

**TITLE 14            HOUSING AND CONSTRUCTION**  
**CHAPTER 7        BUILDING CODES GENERAL**  
**PART 5            2009 NEW MEXICO NON-LOAD BEARING BALED STRAW CONSTRUCTION**  
**BUILDING STANDARDS**

**14.7.5.1            ISSUING AGENCY:** The Construction Industries Division of the Regulation and Licensing Department.  
[14.7.5.1 NMAC - Rp, 14.7.5.1 NMAC, 1-1-08]

**14.7.5.2            SCOPE:** This rule applies to single family residential contracting work performed within the state of New Mexico on or after January 28, 2011, involving non-loadbearing baled straw construction, unless performed pursuant to a permit for which an application was received prior to that date.  
[14.7.5.2 NMAC - Rp, 14.7.5.2 NMAC, 1-1-08; A, 01-28-11]

**14.7.5.3            STATUTORY AUTHORITY:** NMSA 1978 Section 60-13-9(F).  
[14.7.5.3 NMAC - Rp, 14.7.5.3 NMAC, 1-1-08]

**14.7.5.4            DURATION:** Permanent.  
[14.7.5.4 NMAC - Rp, 14.7.5.4 NMAC, 1-1-08]

**14.7.5.5            EFFECTIVE DATE:** January 1, 2008, unless a later date is cited at the end of a section.  
[14.7.5.5 NMAC - Rp, 14.7.5.5 NMAC, 1-1-08]

**14.7.5.6            OBJECTIVE:** The purpose of this rule is to set forth general provisions governing non-loading straw baled construction in New Mexico.  
[14.7.5.6 NMAC - Rp, 14.7.5.6 NMAC, 1-1-08]

**14.7.5.7            DEFINITIONS:**

- A.            Bale** means rectangular compressed blocks of straw, bound by strings or wire.
  - B.            Flakes** means slab of straw removed from an untied bale used to fill small gaps between the ends of stacked bales. Flakes may be retied to maintain the original compression of the bale before placement in gaps.
  - C.            In fill** means bales placed within or interior to the structural members so as not to carry any weight other than the weight of the bales themselves.
  - D.            Laid flat** means stacking bales such that the longest edge of the bale is parallel to the wall plane and the greatest cross sectional area of the bale is horizontal. The resulting wall shall be at least 18" thick.
  - E.            Straw** means the stalk or stem of grain from wheat, rye, oats, rice or barley left after threshing or when the seed head has been removed.
  - F.            Unbuttressed** means a section of baled straw in-fill without a perpendicular wall, column or other lateral support.
- [14.7.5.7 NMAC - Rp, 14.7.5.7 NMAC, 1-1-08]

**14.7.5.8            GENERAL:**

- A.            Baled straw** shall not be used to support the weight of the building beyond the weight of the bales themselves. The bales will act as wall in-fill within or interior to the structural members.
  - B.            The structural support** of the building shall be designed according to the provisions of the 2009 New Mexico residential building code. All loadings shall be as required by 14.7.3.14 NMAC.
  - C.            The vertical and horizontal members** comprising the structural support of the building shall be wrapped in a moisture barrier according to the provisions of the 2009 New Mexico residential building code.
  - D.            The general construction** of the building shall comply with all provisions of all New Mexico building codes applicable to residential construction. (See Title 14, Chapters 5, 7, 8, 9 and 10 of the New Mexico administrative code - NMAC.)
- [14.7.5.8 NMAC - Rp, 14.7.5.8 NMAC, 1-1-08; A, 01-28-11]

**14.7.5.9            BALED STRAW SPECIFICATIONS:**

- A.            Content:** Bales of straw, limited to wheat, rye, oats, rice or barley, shall be acceptable if they meet the minimum requirements for shape, density, moisture content, and ties.
- B.            Shape:** Bales shall be rectangular in shape and consistent in height and width to ensure even distribution of loads.

**C. Ties:** Bales shall be mechanically bound with baling wire or poly-propylene string. Bales shall have a minimum of two strings running parallel to the longest edge. 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.

**D. Moisture content:** Bales must be sufficiently dry with a maximum moisture content of twenty percent (20) at the time of installation. Moisture content of bales shall be determined by one of the following.

(1) Field method: a suitable moisture meter, designed for use with baled straw, 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 five bales randomly selected from the bales to be used.

(2) Laboratory method: a total of five samples, taken from the center of each of five bales randomly selected from the bales to be used, shall be tested for moisture content by a recognized testing lab.

**E. Compression:** All bales shall be field tested for compression before placement in walls. Bales shall be of sufficient compression to remain intact when lifted by one baling wire or poly-propylene twine and transporting it manually a minimum of 25 feet while suspended by one wire or twine.

[14.7.5.9 NMAC - Rp, 14.7.5.9 NMAC, 1-1-08]

#### **14.7.5.10 WALL CONSTRUCTION:**

**A.** Baled straw shall not be used below grade. The foundation shall be constructed so that the bottom of the lowest course of the bale wall is at least six inches (6") above final exterior grade. Baled straw used for in-fill walls shall be laid flat with the vertical joints staggered at each course with a minimum overlap of twelve inches (12"). Vertical joints shall be field tested during placement of bales in the wall. Joints shall be sufficiently tight to prevent the end of a nominal dimension one by four inch (1" x 4") board two feet long from being pushed more than six inches (6") into the joint.

**B.** A moisture barrier shall be placed between the foundation and the first course of baled straw to prevent moisture from migrating through the foundation into the bottom course of bales. The barrier shall run vertically between the perimeter insulation and the foundation wall and shall run horizontally under the bale wall and then double back to the outside edge of the foundation.

(1) The moisture barrier shall consist of one of the following:

- (a) cementitious waterproof coating;
- (b) type 30 asphalt felt over an asphalt emulsion;
- (c) sheet metal flashing, sealed at joints; or
- (d) other ICC approved building moisture barrier.

(2) All penetrations through the moisture barrier, as well as all joints in the barrier, must be sealed with asphalt, caulking or an approved sealant.

(3) Unless protected by a roof above, a moisture barrier shall be placed over the top course of bales to prevent moisture entering the top of the wall of bales. The moisture barrier shall extend down both sides of the top course a minimum of the full top course.

(4) A moisture barrier shall be installed at all window sills prior to installing windows.

**C.** All weather-exposed exterior wall surfaces shall have a weather-resistive barrier to protect the interior wall covering as required by 14.7.3.15 NMAC.

**D.** Gaps between the ends of bales which are less than six inches (6") in width can be filled by a flake inserted securely into the gap.

[14.7.5.10 NMAC - Rp, 14.7.5.10 NMAC, 1-1-08]

#### **14.7.5.11 WALL REINFORCING:**

**A.** The bottom course of the bale wall shall be pinned to the foundation with #4 rebar with a minimum of two pins per bale. These pins should be embedded into the foundation to a depth of not less than seven inches (7") and should continue vertically halfway into the second course of bales.

**B.** Each subsequent course of bales shall have two (2) rebar pins per bale that extend vertically through that course and halfway into the second adjacent course below penetrating a total of two and one half courses. All rebar shall be located approximately nine inches (9") from the bale ends and centered on the width of the bale.

**C.** A continuous horizontal ladder reinforcing shall be placed horizontally between courses at mid wall height and shall be fastened twice per bale to the twine or wire.

[14.7.5.11 NMAC - Rp, 14.7.5.11 NMAC, 1-1-08]

#### **14.7.5.12 WALL ANCHORS:**

**A.** Bale straw in-fill walls shall be securely anchored to all adjacent structural members to sufficiently resist horizontal displacement of the wall panels.

**B.** Anchors shall be placed at every horizontal joint or one per bale along vertical structure and a maximum of twenty-four inches (24") on center along horizontal structures at the top of bale wall panels beginning not more than twelve

inches (12") from each end of the wall panel.

**C.** Anchors shall be metal strips or dowels. Metal strips shall be six inches (6") wide expanded metal lath or FHA perforated metal strips which shall be securely fastened to the vertical structural members and shall extend at least twelve inches (12") onto the adjacent bale and shall be pinned into the bale. Dowels shall be one-half inch (1/2") minimum diameter wood or steel and shall extend into the bale at least six inches (6").

**D.** Intersecting walls of other materials intersecting bale walls shall be attached to the bale wall by means of one or more of the following methods.

(1) Wooden dowels at least five-eighths inch (5/8") in diameter of sufficient length to provide twelve inches (12") 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 (12") in length and one and one-half inches (1-1/2") by three and one-half inches (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 six inches (6") square and a minimum thickness of three-sixteenth inch (3/16") for steel and one-half inch (1/2") for plywood, in at least three equally spaced locations.

[14.7.5.12 NMAC - Rp, 14.7.5.12 NMAC, 1-1-08]

**14.7.5.13 OPENINGS:** Rough bucks and/or door and window frames shall be stabilized with one-half inch by 12 inch (1/2" X 12") diameter wood dowels extended into every adjacent bale or by means of a continuous lath, prior to the application of plaster or stucco.

[14.7.5.13 NMAC - Rp, 14.7.5.13 NMAC, 1-1-08]

#### **14.7.5.14 STUCCO/PLASTER:**

**A.** 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.

**B.** Where bale walls abut other material (wood, concrete, steel, etc.) galvanized expanded metal lath shall be used to cover the junction. Expanded metal lath shall extend a minimum of six inches (6") onto the bales and shall be securely fastened to the bale.

**C.** All straw bale shall have exterior walls plastered with a minimum thickness of seven-eighths inch (7/8") portland cement plaster with or without stucco netting. The following two step process applies to the first coat of portland cement plaster applied to the vertical surface of the bales:

(1) the first coat of plaster shall be thoroughly worked into the bale surface; and

(2) the second coat of plaster shall be applied over the first coat and "scratched" to provide bonding for the subsequent layer of plaster.

**D.** Where wire mesh is used, wire mesh shall be a minimum of 17 gauge wire mesh by one and one half inch (1 1/2") opening and shall be securely attached to the exterior wall surface. Mesh fasteners shall have a maximum spacing of sixteen inches (16") from each other.

[14.7.5.14. - Rp, 14.7.5.14 NMAC, 1-1-08]

**14.7.5.15 PARAPETS:** Straw bales may be used for parapets with a maximum height of two (2) courses. These bales shall be pinned together vertically with rebar and have a continuous wrap with stucco netting encompassing both vertical surfaces and top of the bales. A continuous seal shall be maintained from the roof surface to the top of the parapet and down the other side a minimum of two inches (2") and a maximum of six inches (6"). Reference **14.7.3.15** NMAC and R703 Exterior Coverings for moisture barrier types.

[14.7.5.15 NMAC - Rp, 14.7.5.15 NMAC, 1-1-08]

#### **14.7.5.16 ELECTRICAL:**

**A.** All wiring within bale walls in residential construction shall be type UF or approved conduit systems.

**B.** All wiring within bale walls may be pressed between vertical and horizontal joints of the bales, or bales may be channeled, maintaining a minimum depth of one and one-fourth inches (1 1/4") from the surface of the interior wall finish.

**C.** All cable, conduit systems, electrical and junction boxes, shall be securely attached to the bale wall.

**D.** All electrical wiring, methods and materials in bale walls shall meet the provisions of the New Mexico electrical code currently in effect within the state of New Mexico, and any other applicable state codes or standards.

[14.7.5.16 NMAC - Rp, 14.7.5.16 NMAC, 1-1-08]

**14.7.5.17 PLUMBING:** All plumbing shall meet all provisions of the New Mexico plumbing and mechanical codes currently in effect within the state of New Mexico, and any other applicable state codes or standards.

[14.7.5.17 NMAC - Rp, 14.7.5.17 NMAC, 1-1-08]

**14.7.5.18 PROFESSIONAL SEAL REQUIREMENT AND CERTIFICATE OF OCCUPANCY:**

**A.** Construction documents detailing the structural design of the structure shall be prepared by a licensed New Mexico architect or structural engineer. The architect or engineer stamp must be affixed to each page of the plans detailing construction of the structure with the design professionals signature and date affixed over each stamp.

**B.** Prior to issuance of a certificate of occupancy by the construction industries division, an inspection report must be provided to the general construction inspector by the licensed New Mexico architect or structural engineer. The report shall attest to the building's structural integrity and conformance with the permitted drawings.

[14.7.5.18 NMAC - Rp, 14.7.5.18 NMAC, 1-1-08]

**HISTORY OF 14.7.5 NMAC:**

**Pre NMAC History:** None.

**History of Repealed Material:**

14 NMAC 11.9, Standards for Non-loadbearing Baled Straw Construction (filed 09-30-1997) repealed 11-19-04.

14.7.5 NMAC, 2003 New Mexico Non-Load Bearing Baled Straw Construction Building Standards (filed 10-18-04) repealed 1-1-08.

**NMAC History:**

14 NMAC 11.9, Standards for Non-loadbearing Baled Straw Construction (filed 09-30-1997) was renumbered and replaced by 14.7.5 NMAC, 2003 New Mexico Non-Load Bearing Baled Straw Construction Building Standards, effective 11-19-04.

14.7.5 NMAC, 2003 New Mexico Non-Load Bearing Baled Straw Construction Building Standards (filed 10-18-04) replaced by 14.7.5 NMAC, 2006 New Mexico Non-Load Bearing Baled Straw Construction Building Standards, effective 1-1-08.