

This is an amendment to 14.7.4 NMAC, Part name change and amending Sections, 5, 7, 8, 9, 10, 11 and 12, effective 7/14/2023.

TITLE 14 HOUSING AND CONSTRUCTION
CHAPTER 7 BUILDING CODES GENERAL
PART 4 ~~[2015]~~ 2021 NEW MEXICO EARTHEN BUILDING MATERIALS CODE

14.7.4.5 EFFECTIVE DATE: November 15, 2016, unless a later date is cited at the end of a section. From the date of publication of this rule in the New Mexico register, until December 14, 2023, permits may be issued under either the previously adopted rule, or this rule. After December 14, 2023, permits may be issued only under this rule.

[14.7.4.5 NMAC – Rp, 14.7.4.5 NMAC, 11/15/2016; A, 07/14/2023]

~~[From the date of publication of this rule in the New Mexico register, until July 1, 2017, permits may be issued under either the previously adopted rule, or this rule. After July 1, 2017, permits may be issued only under this rule.]~~

14.7.4.7 DEFINITIONS:

A. Amended soil means improving an unqualified soil to a qualified state with the addition of other soils or amendments.

B. Amendments means additive elements to soil, such as lime, Portland cement, fly ash, etc. which are “dry-mixed” into the main soil body as a percentage of total weight to achieve stabilization.

C. Buttress means a projecting structure providing lateral support to a wall. The buttress shall be incorporated into the foundation and wall system. (~~refer~~ Refer to figure 1 of the earthen building figures supplement).

D. CEB means compressed earth block.

E. Count Rumford fireplace means a fireplace with a typically square opening with coved sides and a shallow firebox depth of at least ~~[two]~~ 12 inches, but no shallower than one third of the width of the firebox. The fireback is vertical and does not slant forward. The throat is located at least two inches above the lintel and is a nozzle, rounded or streamlined so as to preserve laminar flow of the dilution air through the throat and with a cross-sectional area large enough to insure the elimination of all products of combustion.

F. Keyway means a groove on the vertical rammed earth wall surface for interlocking purposes. (~~refer~~ Refer to figure 3 of the earthen building figures supplement).

G. Lift means a course of rammed earth, placed within the forms, and then compacted.

H. Nail means any material rammed into the wall that serves as an attachment device. (~~refer~~ Refer to figure 4 of the earthen building figures supplement).

I. Optimum moisture means sufficient water (generally no more than ten percent) mixed into the soil to attain sufficient compaction.

J. PSI means pounds per square inch.

K. Qualified soil means any soil, or mixture of soils, that attains 300 psi compression strength and attains 50 psi. modulus of rupture.

L. Rammed earth means qualified soil that is mechanically or manually consolidated to full compaction.

M. Round-cap nails means fasteners that include nails or screws in combination with caps of at least three-fourths inches diameter or three-fourths inch square.

N. Stabilization, stabilized means qualified soils that pass the wet strength test under American society for testing and materials (ASTM) D1633-00 or contain a minimum of six percent Portland cement by weight. Stabilization is achieved through the use of amendments.

O. Wet strength compression test means an approved testing laboratory process in which a fully cured rammed earth cylinder is completely submerged in water a minimum of four hours according to ASTM D1633-00, then subjected to a compression test.

[14.7.4.7 NMAC - Rp, 14.7.4.7 NMAC, 11/15/2016; A, 07/14/2023]

14.7.4.8 EARTHEN BUILDING MATERIALS:

A. General. The provisions of 14.7.4 NMAC, shall control the design and construction of one- and two-family dwellings in which earthen building materials form the bearing wall system.

B. Allowable wall heights for earthen structures. All earthen structures whether adobe, burned adobe, compressed earth block, rammed earth or terrón, shall conform to table 1. For purposes of using table 1, height is defined as the distance from the top of the slab or top of stem wall to the underside of the bond beam.

Table 1 ALLOWABLE WALL HEIGHTS FOR EARTHEN STRUCTURES					
Maximum Sds	Wall Thickness	Maximum Height	Maximum Sds	Wall Thickness	Maximum Height
.25	10	120"	.3	10	120"
	12	128		12	128
	14	144		14	144
	16	144		16	144
	18	144		18	144
	24	144		24	144
.35	10	120"	.4	10	120"
	12	128		12	128
	14	144		14	144
	16	144		16	144
	18	144		18	144
	24	144		24	144
.45	10	104"	.5	10	96"
	12	128		12	112
	14	144		14	136
	16	144		16	144
	18	144		18	144
	24	144		24	144

This table is based on two story maximum, one and two family residential with seismic soil site class D1.
NOTE: Sds can also be referred to in the IRC Section R301.2.2.1 determination of seismic design category.

[14.7.4.8 NMAC - Rp, 14.7.4.8 NMAC, 11/15/2016; A, 07/14/2023]

14.7.4.9 ADOBE CONSTRUCTION:

A. General. Adobe shall not be used in any building more than two stories in height. The maximum height of every wall of adobe block without lateral support is specified in 14.7.4.8 NMAC, Table 1. The height of the wall is defined as the distance from the top of the slab or top of stem wall to the underside of the bond beam. The maximum height of exterior walls, which are laterally supported with those supports located no more than 24 feet apart, are as defined in 14.7.4.8 NMAC, Table 1. The bottom story of a two-story is allowed a minimum thickness of ~~four~~ 14 inches with the upper story allowed a thickness of 10 inches providing the structure meets the provisions of 14.7.4.8 NMAC, Table 1.

B. Fireplaces. Adobe or masonry fireplaces and chimneys in adobe structures shall comply with 14.7.3.18 NMAC. They shall be integrated into adjacent adobe walls during construction or secured to them by suitable steel ladder reinforcement or reinforcing rods.

C. Count Rumford fireplaces. Count Rumford fireplaces are allowed as provided in 14.7.3.18 NMAC.

D. Soil. Soil for use in adobe blocks should have a mixture of coarse sand, sand, silt and clay, naturally occurring, or amended with sand or straw, that will make a sun-dried ~~brick~~ block without serious warping or cracking. The best way to determine the fitness of a soil is to make sample blocks and allow them to ~~cure~~ dry in the open, protected from moisture. Then test as specified by Subsections C and D of 14.7.4.11 NMAC. The soil shall not contain more than two percent soluble salts.

E. Passive solar structures. Passive solar structures incorporating the use of solar mass walls (trombes), direct gain arrays or sunspaces (greenhouses) as defined by the passive solar heating worksheet, dated ~~June, 2004~~ September, 2021 and prepared by the state of New Mexico energy, minerals and natural resources department, are allowed.

[14.7.4.9 NMAC - A, 14.7.4.9 NMAC, 07/14/2023]

14.7.4.10 CLASSES OF ADOBE:

A. Stabilized adobe. The term “stabilized” is defined to mean water-resistant adobe made of soil to which certain admixtures are added in the manufacturing process in order to limit water absorption into the adobe. Exterior walls constructed of stabilized mortar and adobe requires no additional protection. Cement stucco or other waterproof coating is not required. The test required is that a dried four inch cube cut from a sample unit shall not gain more than two and a half percent in weight when placed upon a constantly water-saturated porous surface for seven days. An adobe unit that meets this specification shall be considered “stabilized.”

B. Unstabilized adobe. Unstabilized or “natural” adobes are adobes that do not meet the water absorption specifications indicated in Subsection A of 14.7.4.10 NMAC above. Use of unstabilized adobes is prohibited within four inches of the finished floor grade. Stabilized adobe or waterproof masonry units and mortar may be used for the first four inches above finished floor [grade].

C. Terrón. The term “terrón” shall refer to a cut sod brick. Their use is permitted if units are dry and the wall design is in conformance with this code.

D. Burned adobe. The term “burned adobe” shall refer to mud adobe bricks that have been cured by low-temperature kiln firing. This type of adobe is not generally dense enough to be “frost-proof” and may deteriorate with seasonal freeze-thaw cycles. Its use for exterior locations is discouraged in climate zones with daily freeze-thaw cycles.

[14.7.4.10 NMAC - Rp, 14.7.4.10 NMAC, 11/15/2016; A, 07/14/2023]

14.7.4.11 PROPERTIES, SAMPLING AND TESTING:

A. General. Each of the tests prescribed in this section shall be applied to sample units selected at random at a ratio of five units per 25,000 bricks to be used or at the discretion of the building official.

B. Shrinkage cracks. Shrinkage cracks are allowed, providing that these cracks do not jeopardize the structural integrity of the blocks.

C. Compressive strength.

(1) Cured units shall have an average minimum compressive strength of 300 pounds per square inch when tested. One sample out of five may have a compressive strength of not less than 250 psi.

(2) The adobe block shall be tested in the flat position. The length of the test unit must be a minimum of twice the width. The surfaces must be smooth. The test unit shall be subjected to a uniform compressive load that is gradually increased at a rate of 500 psi/minute until failure occurs. A true platen should be used in the testing machine, along with swivel head to accommodate nonparallel bearing surfaces. The compressive strength is defined as P/A , where P = load and A = area of compression surface.

D. Modulus of rupture. Cured units shall average 50 psi in modulus of rupture when tested according to the following procedures. A cured unit shall be laid over two-inch diameter cylindrical supports two inches from each end and extending across the full width of the unit. A cylinder two inches in diameter shall be laid midway between and parallel to the supports. Load shall be applied to the cylinder at a rate of 500 psi/minute until rupture occurs. The modulus of rupture is equal to: $3PL/2bt^2$ (P =rupture load in pounds, L =span between supports, b =width of block, t =thickness of block).

E. Mortar. The use of earth mortar is allowed if the earth mortar material is of the same type as the adobe blocks. Conventional lime/sand/cement mortars of types M, S, and N are also allowed. Mortar “bedding” joints shall be fully grouted, with partially open “head” joints allowable if the surface is to be plastered. All joints shall be lapped at least twenty-five percent of the visible block length.

F. Use. No adobe shall be laid in the wall until fully cured. Adobes shall be laid in level courses so that the top of any course shall be at the same height above the stem around the structure.

G. Foundations. Adobes may not be used for foundations or basement walls. All adobe walls, except as noted, shall have a continuous footing at least eight inches thick and not less than two inches wider on each side that supports the foundation stem walls above. All foundation stem walls that support adobe units shall extend to an elevation not less than six inches above the finish grade. Foundation stem walls shall be at least as thick as the adobe walls they support. Alternative foundation systems must be approved by the building official.

H. Bond beams. All bearing walls shall be topped with a continuous bond beam (except patio walls less than six feet high above stem). All bond beam construction shall be in accordance with accepted engineering practices.

I. Concrete bond beam. Concrete bond beams shall be a minimum of six inches high by 10 inches wide for walls up to 14 inches thick. Where adobe walls are wider than one course, two-thirds of each visible course top shall be covered by the concrete bond beam. All concrete bond beams shall be reinforced with a minimum of two no. 4 reinforcing rods at each floor and ceiling plate line.

J. Wood bond beam. Wood bond beams shall be a minimum of six inches deep by 10 inches wide for walls up to 14 inches thick. Where adobe walls are wider than one course, two-thirds of each visible course top shall be covered by a wood bond beam and the roof load shall be distributed over both bond beams. Wood bond beams may be solid in the six-inch dimension, or may be built up by applying layers of lumber. Ends of wood bond beams are to be lapped a minimum of the width of the wall and fully nailed. No wood layer shall be less than one inch nominal thickness. The building official shall approve all wooden bond beams for walls wider than 14 inches.

K. Lintels. Lintels of wood or concrete are allowed. When an engineer's drawing and seal is not provided, all lintels shall conform to Table 2 or 3 below. The required bearing of any lintel shall not be reduced by a splayed or angled window or door opening.

L. Wood lintels. When an engineer's drawing and seal is not provided for lintels, all wood lintels shall conform to Table 2 and have a fiber stress rating of at least 850 psi.

Table 2 ADOBE WALL WOOD LINTEL SCHEDULE				
MINIMUM FIBER STRESS 850 psi				
Wall Width	Max. Span	Size	Bearing length on earth wall	Load Capacity
10"	4'-0"	10" x 6"	12"	860 PLF
	6'-0"	10" x 8"	12"	1020 PLF
	8'-0"	10" x 10"	18"	1150 PLF
	10'-0"	10" x 12"	24"	1000 PLF
	12'-0"	10" x 14"	24"	1000 PLF
12"	4'-0"	10" x 6"	12"	860 PLF
	6'-0"	10" x 8"	12"	1020 PLF
	8'-0"	10" x 10"	18"	1150 PLF
	10'-0"	10" x 12"	24"	1000 PLF
	12'-0"	10" x 14"	24"	1000 PLF
14"	4'-0"	12" x 6"	12"	950 PLF
	6'-0"	12" x 8"	12"	1150 PLF
	8'-0"	12" x 10"	18"	1300 PLF
	10'-0"	12" x 12"	24"	1300 PLF
	12'-0"	12" x 14"	24"	1200 PLF

M. Concrete lintels. When an engineer's drawing and seal is not provided for lintels, all concrete lintels shall conform to table 3 and have a minimum strength of 3000 psi.

Table 3 ADOBE WALL CONCRETE LINTEL SCHEDULE				MIN.
3000 psi				
Maximum Span	Minimum depth*	Reinforcing	Maximum Capacity per linear foot	Bearing length on earth wall
Less than 6' - 0"	8"	2 - # 4	1500 lbs.	12"
6' - 0" to 10' - 0"	12"	3 - # 5	1500 lbs.	18"
11' - 0" to 16' - 0"	16"	3 - # 6	1500 lbs.	24"
* SIZE Wall width X depth of lintel				

N. Anchorage. Roof and floor structures will be suitably anchored to bond beams. Wood joists, vigas or beams shall be attached to the wood or concrete bond beams with adequate metal fasteners. Door and window bucks shall be secured to the adobe wall with adequate metal fasteners. "Gringo blocks" or wood nailers, placed in the adobe walls as they are laid up, are allowed. Wood and metal partitions may be secured to nailing blocks laid up in the adobe wall or by other approved methods.

O. Plastering. [Add the following new provisions.]

(1) Portland-based [plasters] stucco or lime-based [stuccos] plaster used over insulation board or foam shall follow Subsection P of 14.7.4.11 NMAC.

(2) Unstabilized, uninsulated exterior adobe walls can be protected with plasters or stuccos with a minimum thickness of seven-eighths inch, if adequate roof, parapet, canal, and window flashing is provided.

(3) Portland-based plaster covering unstabilized, adobe walls must be reinforced with self-furring metal wire mesh, minimum 17 gauge by one and one-half inches openings, securely attached to the exterior adobe wall surface by nails or staples with a minimum penetration of one and one-half inches. Such mesh fasteners

shall have a maximum spacing 16 inches from each other. Wood surfaces or areas of dissimilar materials to be covered with Portland-based plaster must be protected from moisture with asphalt felt, covered with expanded metal lath, securely attached to the adobe wall.

(4) Type S hydrated lime stuccos covering unstabilized adobe walls are allowed providing that adobe head joints are left partially open as provided by Subsection E of 14.7.4.11 NMAC. Lime-based stuccos do not require a wire mesh cover except when used over wood or dissimilar materials in which case the surface must be protected from moisture with asphalt felt, covered with expanded metal lath.

(5) Other plasters or coatings are allowed providing they do not constitute a vapor barrier. Interior gypsum or ~~mud~~ clay plasters may be applied directly to the wall, provided that adobe head joints have been left partially open. Expanded metal lath shall be used around window and door openings. If desired, exterior adobe walls may be protected with ~~mud~~ clay plaster. Alternative plastering or coating systems shall be submitted for approval by the building official.

P. Wall insulation. ~~[Add the following new provisions].~~

(1) Insulating boards or foams not exceeding two inches in thickness may be adhered to the exterior of the adobe wall. When insulation board is used, round-cap nails shall attach it to the adobe wall, with nails placed to avoid bed joints between courses. Cap nails shall have a maximum spacing of 16 inches from each other. Additionally, cap nails shall secure the rigid insulation boards around their perimeter edges, with nails spaced no less than two inches apart. All cap nails shall penetrate a minimum of two inches into the adobe wall. Insulating boards or foams shall not be used to form architectural shapes exceeding two inches in thickness.

(2) Insulations exceeding two inches in thickness may be used providing they do not form a vapor barrier. Their weight shall be supported by the stem wall below and contained within vertical furring strips, securely attached to the adobe wall. A sectional, scaled drawing for the proposed insulation scheme must be submitted for review by the building official.

Q. Parapets. ~~[Add the following new provisions].~~

(1) **Plastered parapets**, whether of adobe or frame construction, shall require a seamless ~~permeable~~ impermeable waterproof cover or weather barrier, capping the entire parapet and wrapping over each side. The cover shall extend past the bond beam a minimum of four inches on the wall side. On the roof side, the cover shall properly lap any rising roof felts or membranes and be properly sealed. A layer of expanded metal lath shall be installed over the cover before plaster or stucco is applied. The lath shall extend past the bond beam on the wall side a minimum of five inches and on the roof side, the same distance as the cover below, allowing for plaster stops or seals. No penetrating fasteners are allowed on the horizontal surface of parapets.

(2) **Exposed parapets** of adobe shall be laid in level courses of fully stabilized block and mortar. Bed and head joints shall be fully grouted and tightly tooled. Bedding joints at bond beams and around vents and canales shall be fully grouted and tightly tooled. The horizontal top of exposed adobe parapets shall be covered with a minimum three-fourths inch layer of fully stabilized mortar, troweled to conform with the parapet. Waterproof sealers are allowed, providing they are permeable. Other parapet covers, such as flagstone, Spanish mission tile or cement mortar are allowed providing they are securely attached to the parapet. A scaled, sectional drawing shall be provided to the building official showing the attachment scheme.

[14.7.4.11 NMAC - Rp, 14.7.4.11 NMAC, 11/15/2016; A, 07/14/2023]

14.7.4.12 RAMMED EARTH CONSTRUCTION:

A. General. The following provisions shall apply.

(1) Rammed earth shall not be used in any building more than two stories in height. The height of every wall of rammed earth without lateral support is specified in Table 1 of 14.7.4.8 NMAC. The height of the wall is defined as the distance from the top of the slab or top of stem wall to the underside of the bond beam.

(2) Exterior rammed earth walls shall be a minimum of 18 inches in thickness. Exception: Exterior walls that are also designed as solar mass walls (trombe) as defined by the passive solar heating worksheet, dated June 2004 and prepared by the state of New Mexico energy, minerals and natural resources department, are allowed and shall be minimum thickness of 10 inches, not to exceed two inches. They shall be fully attached to or integrated with any adjacent structural wall and topped with a bond beam that fully attaches them to the bond beam of any adjacent structural wall as described in 14.7.4.17 NMAC.

(3) Interior rammed earth walls shall be a minimum of two inches in thickness.

(4) The first lift of rammed earth walls shall be of stabilized rammed earth or minimum 2500 psi concrete, rising not less than three and one half inches above finish floor level. Unstabilized rammed earth walls must be covered to prevent infiltration of moisture from the top of the wall at the end of each workday and prior to wet weather conditions, whether the walls are contained within forms or not.

(5) Fully stabilized rammed earth walls may be left unprotected from the elements.

(6) In no case shall a rammed earth wall be reduced in thickness with back to back channels or nailers. Channels or nailers rammed on both sides of a running wall shall not be opposite each other to avoid an hourglass configuration in the wall section. Channels or nailers on both sides of a running wall shall be separated from each other vertically at a distance no less than the rammed earth wall thickness. (Refer to Figure 4 of the earthen building figures supplement).

(7) An architect or engineer registered in the state of New Mexico shall design and seal structural portions of two-story residential rammed earth construction documents.

(8) The general construction of the building shall comply with all provisions of the [2009] 2001 New Mexico Residential Building Code (NMRBC), unless otherwise provided for in this rule.

(9) Passive solar structures incorporating the use of solar mass walls (trombe), direct gain arrays or sunspaces (greenhouses) as defined by the passive solar heating worksheet, dated June 2004 and prepared by the state of New Mexico energy, minerals and natural resources department, are allowed.

B. Fireplaces. Adobe or masonry fireplaces and chimneys in rammed earth structures shall comply with 14.7.3.18 NMAC. They shall be integrated into adjacent rammed earth walls during construction or secured to them by suitable steel ladder reinforcement or reinforcing rods.

C. Count Rumford fireplaces. Count Rumford fireplaces are allowed as provided in 14.7.3.18 NMAC.

D. Stop work. The building inspector shall have the authority to issue a “stop work” order if the provisions of this section are not complied with.

E. Lateral support. Lateral support shall occur at intervals not to exceed 24 feet. Rammed earth walls 18 inches to less than 24 inches thick shall be laterally supported with any one or combination of the following: a rammed earth wall of bond beam height that intersects the running wall with at least 60 degrees of support (refer to a Figure 5 of the earthen building figures supplement); an adobe wall of bond beam height and at least 10 inches in width that intersects with and attaches to the running wall with at least 60 degrees of support (refer to Figure 5 of the earthen building figures supplement); a minimum 20 gauge steel frame or wood frame wall of full height that intersects with and attaches to the running wall with 90 degrees of support, that is properly cross-braced or sheathed (refer to Figure 6 of the earthen building figures supplement); a buttress configuration that intersects the running wall at 90 degrees, of adobe or rammed earth. The buttress base must project a minimum of three feet (or thirty-three percent of the wall height) from the running wall and support at least seventy-five percent of the total wall height (refer to Figure 7 of the earthen building figures supplement). The thickness of a rammed earth buttress shall be at least 18 inches. The thickness of an adobe buttress shall be a minimum 14 inches. Rammed earth walls greater than 24 inches in thickness are self-buttressing and do not require lateral support provided their design adheres to Table 1 of 14.7.4.8 NMAC and the other applicable provisions of this rule.

F. Openings. Door and window openings shall be designed such that the opening shall not be any closer to an outside corner of the structure as follows.

(1) In rammed earth walls 18 inches to less than 24 inches thick, openings shall not be located within three feet of any corner of the structure. (Refer to Figure 8 of the earthen building figures supplement). Exception: Openings may be located within three feet of any corner provided a buttress extending at least three feet from the structure supports the corner. A continuous footing below and a continuous bond beam above shall be provided across such openings.

(2) Rammed earth walls greater than 24 inches thick are self-buttressing, with no special consideration for placement of openings within the area of the wall.

G. Piers. Rammed earth piers supporting openings shall measure no less than three square feet in area and no dimension shall be less than 18 inches. (Refer to Figures 9-A and 9-B of the earthen building figures supplement).

[14.7.4.12 NMAC - Rp, 14.7.4.12 NMAC, 11/15/2016; A, 07/14/2023]