 AWG aluminum” with “No. 10 AWG aluminum”.

Section 3603.1: Branch circuits for heating. REVISE by ADDING the following sentence to the end of the paragraph:

Evaporative cooler fan and pump motors shall be permitted to be connected to the same branch circuit as central heating.

ADD NEW subsection E3603.7:

Section E3603.7 Dishwasher and Garbage Disposer Branch Circuits – Dwelling Units. In residential occupancies, dishwasher and garbage disposer may be on the same 20-ampere branch circuit.

ADD NEW subsection E3702.7:

Section E3702.7 Earthen material wiring method. Type UF Cable shall be permitted to be used in mortar joints of adobe construction in occupancies where the use of Nonmetallic Sheathed Cable is permitted by this code.

Table E3701.4 Allowable Applications for Wiring Methods. Revise as Follows:

Allowable Applications (application allowed where marked with an "A")	AC	EMT	ENT	FMC	IMC RNC	LFC ^a	MC	NM	SR	SE	UF	USE
Services		A	A ^b	A ⁱ	A	A ⁱ	A			A		A
Feeders	A	A	A	A	A	A	A	A		A ^b	A	A ^b
Branch Circuits	A	A	A	A	A	A	A	A	A	A ^c	A	
Inside a building	A	A	A	A	A	A	A	A	A	A	A	
Wet locations exposed to sunlight		A	A ^h	A ^d	A	A	A			A	A ^c	A ^c
Damp locations		A	A	A ^d	A	A	A			A	A	A
Embedded in noncinder concrete in dry location		A	A		A							
In noncinder concrete in contact with grade		A	A ^f		A ^f							
Embedded in plaster not exposed to dampness	A	A	A	A	A	A	A			A	A	
Embedded in masonry		A	A		A ^f	A	A				A ^j	
In masonry voids and cells exposed to dampness or below grade line		A ^f	A	A ^d	A ^f	A	A			A	A	
Fished in masonry voids	A			A		A	A	A		A	A	
In masonry voids and cells not exposed to dampness	A	A	A	A	A	A	A	A		A	A	
Run exposed	A	A	A	A	A	A	A	A	A	A	A	A
Run exposed and subject to physical damage					A							
For direct burial		A			A ^B	A	A				A	A
Embedded in earthen material wall systems with full head and bed joints		A ^f	A	A	A ^f	A	A ^f				A	
Embedded in Straw Bale walls		A ^f	A	A	A ^f	A	A ^f	A			A	

For SI: 1 foot = 304.8 mm

- Liquid-tight flexible nonmetallic conduit without integral reinforcement within the conduit wall shall not exceed 6 feet in length.
- The grounded conductor shall be insulated except where used to supply other buildings on the same premises. Type USE cable shall not be used inside buildings.
- The grounded conductor shall be insulated.
- Conductors shall be a type approved for wet locations and the installation shall prevent water from entering other raceways.
- Shall be listed as "Sunlight Resistant".
- Metal raceways shall be protected from corrosion and approved for the application.
- RNC shall be Schedule 80 when exposed outside or when exposed to physical damage inside.
- Shall be listed as "Sunlight Resistant" where exposed to the direct rays of the sun.
- Conduit shall not exceed 6 feet in length.
- Type UF cable shall be permitted to be used in mortar joints of adobe construction in occupancies where the use of nonmetallic cable is permitted by this code.

Section E3808.8.1 Flexible metal conduit. DELETE and REPLACE section and exceptions with:

Section E3808.8.1 Flexible metal conduit. Flexible metal conduit shall not be permitted as a grounding means. An equipment grounding conductor, sized in accordance with Table E3808.12, shall be installed in all flexible metal conduits. Where an equipment-bonding jumper is required around flexible metal conduit, it shall be installed in accordance with Section E3808.20.

Exception: Listed and labeled factory assembled (pre-wired) fixtures and equipment with flexible metal conduit will not require the addition of the grounding conductor in the pre-wired raceway.

Section E3808.8.2 Liquid-tight flexible metal conduit. DELETE and REPLACE section with:

Section E3808.8.2 Liquid-tight flexible metal conduit. Liquid-tight flexible metal conduit shall not be permitted as a grounding means. An equipment grounding conductor, sized in accordance with Table E3808.12, shall be installed in all liquid-tight flexible metal conduits. Where an equipment-bonding jumper is required around liquid-tight flexible metal conduit, it shall be installed in accordance with Section E3808.20.

Exception: Listed and labeled factory assembled (pre-wired) fixtures and equipment with liquid-tight flexible metal conduit will not require the addition of the grounding conductor in the pre-wired raceway.

ADD new subsection E4202.3:

Section E4202.3 Location of power supplies and transformers.

Section E4202.3.1 Accessibility. Class 1, Class 2, and Class 3 power supplies and transformers shall be accessible.

Section E4202.3.2 Prohibited locations.

1. In any closet or space where clearances are not respected as per incandescent exposed luminaires in Section E3903.11.
2. In attics or other space subject to high ambient temperatures.

All Appendix Requirements are adopted with the following exceptions:

APPENDIX E MANUFACTURED HOUSING USED AS DWELLINGS

DELETE this portion in its entirety and REPLACE as follows:

See State office of Manufactured Housing Regulations.

APPENDIX F RADON CONTROL METHODS

DELETE this portion in its entirety.

APPENDIX G POOLS

Section AG102 Definitions

Swimming Pool. DELETE and REPLACE as follows:

A body of water intended for swimming, eighteen or more inches in depth at any point and eight feet or more in length or width.

Section AG105.2 Outdoor swimming pool. DELETE and REPLACE as follows:

Section AG105.2 Pool enclosures; requirements; exceptions.

1. A swimming pool, as defined in section AG102, whether above ground or below ground, shall be protected by an enclosure surrounding the pool area as provided in this section and shall meet the following requirements:
 - A. Be entirely enclosed by at least a five-foot wall, fence or other barrier as measured on the exterior side of the wall, fence or barrier.
 - B. Have no openings in the wall, fence or barrier through which a spherical object four inches in diameter can pass. The horizontal components of any wall, fence or barrier shall be spaced not less than forty-five inches apart measured vertically or shall be placed on the pool side of a wall, fence or barrier which shall not have any opening in the vertical components (vertical rails) greater than one and three-quarter inches measured horizontally.
 - C. Gates for the enclosure shall be self-closing and self-latching with a latch located at least 54 inches above the underlying ground or on the pool side of the gate with a release mechanism at least five inches below the top of the gate and no openings greater than one-half inch within 24 inches of the release. The gate shall open outward from the pool.
 - D. The wall, fence or barrier shall not contain openings, handholds, or footholds accessible from the exterior side of the enclosure that can be used to climb the wall, fence or barrier.
 - E. The wall, fence or barrier shall be at least twenty inches from the water's edge.
2. The residence or living area cannot be used as part of the enclosure required by subsection 1 for a swimming pool or other contained body of water except:
 - (a) in the case of Indoor Pools,
 - (b) if there are no operable openings exceeding 4 inches in the wall of the building in the portion used as an enclosure.

If there are openings greater than 4 inches from the residence or living space which would permit access to the swimming pool or other contained body of water, one of the following is required:

- (a) Between the swimming pool or other contained body of water and the residence or living area, a minimum four foot wall, fence or barrier to the pool area which meets all of the requirements of subsection 1, paragraphs A through E, or
 - (b) The swimming pool shall be an above ground swimming pool, having non-climbable exterior sides, which are a minimum height of four feet. Any access ladder or steps shall be removable without tools and secured in an inaccessible position with a latching device not less than fifty-four inches above the ground when the pool is secure.
3. This section does not apply to:
- A. A system of sumps, irrigation canals, irrigation, flood control or drainage works constructed or operated for the purpose of storing, delivering, distributing or conveying water.
 - B. Stock ponds, storage tanks, livestock operations, livestock watering troughs or other Structures used in normal agricultural practices.
 - C. A swimming pool or contained body of water constructed prior to June 2, 1991.

Section AG105.3 Indoor pools. DELETE and REPLACE with the following:

All doors with direct access to the swimming pool or other contained body of water shall be equipped with a self-latching device which meets the requirements of subsection 1 paragraph C. All other openable dwelling unit or guest room windows with similar access shall be equipped with a screwed in-place wire mesh screen or a keyed lock that prevents opening the window more than four inches, or a latching device located not less than fifty-four inches above the floor. Emergency escape or rescue windows that adjoin the pool area are not permitted.

APPENDIX I: PRIVATE SEWAGE DISPOSAL

Section AI101.1 Scope: DELETE in its entirety and REPLACE as follows:

See State Department of Environmental Quality Regulations.

APPENDIX L: PERMIT FEES DELETE in its entirety and REPLACE as follows:

Appendix L: IRC Residential Structures:

An automatic fire sprinkler system shall be installed throughout every IRC residential structure constructed on property when:

- 1. Fire-flow for buildings as required in the Fire Code cannot be met, or
- 2. Fire hydrant location and spacing requirements of the Fire Code cannot be met, or
- 3. Fire Department access roads with grades less than 15% are not provided, or
- 4. The distance between any portion of an exterior wall of the first story and an approved hydrant is greater than 500 feet.

Residential or quick response sprinklers shall be used. The sprinkler system may be connected to the domestic water supply provided the required design density can be met. Residential fire sprinkler systems shall be installed in accordance with the Fire Code.

APPENDIX M: HOME DAY CARE- R-3 OCCUPANCY- DELETE in its entirety REPLACE as follows:

Appendix M - Straw-Bale Structures

Section AM101 Purpose. The purpose of this appendix chapter is to establish minimum prescriptive standards of safety for the construction of structures which use baled straw as a load bearing or non-load bearing material.

Section AM102 Scope. The provisions of this chapter shall apply to all structures utilizing straw-bales in the construction of wall systems. Load bearing structures shall be limited to Occupancy Groups R, Division 3 and U.

Section AM103 Definitions. For the purpose of this chapter, certain terms are defined as follows:

STRAW is the dry stems of cereal grains left after the seed heads have been removed.

BALES are rectangular compressed blocks of straw, bound by strings or wire.

FLAKES are slabs of straw removed from an untied bale. Flakes are used to fill small gaps between the ends of stacked bales.

LAI D FLAT refers to stacking bales so that the sides with the largest cross-sectional area are horizontal and the longest dimension of this area is parallel with the wall plane.

LAI D ON-EDGE refers to stacking bales so that the sides with the largest cross-sectional area are vertical and the longest dimension of this area is horizontal and parallel with the wall plane.

Section AM104 MATERIALS

AM104.1 Specifications for Bales.

AM104.1.1 Type of Straw. Bales of various types of straw, including, but not limited to, wheat, rice, rye, barley, oats and similar plants, shall be acceptable if they meet the minimum requirements for density, shape, moisture content, and ties.

AM104.1.2 Shape. Bales shall be rectangular in shape.

AM104.1.3 Dimensions. Bales used within a continuous wall shall be of consistent height and width to ensure even distribution of loads within wall systems.

AM104.1.4 Ties. Bales shall be bound with ties of either polypropylene string or baling wire. Bales with broken or loose ties shall not be used unless the broken or loose ties are replaced with ties which restore the original degree of compaction of the bale.

AM104.1.5 Moisture Content. Moisture content of bales, at time of installation, shall not exceed 20% of the total weight of the bale. Moisture content of bales shall be determined by one of the following:

AM104.1.5.1 Field Method. A suitable moisture meter, designed for use with baled straw or hay, and equipped with a probe of sufficient length to reach the center of the bale, shall be used to determine the average moisture content of 5 bales randomly selected from the bales to be used.

AM104.1.5.2 Laboratory Method. A total of 5 samples, taken from the center of each of 5 bales randomly selected from the bales to be used, shall be tested for moisture content by a recognized testing lab.

AM104.1.6 Density. Bales in load-bearing structures shall have a minimum calculated dry density of 7.0 pounds per cubic foot. The calculated dry density shall be determined after reducing the actual bale weight by the weight of the moisture content, as determined in Section 7204.1.5. The calculated dry density shall be determined by dividing the calculated dry weight of the bale by the volume of the bale.

AM104.1.7 Custom Size Bales. Where custom-made partial bales are used, they shall be of the same density, same string or wire tension, and, where possible, use the same number of ties as the standard size bales.

Section AM105 - Construction and General Requirements

AM105.1 General. Bale walls, when covered with plaster, drywall or stucco shall be deemed to have the equivalent fire resistive rating as wood frame construction with the same wall-finishing system.

AM105.2 Wall Thickness. Nominal minimum bale wall thickness shall be 14 inches.

AM105.3 Wall Height. Bale walls shall not exceed one story in height and the bale portion shall not exceed a height to width ratio of 5.6 : 1 (for example, the maximum height for the bale portion of a 23 inch thick wall would be 10 feet - 8 inches), unless the structure is designed by an engineer or architect licensed by the State to practice as such, and approved by the Building Official.

Exception: In the non-load bearing exterior end walls of structures with gable or shed roofs, an approved continuous assembly shall be required at the roof bearing assembly level.

AM105.4 Unsupported Wall Length. The ratio of unsupported wall length to thickness, for bale walls, shall not exceed 13:1 (for a 23-inch thick wall, the maximum unsupported length allowed is 25 feet), unless the structure is designed by an engineer or architect licensed by the State to practice as such, and approved by the Building Official.

AM105.5 Allowable Loads. The allowable vertical load (live and dead load) on the top of bale walls shall not exceed 360 pounds per square foot (psf) and the resultant load shall act at the center of the wall. Bale structures shall be designed to withstand all vertical and horizontal loads as specified in Chapter 16.

AM105.6 Foundations. Foundations shall be sized to accommodate the thickness of the bale wall and the load created by the wall and roof live and dead loads. Foundation (stem) walls which support bale walls shall extend to an elevation of not less than 6 inches above adjacent ground at all points. The minimum width of the footing shall be the width of the bale it supports, except that the bales may overhang the exterior edge of the foundation by not more than 3 inches to accommodate rigid perimeter insulation. Footings shall extend a minimum of 12 inches below natural, undisturbed soil, or to frost line, whichever is lower.

Section AM105.7 Wall and Roof Bearing Assembly Anchorage

AM105.7.1 General. Vertical reinforcing bars with a minimum diameter of 1/2", shall be embedded in the foundation a minimum depth of 6 inches, and shall extend above foundation a minimum of 12 inches. These vertical bars shall be located along the centerline of the bale wall, spaced not more than 2 feet apart. A vertical bar shall also be located within 1 foot of any opening or corner, except at locations occupied by anchor bolts.

AM105.7.2 Intersecting Walls. Walls of other materials intersecting bale walls shall be attached to the bale wall by means of one or more of the following methods or an acceptable equivalent:

1. Wooden dowels at least 5/8" in diameter of sufficient length to provide 12 inches of penetration into the bale, driven through holes bored in the abutting stud, and spaced to provide one dowel connection per bale.
2. Pointed wooden stakes, at least 12 inches in length and 1-1/2" by 3-1/2" at the exposed end, fully driven into each course of bales, as anchorage points.
3. Bolted or threaded rod connection of the abutting wall, through the bale wall, to a steel nut and steel or plywood plate washer, a minimum of 6 inches square and a minimum thickness of 3/16" for steel and 1/2" for plywood, in at least three locations.

AM105.7.3 Anchor Bolts. Load bearing bale walls shall be anchored to the foundation by 1/2" diameter steel anchor bolts embedded at least 7 inches in the foundation at intervals of 6 feet or less. A minimum of two anchor bolts per wall shall be provided with one bolt located within 36 inches of each end of each wall. Sections of 1/2" diameter threaded rod shall be connected to the anchor bolts, and to each other, by means of threaded coupling nuts and shall extend through the roof bearing assembly and be fastened with a steel washer and nut. Bale walls and roof bearing assemblies may be anchored to the foundation by means of other methods which are adequate to resist uplift forces resulting from the design wind load. There shall be a minimum of two points of anchorage per wall, spaced not more than 6 feet apart, with one located within 36 inches of each end of each wall.

The dead load of the roof and ceiling systems will produce vertical compression of the bales. Regardless of the anchoring system used to attach the roof bearing assembly to the foundation, prior

to installation of wall finish materials, bolts or straps shall be re-tightened to compensate for this compression.

AM105.7.4 Moisture Barrier. A moisture barrier shall be used between the top of the foundation and the bottom of the bale wall to prevent moisture from migrating through the foundation into the bottom course of bales. This barrier shall consist of one of the following:

1. cementitious waterproof coating;
2. type 30 asphalt felt over an asphalt emulsion;
3. sheet metal flashing, sealed at joints;
4. other approved building moisture barrier. All penetrations through the moisture barrier, as well as all joints in the barrier, must be sealed with asphalt, caulking or an approved sealant.

AM105.7.5 Stacking and Pinning. Bales in load-bearing walls shall be laid flat and stacked in running bond where possible, with each bale overlapping the two bales beneath it. Bales in non load-bearing walls may be laid either flat or on-edge and stacked in running bond where possible. For non-load bearing walls, bales may be laid either flat or on-edge. Bales in load bearing walls shall be laid flat and stacked in a running bond, where possible, with each bale overlapping the two bales beneath it. Overlaps shall be a minimum of 12 inches. Gaps between the ends of bales which are less than 6 inches in width can be filled by an untied flake inserted snugly into the gap.

The first course of bales shall be laid by impaling the bales on the vertical bars or threaded rods, if any, extending from the foundation. When the fourth course has been laid, #4 rebar pins, or an acceptable equivalent long enough to extend through all four courses, shall be driven down through the bales, two in each bale, located so that they do not pass within six inches of, or through the space between the ends of any two bales. The layout of these pins shall approximate the layout of the vertical bars extending from the foundation. As each subsequent course is laid, two such pins, long enough to extend through the course being laid and the three courses immediately below it, shall be driven down through each bale. This pinning method shall be continued to the top of the wall. In walls seven or eight courses high, pinning at the fifth course may be eliminated.

Only full-length bales shall be used at corners of load bearing walls, unless exceptions are designed by an engineer or architect licensed by the State to practice as such, and approved by the Building Official.

Vertical #4 rebar pins, or an acceptable alternative, shall be located within 1 foot of all corners or door openings.

Staples, made of #3 or larger rebar formed into a "U" shape, at least 18 inches long with two 6 inch legs, shall be used at all corners of every course, driven with one leg into the top of each abutting corner bale. In lieu of staples, corner bales may be tied together, by a method approved by the building official.

AM105.7.5.1 Alternative Pinning Method. When the third course has been laid, vertical #4 rebar pins, or an acceptable equivalent, long enough to extend through all three courses, shall be driven down through the bales, two in each bale, located so that they do not pass within 6 inches

of, or through the space between the ends of any two bales. The layout of these rebar pins shall approximate the layout of the rebar pins extending from the foundation. As each subsequent course is laid, two such pins, long enough to extend through that course and the two courses immediately below it, shall be driven down through each bale. This pinning method shall be continued to the top of the wall.

AM105.7.6 Roof Bearing Assembly. Load bearing bale walls shall have a roof bearing assembly at the top of the wall to bear the roof load and to provide a means of connecting the roof structure to the foundation. The roof bearing assembly shall be continuous along the tops of structural walls.

An acceptable roof bearing assembly option consists of two double 2" X 6", or larger, horizontal top plates, one located at the inner edge of the wall and the other at the outer edge. Connecting the two doubled top plates and located horizontally and perpendicular to the length of the wall shall be 2" X 6" cross members spaced no more than 72 inches center to center, and as required to align with the threaded rods extending from the anchor bolts in the foundation. The double 2" X 6" top plates shall be face nailed with 16d nails staggered at 16 inches on center, with laps and intersections face nailed with four 16d nails. The cross members shall be face nailed to the top plates with four 16d nails at each end. Corner connections shall include overlaps nailed as above or an acceptable equivalent such as plywood gussets or metal plates. Alternatives to this roof bearing assembly option must provide equal or greater vertical rigidity and provide horizontal rigidity equivalent to a continuous double 2 by 4 top plate.

The connection of roof framing members to the roof bearing assembly shall comply with the appropriate sections of the UBC.

AM105.7.7 Openings and Lintels. All openings in load bearing bale walls shall be a minimum of one full bale length from any outside corner, unless exceptions are designed by an engineer or architect licensed by the State to practice as such, and approved by the Building Official.

AM105.7.7.1 Openings. Openings in exterior bale walls shall not exceed 50 percent of the total wall area, based on interior dimensions, where the wall is providing resistance to lateral loads, unless the structure is designed by an engineer or architect licensed by the State to practice as such, and approved by the Building Official.

AM105.7.7.2 Lintels. Wall and/or roof load present above any opening shall be carried, or transferred to the bales below by one of the following:

1. A structural frame,
2. A lintel (such as an angle-iron cradle, wooden beam, wooden box beam). Lintels shall be at least twice as long as the opening is wide and extend at least 24" beyond either side of the opening. Lintels shall be centered over openings, and shall not exceed the load limitations of Section 7205.5 by more than 25 percent.

AM105.7.8 Moisture Protection. All weather-exposed bale walls shall be protected from water damage. An approved building moisture barrier shall be used to protect at least the bottom course of bales, but not more than the lower one-third of the vertical exterior wall surface, in order to allow

natural transpiration of moisture from the bales. The moisture barrier shall have its upper edge inserted at least 6 inches into the horizontal joint between two courses of bales, and shall extend at least 3 inches below the top of the foundation. Bale walls shall have special moisture protection provided at all window sills. Unless protected by a roof, the tops of walls shall also be protected. This moisture protection shall consist of a waterproof membrane, such as asphalt-impregnated felt paper, polyethylene sheeting, or other acceptable moisture barrier, installed in such manner as to prevent water from entering the wall system at window sills or at the tops of walls.

AM105.7.9 Wall Finishes. Interior and exterior surfaces of bale walls shall be protected from mechanical damage, flame, animals, and prolonged exposure to water. Bale walls adjacent to bath and shower enclosures shall be protected by a moisture barrier.

Cement stucco shall be reinforced with galvanized woven wire stucco netting or an acceptable equivalent. Such reinforcement shall be secured by attachment through the wall at a maximum spacing of 24 inches horizontally and 16 inches vertically, using a method approved by the Building Official.

Where bales abut other materials, the plaster/stucco shall be reinforced with galvanized expanded metal lath, or an acceptable equivalent, extending a minimum of 6 inches onto the bales.

Earthen and lime-based plasters may be applied directly onto the exterior and interior surface of bale walls without reinforcement, except where applied over materials other than straw. Weather-exposed earthen plasters shall be stabilized using a method approved by the building official.

Lime based plasters may be applied directly onto the exterior surface of bale walls without reinforcement, except where applied over materials other than straw.

AM105.7.10 Electrical. All wiring within or on bale walls shall meet all provisions of the National Electrical Code adopted by this jurisdiction. Type NM or UF cable may be used, or wiring may be run in metallic or nonmetallic conduit systems.

Electrical boxes shall be securely attached to wooden stakes driven a minimum of 12 inches into the bales, or an acceptable equivalent.

AM105.7.11 Plumbing. Water or gas pipes within bale walls shall be encased in a continuous pipe sleeve to prevent leakage within the wall. Where pipes are mounted on bale walls, they shall be isolated from the bales by a moisture barrier.

Section AM106 Privacy/Landscape Walls

AM106.1 General. This section covers freestanding or attached bale privacy or landscape walls, not exceeding 6 feet in height, from final grade to top of wall. Bales may be stacked either flat or on-edge. Alternate methods, other than those listed in this section, may be approved by the building official.

AM106.2 Foundations. The minimum foundation shall consist of an 8 inch thick reinforced concrete stem wall, over an approved footing. Minimum width of the stem wall shall be equal to the width of the

bottom bale. Stem walls shall have continuous horizontal reinforcement consisting of two #4 bars with 24 inches minimum lap at splices.

AM106.2.1 Reinforcement. Vertical reinforcing bars, a minimum 3/8" in diameter, shall be placed in the center of the stem wall, two per bale, and extend up a minimum of 24 inches, and be embedded a minimum of 4 inches into the concrete stem wall. Bales shall be pinned, using two 3/8" diameter bars per bale, and use pins long enough to provide at least one vertical bar from stem wall to top of wall, with a minimum of one full bale overlap where not continuous.

For the purpose of attaching stucco mesh to the wall, 12d or larger galvanized common double-headed nails shall be embedded in the concrete a minimum of 1 inch below the top of the stem wall, with the heads embedded a minimum of 2 inches into the concrete, and the points extending a minimum of 3/4" from the face of the stem wall, and spaced a minimum of 6" on center on both sides of the wall.

AM106.2.2 Moisture Barrier. A moisture barrier shall be used between the top of the stem wall and the first course of bales. A moisture barrier shall also be used to protect the tops of bales at the top of walls, and shall extend 6 inches down on either side of the wall.

AM106.2.3 Stucco Mesh. Stucco mesh, 20 gauge or heavier, shall be attached by means of clinching the embedded nails on one side of the wall, stretching a continuous piece of netting tightly over the top of the wall, and fastening the netting in the same manner on the opposite side of the wall.

AM106.2.4 Wall Finish. Walls shall be finished with cement stucco, or stabilized mud plaster, with a minimum thickness of 7/8".

Appendices O, P, Q are hereby DELETED in their entirety.

In the 2012 IRC, Section R202 defines Fireblocking as "Building materials or materials approved for use as fireblocking, installed to resist the free passage of flame to other areas of the building through concealed spaces. Section R302.11 addresses "Fireblocking". It states that "fireblocking shall be provided to cut off all concealed draft openings (both vertical and horizontal) and to form an effective fire barrier between stories, and between a top story and the roof space." While Section 302.11.1 lists fireblocking materials, none are foams. Most importantly Section R302.11.2 states "The integrity of all fireblocks shall be maintained."

A flammable foam cannot maintain the integrity of a fireblock. UL 1479 and ASTM-E814 are specific test procedures that establish guidelines to address penetrations made through fire-rated assemblies. Since this procedure exceeds that of R302.11, it should be recognized as maintaining a fireblock. Similarly ASTM-E136 is a test procedure to determine noncombustible materials and should be recognized also.

My motion is to recognize any product passing UL 1479, ASTM-E814 or ASTM-E136 as a product that maintains the integrity of a fireblock.

Products such as Abesco FP200 FR, Great Stuff Fireblock, Hilti CP620 or Touch 'n Foam Fire Break all meet one of these standards.

Bob Lee