

Duct Leakage Requirements of the ECCCNYS-2020 (R403.3)

The ECCCNYS-2020 (Energy Code) contains very critical requirements for the air sealing of HVAC distribution ducts in low-rise (3 stories or less) Residential Construction. These requirements are covered in Section R403.2 of the Energy Code, and are replicated for easy reference below.

R403.2 Ducts. Ducts and air handlers shall be in accordance with Sections R403.2.1 through R403.2.3.

First, all ducts located outside the building envelope must be insulated to the following R-values:

- **R403.3.2 Insulation (Prescriptive).** Supply and Return ducts in attics shall be insulated to a minimum of R-8. All other ducts shall be insulated to a minimum of R-6.

Exception: Ducts or portions thereof located completely inside the *building thermal envelope*.

Perhaps MORE importantly, all ducts, whether inside or outside the building envelope, must be sealed to prevent conditioned air from leaking from them. This duct leakage can cause many problems in homes, including losses in energy efficiency, movement of air through spaces not intended for that air movement, and adverse impacts on building pressurization, potentially leading to gas appliance back drafting, structural, rot and mold, and other indoor air quality issues.

- **R403.3.2 Sealing (Mandatory).** Ducts, air handlers, and filter boxes shall be sealed. Joints and seams shall comply with either the *International Mechanical Code* or *International Residential Code*, as applicable.

Exceptions:

1. Air-impermeable spray foam products shall be permitted to be applied without additional joint seals.
2. Where a duct connection is made that is partially inaccessible, three screws or rivets shall be equally spaced on the exposed portion of the joint so as to prevent a hinge effect.
3. Continuously welded and locking-type longitudinal joints and seams in ducts operating at static pressures less than 2 inches of water column (500 Pa) pressure classification shall not require additional closure systems.



Any duct systems located totally or partially outside the conditioned space, such as supplies or returns in attics or crawlspaces, behind knee walls, or other unconditioned spaces, **MUST** be tested.

Duct tightness shall be verified by either of the following:

1. Rough-in test: Total leakage shall be less than or equal to 4 cfm (113.3 L/min) per 100 square feet (9.29 m²) of conditioned floor area when tested at a pressure differential of 0.1 inches w.g. (25 Pa) across the system, including the manufacturer's air handler enclosure. All registers shall be taped or otherwise sealed during the test. If the air handler is not installed at the time of the test, total leakage shall be less than or equal to 3cfm (85 L/min) per 100 square feet (9.29 m²) of conditioned floor area.

2. Post construction test: Total leakage shall be less than or equal to 4 cfm (113.3 L/min) per 100 square feet (9.29 m²) of conditioned floor area when tested at a pressure differential of 0.1 inches w.g. (25 Pa) across the entire system, including the manufacturer's air handler enclosure. All register boots shall be taped or otherwise sealed during the test.

Exception: The total leakage test is not required for ducts and air handlers located entirely within the building thermal envelope.

R403.2.2.1 Sealed air handler. Air handlers shall have a manufacturer's designation for an air leakage of no more than 2 percent of the design air flow rate when tested in accordance with ASHRAE 193.

The diagram is divided into two horizontal sections: 'BEFORE' (top) and 'IMPROVED' (bottom). Each section shows a cross-section of a three-story house with a basement, illustrating the air duct system. In the 'BEFORE' section, red arrows indicate air leakage from the ducts into the attic (A), through registers and grills (B), at the furnace and filter slot (C), and through kinks in flexible ductwork (D). In the 'IMPROVED' section, the ductwork is shown with various improvements: properly sealed ducts (E), registers and grills tightly sealed to ducts (F), a sealed furnace and filter slot (G), well-insulated ducts in unfinished areas (H), and straightened flexible ducts with improved airflow (I). The 'COMMON DUCT PROBLEMS AND SOLUTIONS' text is positioned to the right of each section.

COMMON DUCT PROBLEMS AND SOLUTIONS

PROBLEMS:

- A. Leaky, torn, and disconnected ducts
- B. Poorly sealed registers and grills
- C. Leaks at furnace and filter slot
- D. Kinks in flexible ductwork restricting airflow

SOLUTIONS:

- E. Properly sealed ducts
- F. Registers and grills tightly sealed to ducts
- G. Sealed furnace and filter slot
- H. Well-insulated ducts in unfinished areas
- I. Straightened flexible ducts with improved airflow