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BUILDING
ENCLOSURE
CONFERENCE
2023

Whole Building Airtightness: A 439 Building Study of Performance

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EDUCATION

Whole Building Airtightness:

A 439 Building Study of Performance

- 11 years testing experience
- 9 years enclosure consulting experience
- Loves motorcycles, roller coasters, traveling

Mike Poirier

Vice-President at QED Lab, Inc in Troutdale, Oregon

Certified Level 2 Infrared Thermographer

AAMA Fenestration Master

Certified Level 3 Blower Door Testing Technician

Learning Objectives

1. Identify a baseline performance for airtightness in commercial buildings.
2. Compare test results to ever-changing energy code requirements.
3. Learn common mistakes in design and craftsmanship which cause test failures and significant air leaks.
4. Review conditions proven to perform

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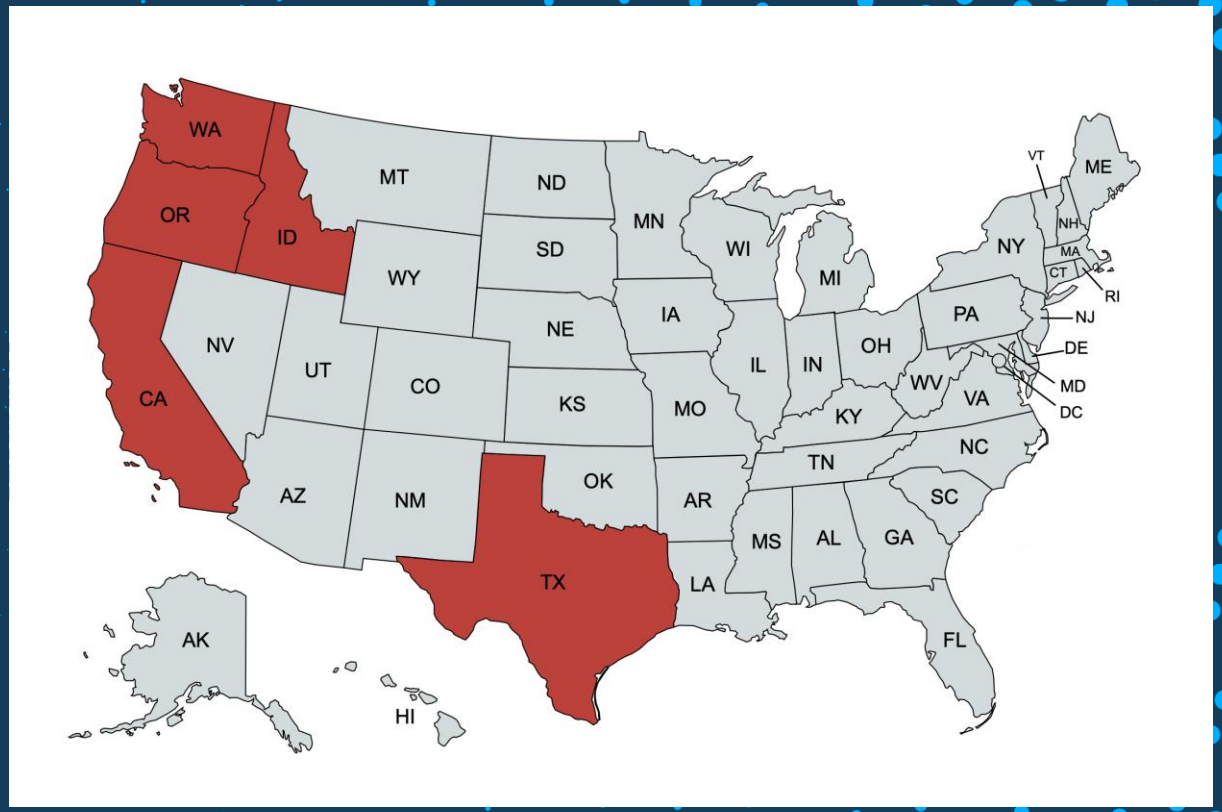
BE BUILDING ENCLOSURE

Whole Building Airtightness:

A ~~439~~ Building Study of Performance

579

- ❑ Includes results from January 2016 – March 2023
- ❑ Commercial buildings only (@75 Pa)
- ❑ Specimens located across 5 states (OR, WA, CA, ID, TX)
- ❑ Testing required by energy code, specification, USACE, or other program



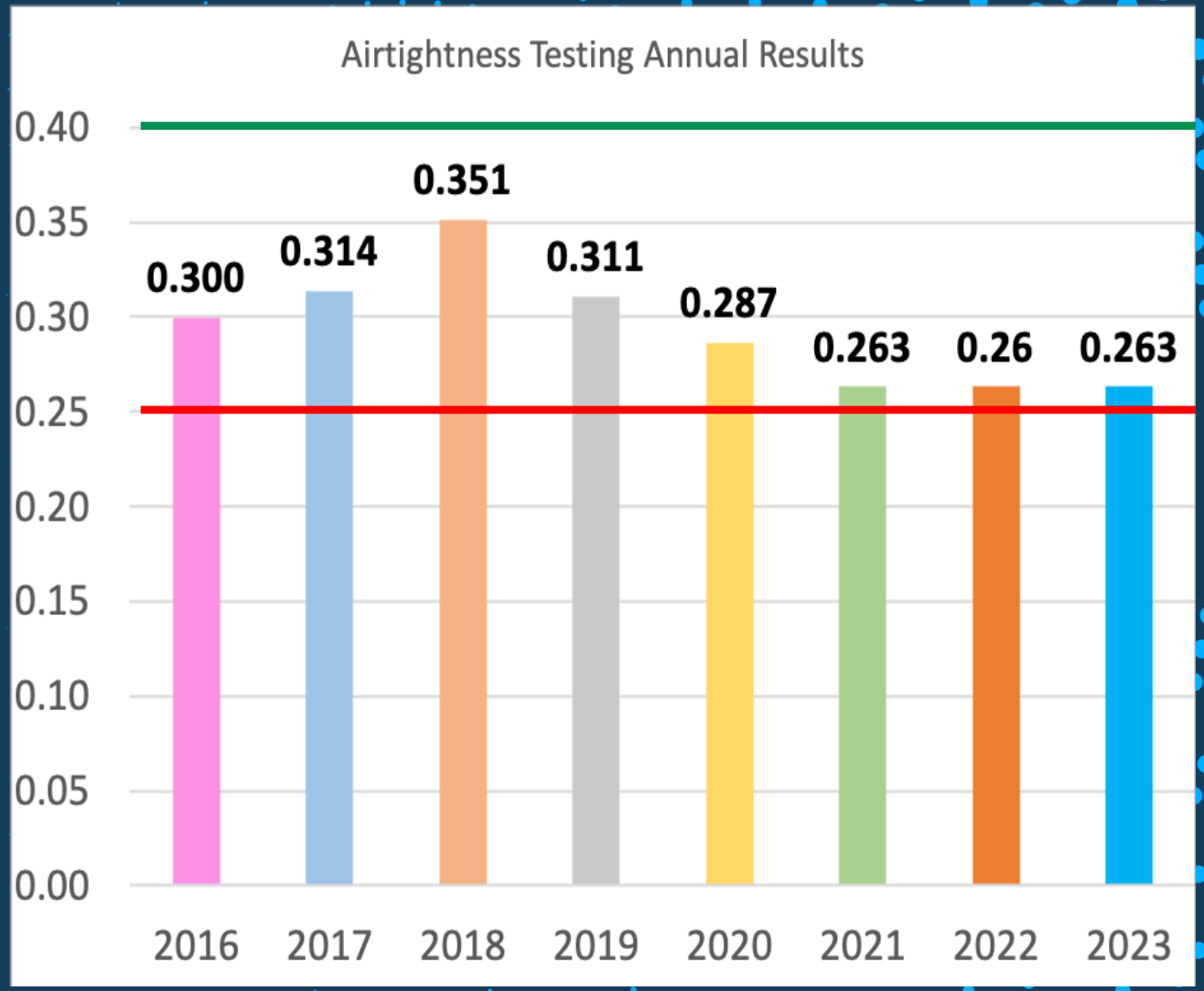
Maximum Leakage @ 75 Pa

Common Code & Specification Maximums

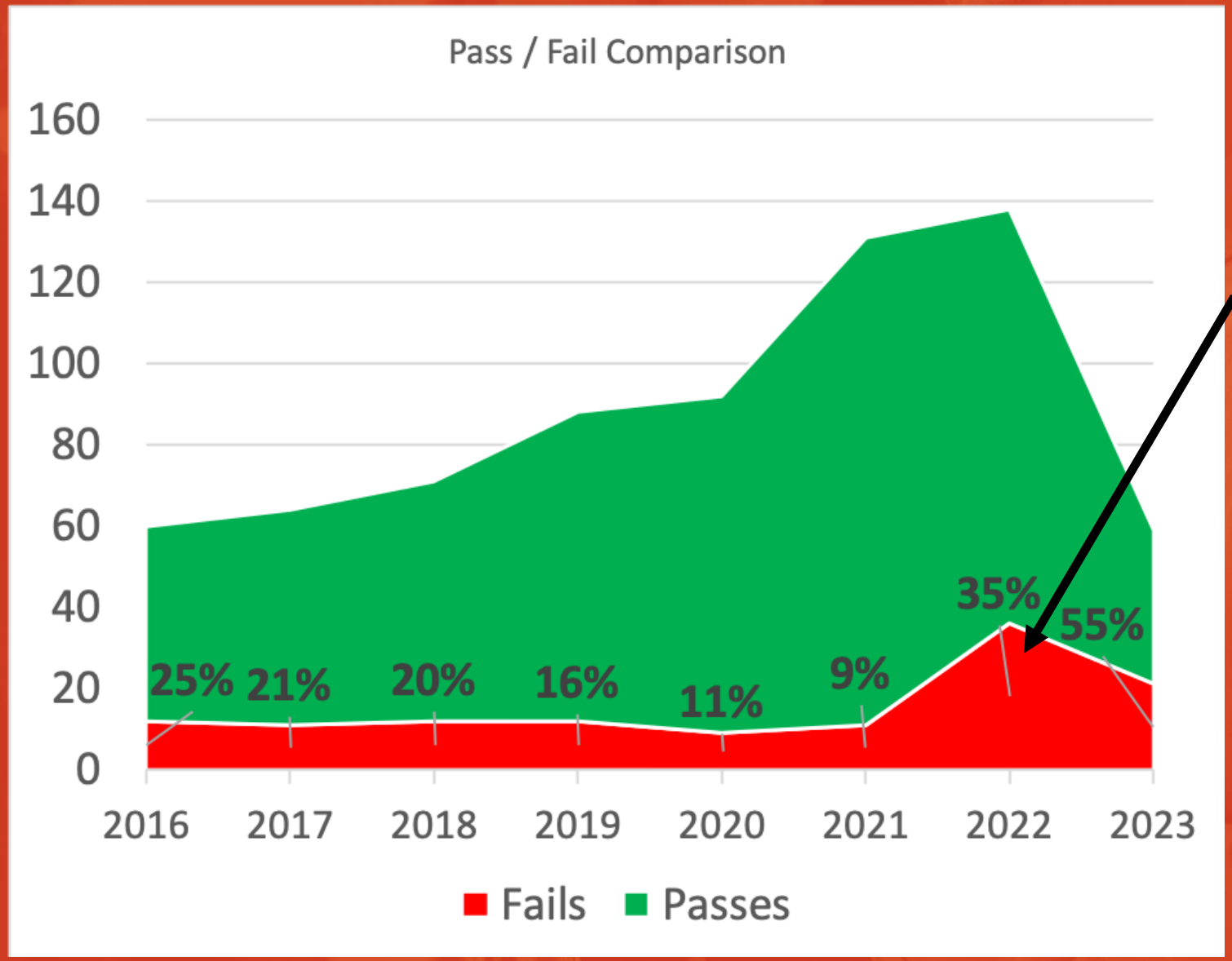
Year	Jurisdiction / Document	Leakage @ 75 Pa
2018	Washington State Energy Code	.25 CFM/SF
2018	City of Seattle, WA Energy Code	.25 CFM/SF
2019	California Building Energy Efficiency Standards	.40 CFM/SF
2019	ASHRAE 90.1	.40 CFM/SF
2020	New York Energy Code	.40 CFM/SF
2019	Oregon Zero Energy Ready Commercial Code	.40 CFM/SF (per ASHRAE 90.1)
2021	City of Austin, TX	.40 CFM/SF (per ASHRAE 90.1)

Actual Building Performance

Year	Best (CFM/SF)	Worst (CFM/SF)	Average	Specimens Tested
2016	.037	.478	.331	48
2017	.073	.518	.294	53
2018	.065	1.05	.328	59
2019	.039	.553	.336	76
2020	.043	.961	.305	83
2021	.074	.569	.284	120
2022	.051	.505	.283	102
2023 (Jan – Mar)	.150	1.31	.366	38



Failure Rates



What happened in 2022 / 2023?

Failure Rates

What happened in 2022 / 2023?

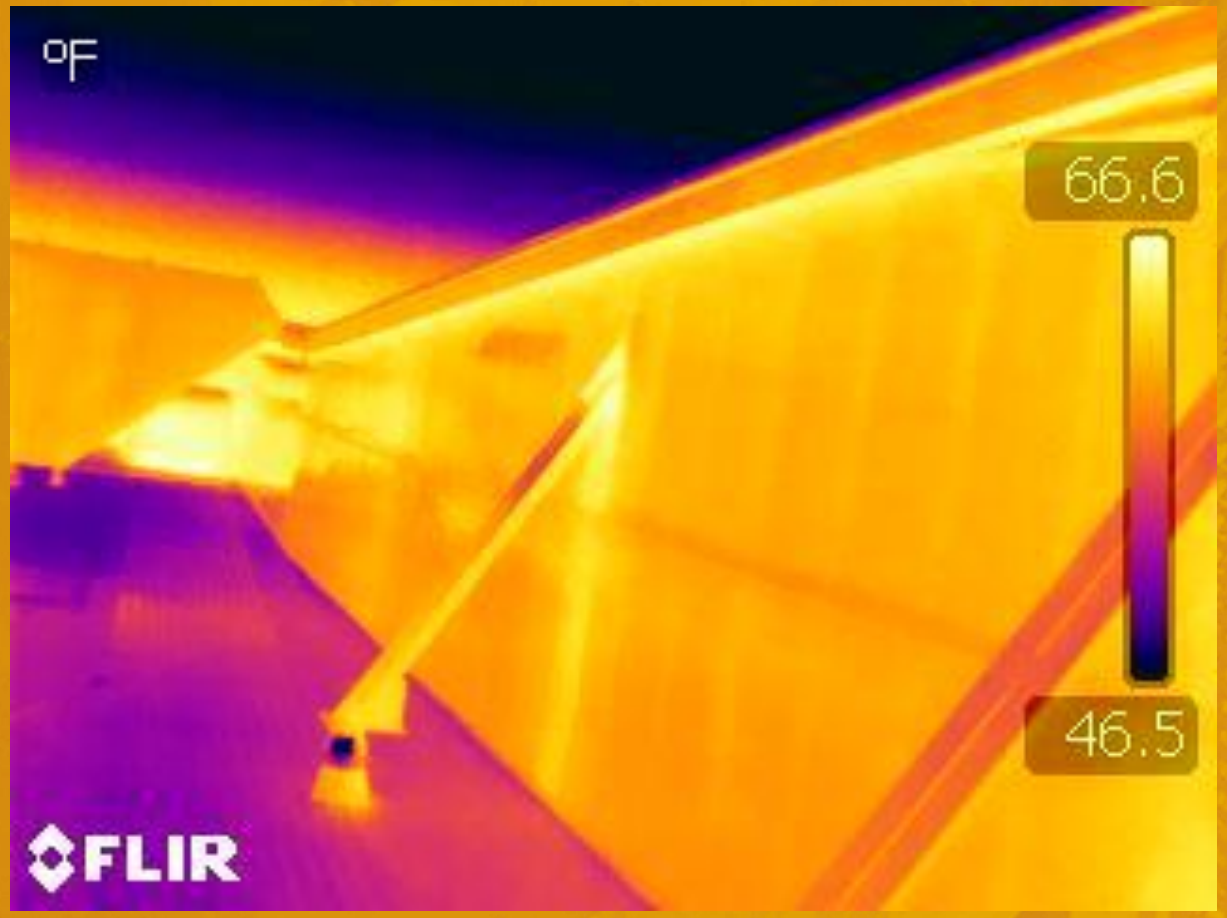
- Supply chain problems
- Product substitutions
- Labor shortages
- Rushed installations
- Code changes

What happened in 2022 / 2023?

- Manufacturing Errors
- Incompleteness

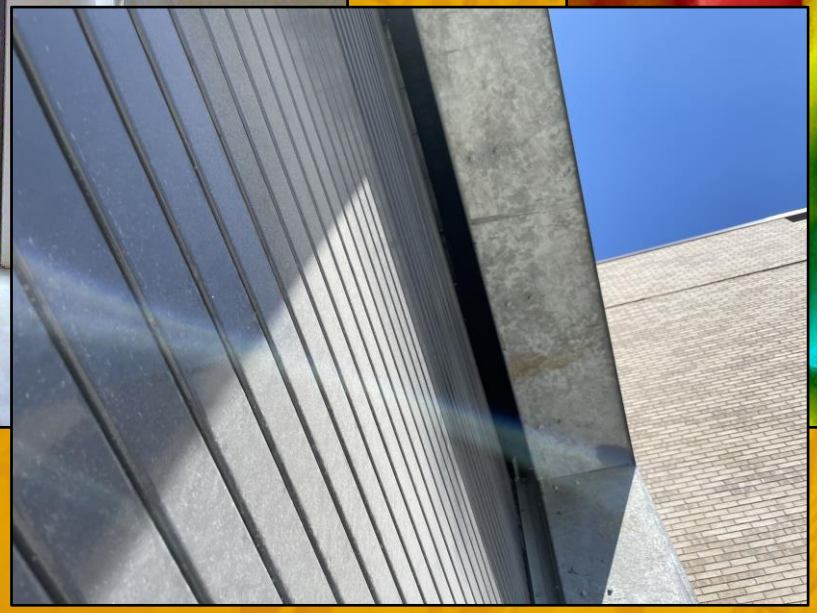
Most Common Air Leakage Sources

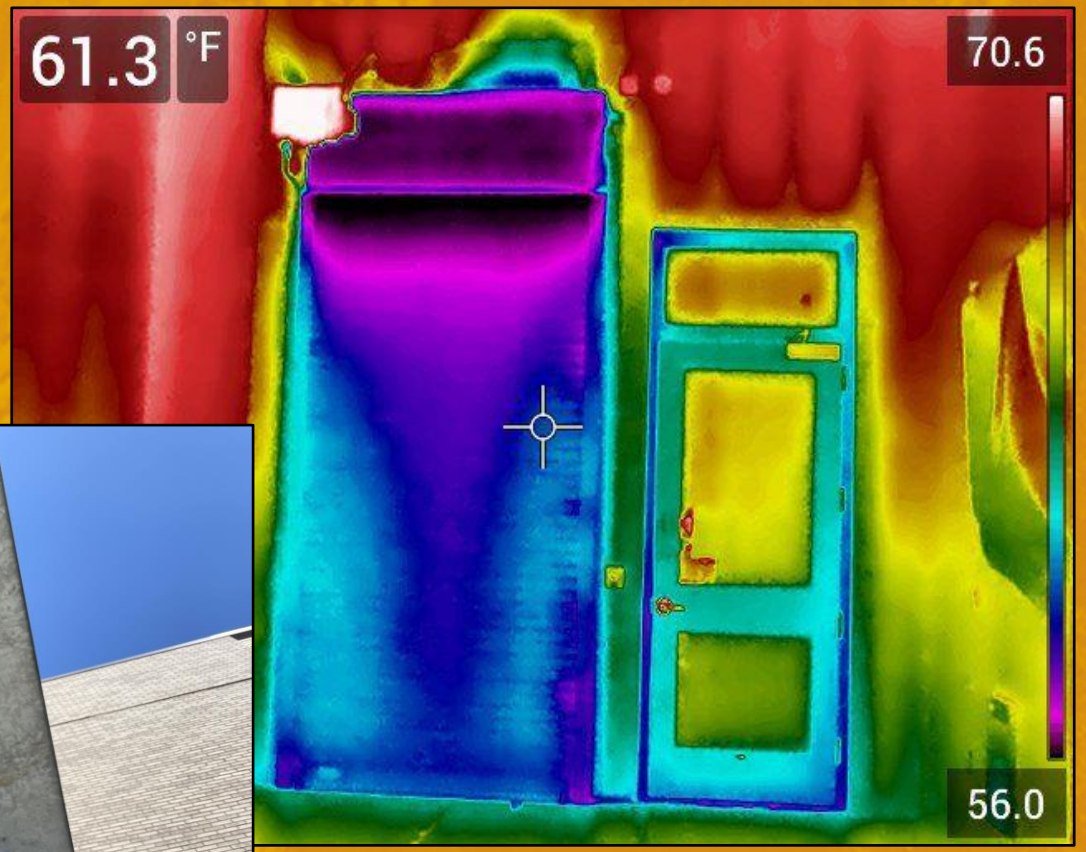
#1 Parapet Details



Most Common Air Leakage Sources

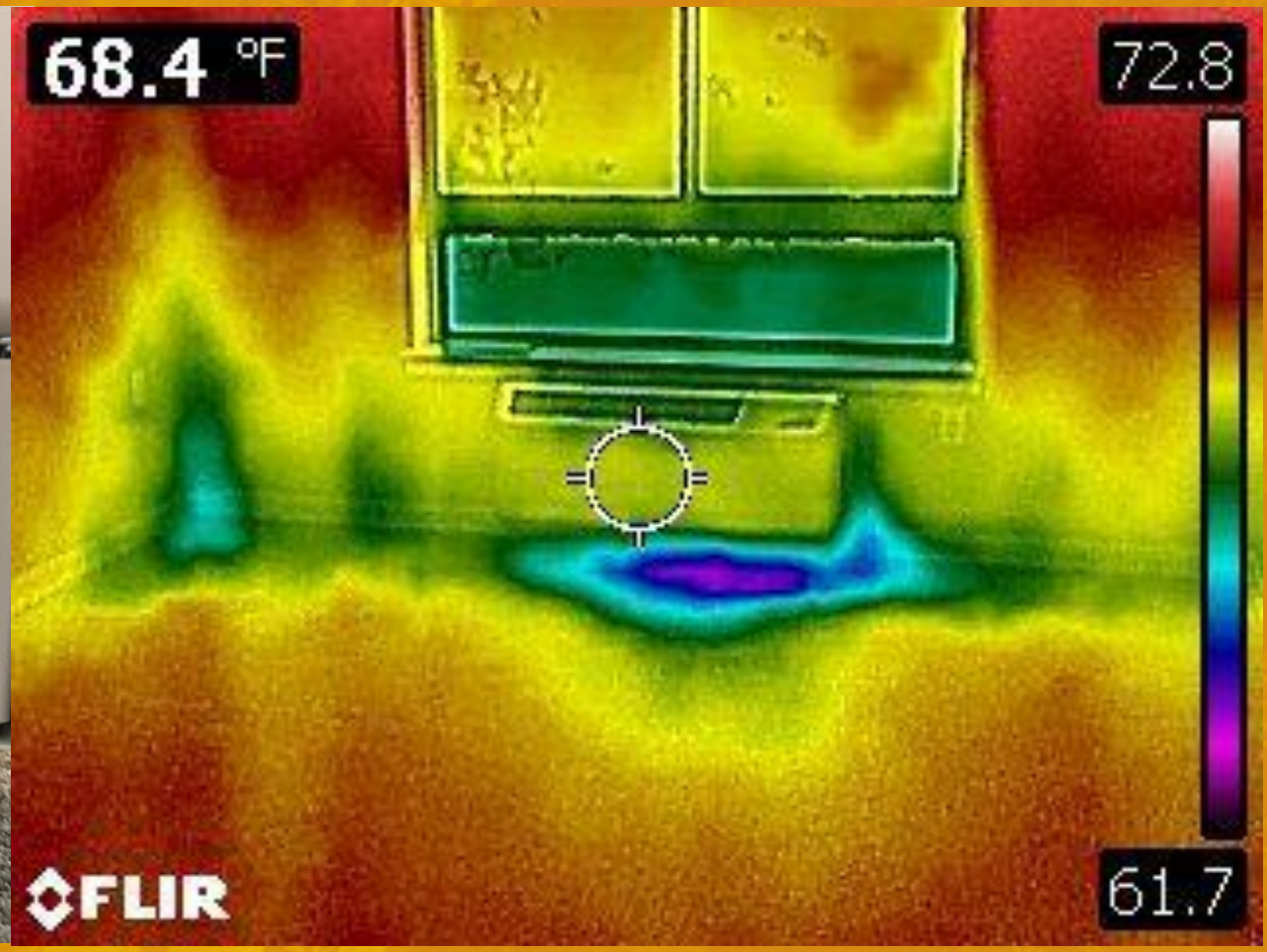
#2 Coiling and Panel Overhead Doors





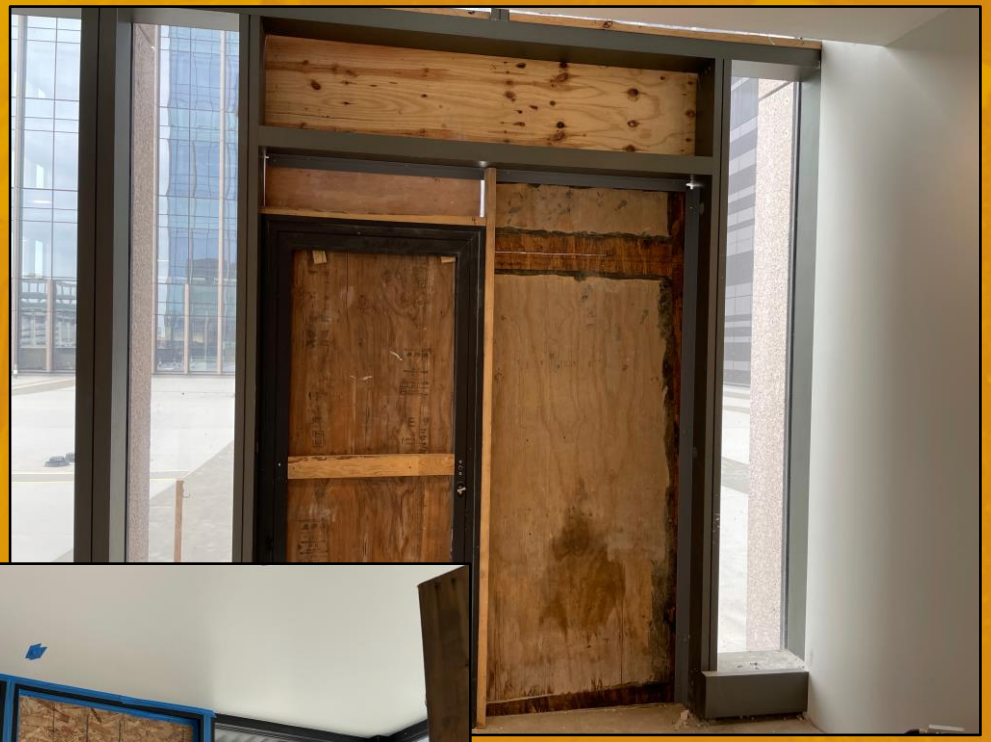
Most Common Air Leakage Sources

#3 PTAC and VTAC Units



Most Common Air Leakage Sources

Incomplete Enclosure



Details Proven to Perform: Wall Systems

- Seal all penetrations prior to cladding installation
- Install air barrier prior to electrical meter mounting
- Seal all seams and transitions

Details Proven to Perform: Parapets & Roofs

- Seal parapet walls to roof and wall air barrier
- Welded seams at TPO roof, cinch bands on pipe penetrations
- Extend roofing up parapet wall for wall air barrier connection

Details Proven to Perform: Windows & Doors

- Extend air barrier from RO to interior
- Seal window to RO air barrier
- Set door thresholds in sealant, or use sill pan with interior back-dam to accept a sealant joint

Review

- Ever-changing energy codes require ever-changing products, details, and installation procedures
- Roughly 20% of commercial buildings result in failed blower door test results
- Be careful with product substitutions and availability
- Avoid standard coiling doors and overhead doors
- Consider common weak details in airtightness design
- Use of Infrared Thermography is a great tool for identifying suspicious air leakage zones
- Make sure your test is performed accurately, which includes appropriate building