Michigan Energy Code Compliance Aid:
Commercial Blower Door Testing for Air Barrier Verification

This compliance aid summarizes key air barrier verification requirements of the 2015 Michigan Energy Code (MEC) based on ASHRAE 90.1-2013. It also compares them to the requirements found in the 2021 IECC and ASHRAE 90.1-2019, two documents on which the next iteration of the MEC may be based. It is intended to help readers understand and meet the current code requirements; and to help forward-thinking readers reduce energy costs by voluntarily adopting forthcoming construction standards in advance of their being required by code.

This compliance aid does not explain the MEC in its entirety. Readers are referred to the current MEC and foundational documents for complete details.

Minimizing Air Leakage: Air Barrier Materials, Design, Installation, and Testing

2015 MEC/ASHRAE 90.1-2013 and 90.1-2019 §5.4.3.1 - 5.4.3.2 and 2021 IECC §C402.5.4

The Michigan Energy Code (MEC) requires a continuous air barrier to ensure that new building envelopes are designed and constructed to reduce operating energy use. According to the Air Barrier Association of America, an air barrier is "a system of assemblies within the building envelope that are designed, installed, and integrated in such a way as to restrict the uncontrolled flow of air into and out of the building enclosure." The air barrier includes materials, components, assemblies, and the joints and intersections between them. It also includes penetrations for piping, conduit, venting, and other purposes. When penetrations and intersections are not properly sealed, they can act as points for the unintended exchange of air and moisture, or entry points for particulates and pests.

For commercial buildings, the 2015 MEC provides leakage criteria for air barrier components and requires measures such as the use of vestibules under certain circumstances and weather seals on loading dock doors. However, it does not require envelope testing. Instead, it is assumed that when the air barrier is designed and constructed in accordance with MEC criteria, an acceptable overall air leakage rate will be achieved.

Envelope Air Tightness Testing

2015 MEC/ASHRAE 90.1-2013 and ASHRAE 90.1-2019 §5.4.3.1 - §5.4.3.2 and 2021 IECC §C402.5.4

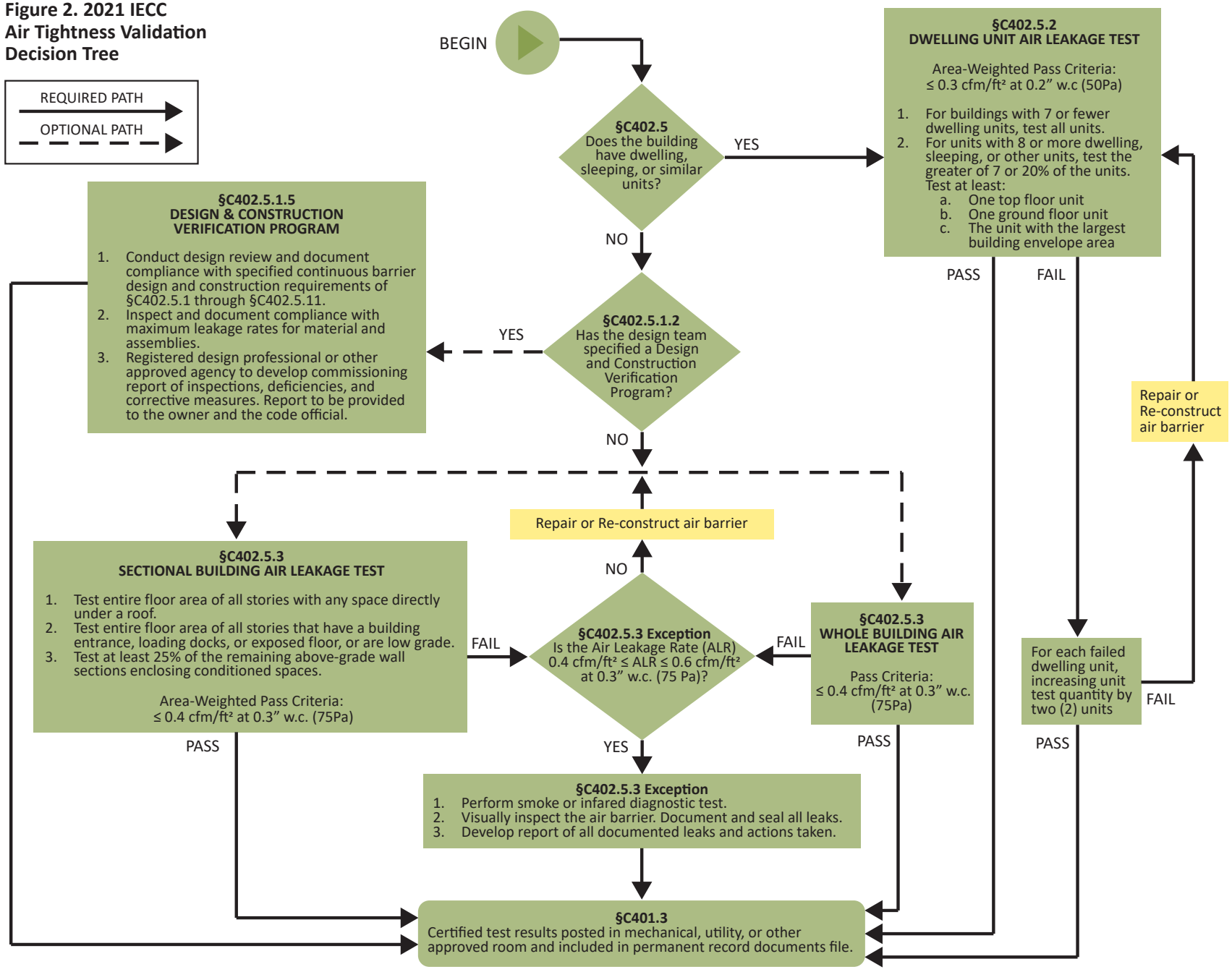
Although the 2015 MEC does not require air tightness testing for commercial buildings, the next iteration of the MEC may. Both ASHRAE 90.1-2019 and the 2021 IECC require that a field quality assurance method be used to ensure air barrier continuity in new buildings, additions, and alterations with new envelope assemblies. In Michigan, the 2021 IECC requires testing for all residential and institutional buildings. For other occupancy groups, a verification program may be used in lieu of testing. ASHRAE 90.1-2019 offers the option of testing or using a verification program for all occupancy groups. Knowing which approach to take—testing or verification program—can involve a series of interrelated decisions as shown in Figures 2 and 3.

Air leakage testing for commercial buildings is done in accordance with one of four standard test methods, depending on which is most appropriate for the project. RESNET 380 is typically used for multi-family buildings and ASTM E-1827 is typically used for small, single-zone buildings. ASTM E-779 offers test procedures that can be used for larger buildings using blower doors or where blower doors are not practical. ASTM E-3158 is specifically for large multi-zoned buildings.

When blower doors are used, the commercial test protocol is very similar to the residential protocol. One difference is the number of fans and blower doors. Most residential buildings can be tested with a single fan in a single door, whereas commercial buildings will likely use more than one fan and may also require more than one blower door. When multiple fans and/or doors are used, it is important to ensure all fans operate at the same speed so that they do not "fight" each other. Additionally, each blower door may require separate circuiting to avoid overloading the building's electrical system and tripping breakers.

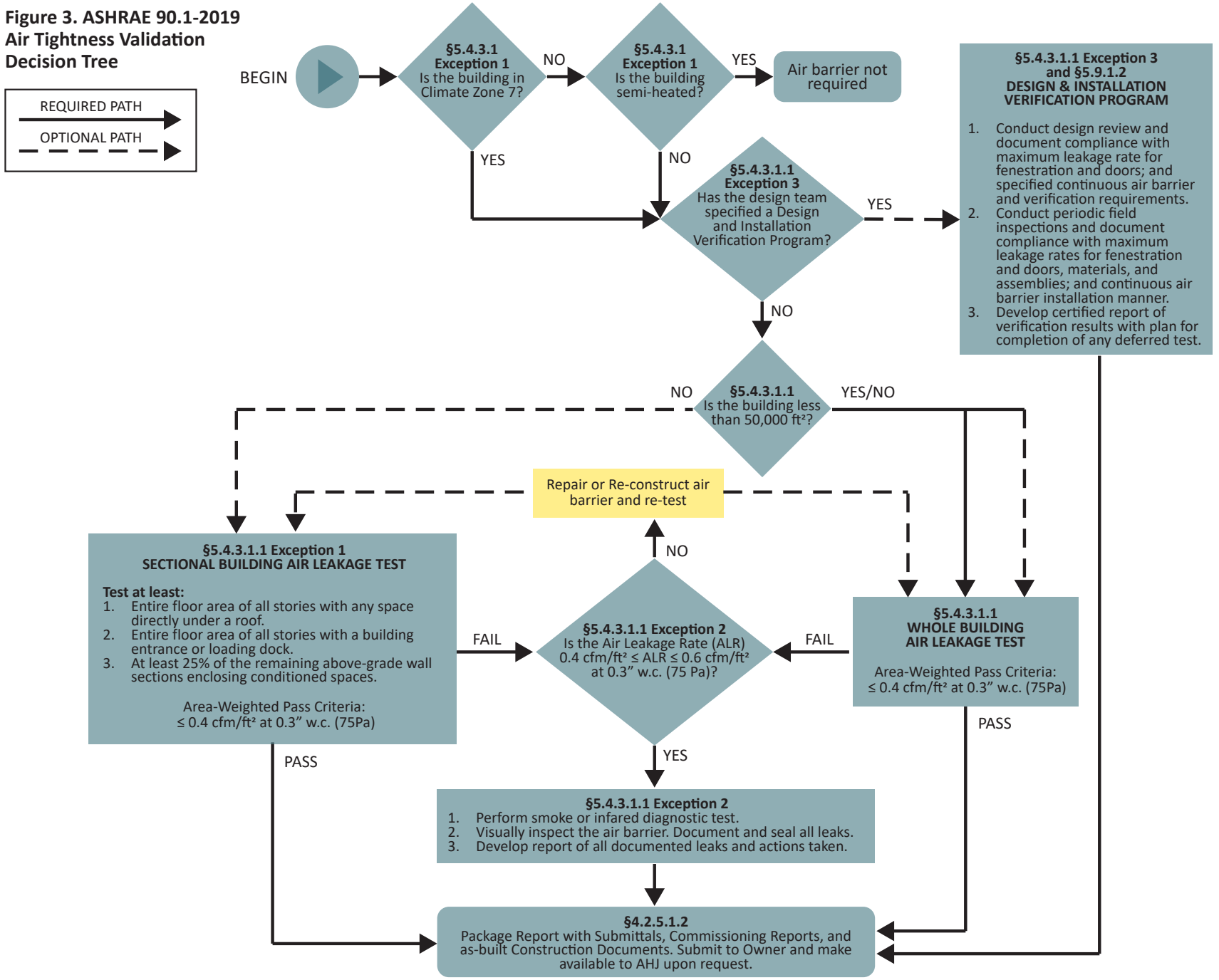
Figure 1. Example of a Commercial Blower Door Set-up

Figure 2. 2021 IECC Air Tightness Validation Decision Tree



Data adapted from the 2021 IECC. Exceptions may apply. See source documents for complete details.

Figure 3. ASHRAE 90.1-2019 Air Tightness Validation Decision Tree



Data adapted from ASHRAE 90.1-2019. Exceptions may apply. See source documents for complete details.

Other key differences are the reporting metrics and test pressures. Residential leakage rates are generally reported in units of building air changes per hour measured at 0.2" w.c. (50 Pa), while commercial building leakage rates are typically reported in units of cfm per square foot of conditioned floor area measured at 0.3" w.c. (75 Pa).

Allowable Leakage Rates

ASHRAE 90.1-2019 §5.4.3.1.1 and 2021 IECC §C402.5.2 and C402.5.3

Table 1. Maximum Allowable Commercial Building Envelope Leakage Rates

2015 MEC	ASHRAE 90.1-2019*	2021 IECC*	
		Dwelling/Sleeping Units	All Other
No Requirement for the envelope as a whole, but maximum allowable rates are specified for envelope components and assemblies	0.4 cfm/ft² at 0.3" w.c. (75 Pa) **OR** 0.6 cfm/ft² at 0.3" w.c. (75 Pa) with smoke or IR test and report of actions taken to seal leaks	0.3 cfm/ft² at 0.2" w.c. (50 Pa)	0.4 cfm/ft² at 0.3" w.c. (75 Pa) **OR** 0.6 cfm/ft² at 0.3" w.c. (75 Pa) with smoke or IR test and report of actions taken to seal leaks

Data adapted from the 2015 MEC, 2021 IECC, and ASHRAE 90.1-2019. Exceptions may apply. See source documents for complete details.
*Maximum allowable rates are also specified for individual commercial components and assemblies.

In general, the maximum allowable leakage rate is 0.4 cfm/ft² at 75 Pa. When test results are higher than this, leaks must be located and corrected. Locating leaks is easily done with an infrared thermal scan in conjunction with building pressurization or depressurization, using one of the ASTM E-1186 standard methods. Thermal scanning works best when there is a least a 7.5°F differential in indoor and outdoor air temperatures. After the identified leaks have been corrected, if a leakage rate of no more than 0.6 cfm/ft² at 75 Pa is achieved, the envelope is deemed to be in compliance.

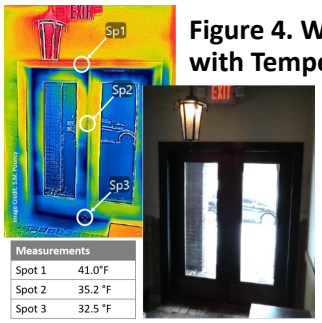


Figure 4. Winter Air Infiltration with Temperature Differential

Documentation Requirements

ASHRAE 90.1-2019 §5.2.5.2 and 2021 IECC §C401.3 and C402.5.1.5

To confirm compliance, documentation must be provided to the code official and the owner. The 2021 IECC and ASHRAE 90.1-2019 have similar documentation requirements, with some minor differences, as shown below.

Table 2. Documentation Requirements

Required Documents	ASHRAE 90.1-2019	2021 IECC
Final Commissioning Report by the registered design professional or approved agency	Within 90 days of acceptance. Must comply with ASHRAE Std. 202	Within 90 days of Certificate of Occupancy
Statement of compliance with test results	Yes	Must be posted in mechanical room
Deficiencies found during construction documents reviews and corrective actions taken	Yes	Yes
Deficiencies found during field inspections and corrective actions taken	Yes	Yes
Commissioning Plan, including climate conditions, for completing any deferred testing	Yes	Yes

Data adapted from the 2015 MEC, 2021 IECC, and ASHRAE 90.1-2019. Exceptions may apply. See source documents for complete details.

EGLE
MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY

BUILDING VITALS

MEEA
MIDWEST ENERGY EFFICIENCY ALLIANCE

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