



U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT  
WASHINGTON, DC 20410-8000

ASSISTANT SECRETARY FOR HOUSING-  
FEDERAL HOUSING COMMISSIONER

MAY 1 - 2014

Manufactured Housing Consensus Committee

Dear Committee Member:

This is in response to information received from Manufactured Housing Consensus Committee (MHCC) member Manuel Santana and others regarding expressed concerns and problems associated with compliance with the new requirements for supply air ducts in 24 CFR § 3280.715(a)(1) of the Manufactured Home Construction and Safety Standards (copy enclosed) that were published in the Federal Register on December 9, 2013. A detailed analysis of potential issues provided by Mr. Santana is attached for your review and consideration.

Specifically, manufacturers and their suppliers have encountered problems in finding workable solutions in meeting the new requirement for furnace supply plenums to be constructed of metal for a minimum of 3 feet from the heat exchanger, due to small furnace compartment spaces and smaller attic and crawl space areas than encountered in site built construction. The information provided also suggests there are no issues associated with the use of Class 1 supply air ducts and with elimination of the less fire resistive Class 2 type supply air ducts as required by the final rule.

In view of all of the above, the Department has determined that the requirement in 24 CFR § 3280.715(a)(1) for furnace supply plenums to be constructed of metal that extends a minimum of 3 feet from the heat exchanger is to be indefinitely delayed to provide industry with sufficient time to develop a workable solution to meet the requirement or until the MHCC can reassess this aspect of the rule and provide recommendations on how this matter should be resolved. During this interim period, manufacturers will be required to provide Class 1 air ducts and connectors within 3 feet of the furnace bonnet or plenum as required by the final rule and will be allowed to use a Class 0 or Class 1 furnace supply plenum within 3 feet of the heat exchanger.

If you have any additional comments or questions, please contact me at (202) 402-7112.

Sincerely,

A handwritten signature in black ink, appearing to read "Pamela Beck Danner".

Pamela Beck Danner  
Administrator  
Office of Manufactured Housing Programs

Enclosures

Analysis of New HUD Standards Revisions to 3280.715, effective 6/9/2014

04/17/14

The purpose of this paper is to identify the significant changes made to §3280.715 by the new HUD standards revisions effective June 9, 2014. This paper will evaluate their justification, impact and provide recommendations where appropriate.

Significant Changes

1. Class 2 ducts have been eliminated
2. Class 1 ducts and connectors are not allowed within 3 feet of the furnace bonnet or plenum
3. The furnace supply plenum must be constructed of metal that extends at least 3 feet from the heat exchanger.
4. Crossover duct insulation has been increased from R-4 to R-8

With respect to modern Manufactured Housing (MH) construction, Class 2 ducts are no longer used, Class 1 ducts are fiberglass board or insulated flex ducts and Class 0 ducts are aluminum or steel ducts.

Justification

Justification for the revisions provided in the Supplementary Information of the Final Rule, can be found in *Part III, This Final Rule, Section H*.

1. "Class 2 ducts were deleted because the change is consistent with the requirements of the International Residential Code for One and Two Family Dwellings, and would improve the fire safety and performance of air handling ducts by requiring the use of Class 0 or 1 ducts".
2. There was no justification provided for requiring Class 1 ducts not be allowed within 3 feet of the furnace bonnet or plenum
3. There was no justification provided for requiring that the plenum be constructed of metal for 3 feet from the heat exchanger.
4. Justification for this was to provide consistency with the IRC

Analysis and Impact

The 2012 version of the International Residential Code (IRC) and 2012 version of the International Mechanical Code (IMC) were analyzed and compared to the new HUD requirements.

The elimination of Class 2 ducts is consistent with the requirements of the IRC/IMC. To my knowledge, Class 2 ducts are no longer being used in manufactured housing.

The IRC/IMC does not have any limitations on where Class 1 ducts may be located relative to a furnace plenum or bonnet. Rather, the IRC/IMC requires that the discharge air temperature of the equipment be limited to 250°F as a condition for the use of Class 0 or 1 ducts (see §M1601.1.1 attached). It is then the responsibility of others to ensure that the duct being installed is rated to withstand at least 250°F. Similarly, the IRC/IMC does not have any requirement as to the construction of a furnace supply plenum that extends 3 feet from the heat exchanger.

This rule will have a significant impact on all manufacturers in varying degrees. Manufactured homes are typically built with one of the following duct systems

- Downflow
  1. Singlewide units with aluminum ducts, no crossovers
  2. Multiwide units with aluminum ducts and round flex duct crossovers
  3. Single wide units with rigid insulated ducts and no crossovers
  4. Multiwide units with rigid insulated ducts with round flex duct crossovers
- Upflow
  1. Singlewide units with a rigid insulation plenum connected to round flex duct, no crossovers
  2. Multiwide units with a rigid insulation plenum connected to round flex duct and crossovers

Singlewide units with downflow furnaces and aluminum ducts will be affected by Item #3 in the significant changes listed above. Item #3 is the requirement for a metal supply plenum that extends 3 feet from the heat exchanger. §3280.702 defines a plenum as “an air compartment which is part of an air distribution system to which one or more ducts or outlets are connected”. This can be interpreted to mean that the duct cannot be taken as part of the plenum since one or more ducts are not connected to it. If a plenum is taken to be separate from ducts then it is not possible to install a metal plenum that extends 3 feet between the heat exchanger and the duct below as the furnace heat exchanger and the duct are only separated by the depth of the floor joists. In order to comply with this requirement, the ducts will have to be installed approximately 2' below the underside of the joists.

Multiwide units with downflow furnaces and aluminum ducts and round flex duct crossovers will be affected by items #2, 3 and 4 of the significant changes listed above. It is considered best practice to install the crossover duct directly underneath the furnace. When this is done, (assuming the flex duct can be taken to be the supply plenum) the flex duct will have to be replaced with a round metal duct for a distance necessary to comply with the 3 feet supply plenum from the heat exchanger requirement. Once this distance is reached, the metal duct will need to be extended an additional 3 feet to comply with the requirement that a Class 1 duct cannot be within 3 feet of a furnace supply bonnet or plenum. All portions of the metal duct crossover that is exposed to outside air must be insulated to R8 minimum per item #4 of the significant changes listed above.

Singlewide units with downflow furnaces and rigid insulated ducts will be affected by items #2 and 3 in the significant changes listed above. Item #2 prohibits Class 1 ducts from being within 3 feet of the furnace plenum. This means that a metal duct will have to be installed directly underneath the furnace plenum for a distance of 3 feet in both directions. Similar to the discussion above, the requirement for a 3 feet metal supply plenum will be difficult to accomplish as it will require the ductwork to be placed approximately 2' below the underside of the joists.

Multiwide units with downflow furnaces, rigid insulated ducts and round flex crossovers will be affected by items #2, 3 and 4 of the significant changes listed above. This scenario combines the difficulties listed for the other scenarios above. There will need to be metal duct run for 3 feet in both directions under

the furnace, the crossover (if allowed to serve as the plenum) will need to be metal for 3 feet from the heat exchanger followed by 3 feet minimum until it can be connected to an insulated flex duct. All portions of the metal duct crossover that is exposed to outside air must be insulated to R8 minimum.

Singlewide and multiwide units with an upflow furnace are typically equipped with a plenum made from rigid insulated duct material, round insulated flex duct is connected to the plenum. This scenario will be affected by items #2, 3 and 4 from the significant changes listed above. The supply plenum will need to be fabricated from metal for 3 feet from the heat exchanger. All ducts leading away from the supply plenum for 3 feet in all directions will have to be metal before transitioning to round insulated flex duct. All exposed metal ductwork will need to be insulated to R-8 minimum.

With respect to potential solutions, clarification of the new requirements and the definition of a plenum will be required before any proposed solution can be finalized. The revised standard do not allow for a Class 1 duct to be within 3 feet of the furnace plenum, there is no mention of Class 1 ducts being allowed in this range as long as the inside of the duct is lined with a Class 0 material. The same applies to the requirement for a metal 3 feet supply plenum from the heat exchanger to the duct, the standards don't mention that this can be a metal duct encased in Class 1 material.

There is a proposed solution for the downflow scenario with rigid insulated duct. It includes opening the rigid duct and lining it for 3 feet in each direction with a metal duct, then resealing the rigid insulated duct. This solution is dependent on the issues above being clarified.

As of the date on this paper there are no practical solutions to the upflow scenario.

#### Conclusion and Recommendations

It is not clear from the comments in the preamble what caused HUD to restrict use of Class 1 ducts within 3 feet of bonnets of plenums or require a metal supply plenum to extend 3 feet from the heat exchanger. No data of incidents of fire caused by Class 1 ducts connected to plenums or bonnets within 3 feet.

The IRC addresses fire safety of the ducts by limiting the air discharge temperature to 250°. Based on information received from one major supplier of equipment approved for installation in manufactured housing, air discharge temperatures for their products range from 155°F to a high of 210°F for high efficiency equipment.

Rigid insulated duct board currently used by this manufacturer is listed as Class 1 and for max 250°F operating temperature.

With air discharge temperature not being an issue, it is questionable how the use of Class 0 duct near the plenum or bonnet would improve fire safety. There are no open flames in fuel burning equipment, all combustion takes place inside the heat exchanger. The likelihood of flames getting into the duct

system is slim to none and would only be an issue with deterioration of the heat exchanger housing due to the lack of maintenance and periodical inspections by qualified service personnel. Electrical equipment does not produce any flames.

The industry and its suppliers have not come up with a viable solution to comply with the new requirements, especially for upflow systems common in the industry. Metal portions of duct systems, especially when also used for air conditioning, must be insulated to prevent condensation. One supplier's solution for down flow systems is to insert metal sleeves into existing Class 1 duct components, by cutting open the duct board and resealing it once insertion is complete. This solution may not comply with the new requirements since it is unclear if a Class 1 material is allowed within 3 feet of the plenum even if the interior is lined with a metal (Class 0) duct.

All proposed solutions currently being considered increase fabrication complexity, parts and pieces, cost as well as the opportunity for mistakes. I believe that implementation of these new rules carry the risk of lowered energy efficiency of the system due to constraints in the air flow and likely introduction of leakage points due to increased joints and connections. Increased duct leakage outside of the pressure envelope has been identified as contributing to moisture problems in humid climate zones. There are many obstacles and risks with no tangible benefits.

I recommend that HUD delay enforcement of the metal supply plenum required 3 feet from the heat exchanger and prohibition of Class 1 ducts within 3 feet of the furnace bonnet or plenum. I believe that HUD needs to reconsider the substantiation of making these changes and if HUD elects to proceed with implementation, do so only after issuing guidelines or an interpretative bulletin to eliminate disparate enforcement among the industry's third parties.

I, Storage Water Heaters with Input/Ratings of 75,000 BTU per hour or less, ANSI Z21.10.1-1998 with addendums Z21.10.1a-2000, and Z21.10.1b-1992, except that for oil-fired units. CF=1.0, Q=total gallons of oil consumed and H=total heating value of oil in BTU/gallon.

Storage capacity in gallons	Recovery efficiency	Standby loss
Less than 25 .....	At least 75 percent. ....	Not more than 7.5 percent.
25 up to 35 .....	00 .....	Not more than 7 percent.
35 or more .....	00 .....	Not more than 6 percent.

\* \* \* \* \*

(f) *Oil-fired heating equipment.* All oil-fired heating equipment must conform to Liquid Fuel-burning Heating Appliances for Manufactured Homes and Recreational Vehicles, UL 307A-1995, with 1997 revisions, and be installed in accordance with Standard for the Installation of Oil Burning Equipment, NFPA 31-01 (incorporated by reference, see § 3280.4). Regardless of the requirements of the above-referenced standards, or any other standards referenced in this part, the following are not required:

\* \* \* \* \*

■ 32. Revise § 3280.711 to read as follows:

**§ 3280.711 Instructions.**

Operating instructions must be provided with each appliance. The operating and installation instructions for each appliance must be provided with the homeowner's manual.

■ 33. Amend § 3280.714 as follows:

■ a. Add "(incorporated by reference, see § 3280.4)" immediately following "Heat Pump Equipment" in paragraph (a)(1) introductory text and immediately following "Heat Pump Appliances" in paragraph (a)(2); and

■ b. Revise paragraphs (a)(1)(i) and (ii). The revisions read as follows:

**§ 3280.714 Appliances, cooling.**

(a) \* \* \*  
(1) \* \* \*

(i) Electric motor-driven unitary air-cooled air conditioners and heat pumps in the cooling mode with rated capacity less than 65,000 BTU/hour (19,045 watts), when rated at ARI standard rating conditions in ARI Standard 210/240-89, Unitary Air-Conditioning and Air-Source Heat Pump Equipment, must have seasonal energy efficiency (SEER) values not less than as specified in 10 CFR Part 430, Energy Conservation Program for Consumer Products: Central Air Conditioners and Heat Pumps Energy Conservation Standards.

(ii) Heat pumps must be certified to comply with all requirements of the ARI Standard 210/240-89, Unitary Air Conditioning and Air-Source Heat Pump Equipment. Electric motor-driven vapor compression heat pumps with

supplemental electrical resistance heat must be sized to provide by compression at least 60 percent of the calculated annual heating requirements for the manufactured home being served. A control must be provided and set to prevent operation of supplemental electrical resistance heat at outdoor temperatures above 40 °F (4 °C), except for defrost conditions. Electric motor-driven vapor compression heat pumps with supplemental electric resistance heat conforming to ARI Standard 210/240-89, Unitary Air-Conditioning and Air-Source Heat Pump Equipment, must have Heating Season Performance Factor (HSPF) efficiencies not less than as specified in the 10 CFR Part 430, Energy Conservation Program for Consumer Products: Central Air Conditioners and Heat Pumps Energy Conservation Standards.

\* \* \* \* \*

■ 34. In § 3280.715, revise paragraphs (a)(1) introductory text, (a)(5)(ii), (a)(7), and (d) to read as follows:

**§ 3280.715 Circulating air systems.**

(a) \* \* \*

(1) Supply air ducts, fittings, and any dampers contained therein must be made of galvanized steel, tin-plated steel, or aluminum, or must be listed as Class 0 or Class 1 air ducts and air connectors in accordance with UL 181-2003, Factory-Made Air Ducts and Air Connectors (incorporated by reference, see § 3280.4). Class 1 air ducts and air connectors must be located at least 3 feet from the furnace bonnet or plenum. Air connectors must not be used for exterior manufactured home duct connection. A duct system integral with the structure must be of durable construction that can be demonstrated to be equally resistant to fire and deterioration as required by this section. Furnace supply plenums must be constructed of metal that extends a minimum of 3 feet from the heat exchanger measured along the centerline of airflow. Ducts constructed from sheet metal must be in accordance with the following table:

\* \* \* \* \*

(5) \* \* \*

(ii) The manufacturer must provide installation instructions for supporting,

mechanically fastening, sealing, and insulating each crossover duct. The instructions must indicate that no portion of the crossover duct is to be in contact with the ground, and must describe the means to support the duct without compressing the insulation and restricting airflow.

\* \* \* \* \*

(7) Unless installed in a basement, supply and return ducts, fittings, and crossover duct plenums exposed directly to outside air, such as those under-chassis crossover ducts or ducts connecting external heating, cooling, or combination heating/cooling appliances, must be insulated with material having a minimum thermal resistance of R-8 in all Thermal Zones. All such insulating materials must have a continuous vapor barrier retarder having a perm rating of not more than 1 perm. Where ducts are exposed underneath the manufactured home, they must comply with paragraph (a)(5)(ii) of this section, and shall be listed for exterior use.

\* \* \* \* \*

(d) *Supports and protection.* Ducts must be securely supported. Nails or other fasteners must not be driven or penetrate through duct walls. Where vertical ducts are installed within closets or rooms, they must be enclosed with materials equivalent to those used in the closet or room construction.

\* \* \* \* \*

■ 36. In § 3280.802, revise paragraphs (a)(37) and (39) to read as follows:

**§ 3280.802 Definitions.**

(a) \* \* \*

(37) *Receptacle* means a contact device installed at the outlet for the connection of an attachment plug. A single receptacle is a single contact device with no other contact device on the same yoke. A multiple receptacle is a device with two or more contact devices on the same yoke.

\* \* \* \* \*

(39) *Utilization equipment* means equipment that utilizes electric energy for electronic, electromechanical, chemical, heating, lighting, or similar purposes.

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