**REPI-84-21**

**IECC®: R403.3.5, R403.3.6**

**Proponents:**

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**2021 International Energy Conservation Code**

**Revise as follows:**

**Definition**

**DUCT SYSTEM.** A continuous passageway for the transmission of air that, in addition to supply and return ducts, includes air handlers, duct fittings boots and elbows, dampers, plenums, filter boxes, ~~fans~~ and accessory air-handling equipment and appliances.

**R403.3.5 Duct testing.**

Duct~~s~~ systems shall be pressure tested in accordance with ANSI/RESNET/ICC 380 or ASTM E1554 to determine air leakage by one of the following methods:

1. Rough-in test: Total leakage shall be measured with a pressure differential of 0.1 inch w.g. (25 Pa) across the system, including the manufacturer’s air handler enclosure if installed at the time of the test. ~~Registers shall be taped or otherwise sealed during the~~ ~~All portions of the duct system, including air handler, filter box, supply and return boots, shall be tested.~~
2. Postconstruction test: Total leakage shall be measured with a pressure differential of 0.1 inch w.g. (25 Pa) across the entire system, including the manufacturer’s air handler enclosure. ~~Registers shall be taped or otherwise sealed during the test.~~ ~~All portions of the duct system, including air handler, filter box, supply and return boots, shall be tested.~~

A written report of the results of the test shall be signed by the party conducting the test and provided to the code official.

**Exception:** A duct system air-leakage test shall not be required for duct~~s~~ systems serving ventilation systems that are not integrated with duct~~s~~ systems serving heating or cooling systems.

**R403.3.6 Duct leakage.**

The total leakage of the duct~~s~~ systems, where measured in accordance with Section R403.3.5, shall be as follows:

Rough-in test: The total leakage shall be less than or equal to 4.0 cubic feet per minute (113.3 L/min) per 100 square feet (9.29 m2) of conditioned floor area where the air handler is installed at the time of the test. ~~Where the air handler is not installed at the time of the test, the total leakage shall be less than or equal to 3.0 cubic feet per minute (85 L/min) per 100 square feet (9.29 m2) of conditioned floor area.~~

**Exceptions:**

1. Where the air handler is not installed at the time of the test, the total leakage shall be less than or equal to 3.0 cubic feet per minute (85 L/min) per 100 square feet (9.29 m2) of conditioned floor area.
2. ~~If~~ Where the HVAC duct system is serving less than or equal to ~~1,200~~ 1,000 square feet of conditioned floor area, the allowable duct leakage shall be ~~50~~ 40 cubic feet per minute or less.

Postconstruction test: Total leakage shall be less than or equal to 4.0 cubic feet per minute (113.3 L/min) per 100 square feet (9.29 m2) of conditioned floor area.

**Exception:** ~~If~~ Where the HVAC duct system is serving less than or equal to ~~1,200~~ 1,000 square feet of conditioned floor area, the allowable duct leakage shall be ~~50~~ 40 cubic feet per minute or less.

~~Test for ducts within thermal envelope: Where all ducts and air handlers are located entirely within the building thermal envelope, total leakage shall be less than or equal to 8.0 cubic feet per minute (226.6 L/min) per 100 square feet (9.29 m2) of conditioned floor area.~~

**Reason Statement:**

The Modifications made in blue above were made from input from the HVAC duct testing working group chaired by David Bixby and Gary Klein and the HVACR subcommittee during 1st reading of the proposal.

This code change proposal begins by defining a duct leakage test of the entire system, including the duct, the air handler, filter box and supply and return boots. The entire system is what is tested and what needs to pass the requirements of the IECC. This is important to make clear as we are seeing significant leakage at duct boots for example, that many feel are exempt as they are not specifically called out. In addition, although manufacturers are supposed to be delivering tight air handler boxes the reality that they either are not or when they are installed, they continue to leak. Testing the entirety of the HVAC system as installed leads to better efficiency and performance.

An allowance to have ducts that leak as much as 8 CFM per 100 sqft of conditioned floor area has been removed by this proposal as this allowance does not take into consideration the inefficiencies that arise from ductwork that leaks within the building thermal envelope. First, since the code does not require a duct leakage to outside test it is unable to quantify how much of the leakage that is supposed to be leaking inside the envelope is actually leaking outside. Second, duct leakage as high as 8 CFM means that rooms with specific design flows are not being heated or cooled to the design parameters. This causes the occupant to adjust the thermostat to try to compensate for comfort issues associated with duct leakage. This causes more leakage and potential increased stratification of temperature in the home, building durability and potential safety problems in the house. Sticking with efficiency of the system, the

thermostat adjustment leads to short cycling as the system that was design to specific set point temperatures tries to achieve arbitrary set points. A consistent duct leakage allowance requirement of 4CFM across the board regardless of duct location simplifies things for

contractors and ensure better performance of ducts locating both inside and outside the building.

The duct leakage section of the proposal restructures the requirement with exceptions, one of which is currently awkwardly in the body of the code and one of which is being proposed. For duct work servicing small square footages, it become unreasonable to require the duct to be tighter than 50 CFM. At 1200 sqft the 4 CFM duct leakage target would be 48 CFM, so this appeared to be the perfect starting point for this exception.

**Cost Impact:**

The code change proposal will increase the cost of construction. This proposal may increase cost in jurisdiction that have not concentrated on total system duct leakage and that have allowed ducts to leak more if they are within the building envelope. The increased cost comes down quickly as installers better understand installation techniques that ensure tighter systems and are also mitigated by better system performance, efficiency, and fewer call backs.