

U.S. Department of Energy Codes Conference Tucson, Arizona

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Presentation Outline

- Drivers behind making multifamily homes more energy efficient in Phoenix (Arizona)
- Challenges
= Opportunities



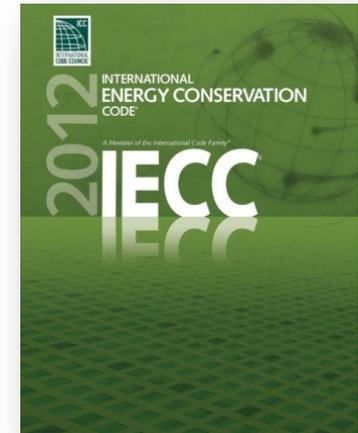
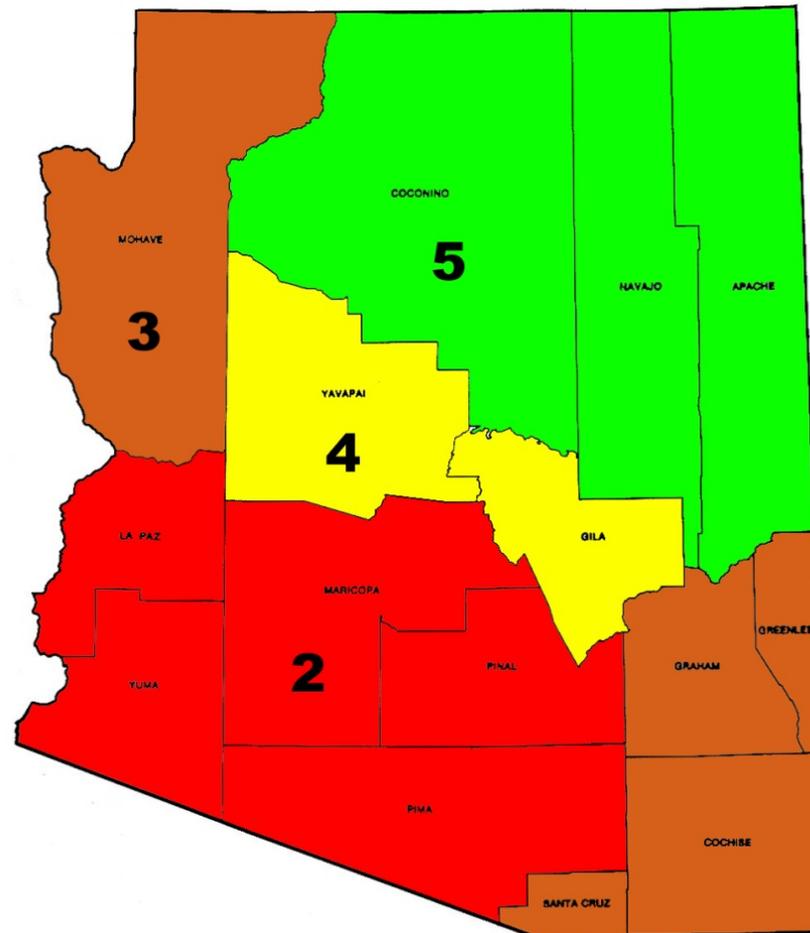
Multifamily Homes Drivers

- IECC 2012
- APS Multifamily Energy Efficiency Program (MEEP)
- LEED for Homes
- Low Income Housing Tax Credits



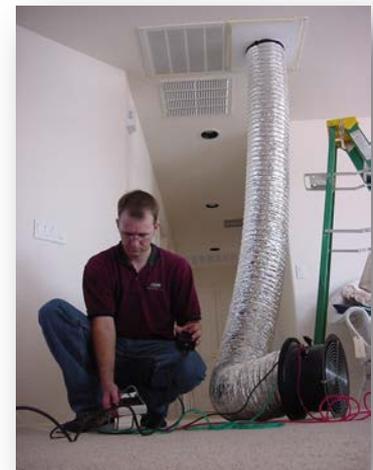
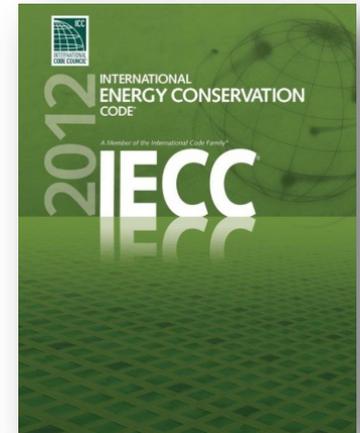
Multifamily Homes Drivers

- IECC 2012



Multifamily Homes Drivers

- IECC 2012
 - R402.4.1.1 – Building Envelope – Thermal and Air Barrier Checklist
 - R402.4.1.2 – Testing – Air leakage rate of building envelope
 - R403.2.2 – Sealing – Duct Tightness
 - Per IRC1507 – Whole-house mechanical ventilation (requirements very similar to ASHRAE 62.2)



Multifamily Homes Drivers

• Municipal Code Adoption Overview

Municipalities who have adopted the Residential IECC 2012

- Avondale
- Buckeye +
- Chandler +
- El Mirage
- Glendale
- Gilbert* +
- Goodyear +
- Marana
- Maricopa County*
- Pima County
- Paradise Valley
- Peoria
- Phoenix +
- Queen Creek +
- Sahuarita
- Scottsdale +
- Surprise +
- Tucson



+ HERS compliance option included

*Compliance with the 2012 IECC is voluntary

Multifamily Homes Drivers

- **MAG Standard Language for IECC 2012**

RI02.1.2 RESNET Testing & Inspection Protocol. The Residential Energy Services Network (RESNET) Mortgage Industry National Home Energy Rating System Standards Protocol for third party testing and inspections, shall be deemed to meet the requirements of sections R402.4.1.1, R402.4.1.2 and R403.2.2. and shall meet the following conditions:

1. Third Party Testing and Inspections shall be completed by RESNET certified Raters or Rating Field Inspectors and shall be subject to RESNET Quality Assurance Field Review procedures.
2. Sampling in accordance with Chapter 6 of the RESNET Standards shall be performed by Raters or Rating Field Inspectors working under a RESNET Accredited Sampling Provider.
3. Third Party Testing is required for the following items:
 - a. R402.4.1.1 – Building Envelope – Thermal and Air Barrier Checklist
 - b. R402.4.1.2 – Testing – Air Leakage Rate
 - c. R403.2.2 – Sealing – Duct Tightness
4. The other requirements identified as “mandatory” in Chapter 4 shall be met.
5. Alternate testing and inspection programs and protocols shall be allowed when approved by the Code Official.

Multifamily Homes Drivers



Multifamily Energy Efficiency Program

Preliminary 2014 New Construction Builder's Option Packages (BOP)

MANDATORY PRESCRIPTIVE PATH CRITERIA

All BOP's must incorporate the requirements in this sections

Minimum HVAC Requirements	Gas Furnace	14 SEER A/C and 80 AFUE		
	Boilers	14 SEER A/C and 80 AFUE		
	Oil Furnace	14 SEER A/C and 80 AFUE		
	Heat Pump	14 SEER A/C and 7.7 HSPF		
Thermostat	ENERGY STAR® qualified programmable thermostat. Setback are 80° for cooling and 59° for heating			
Ductwork	Leakage must be less than or equal to 4 CFM to outdoors per 100sq ft. AND Minimum R-6 insulation on ducts in unconditioned spaces.			
Envelope Infiltration- <small>(The climate zones are based on the 2004 IRC code- Figure N1101.2) ACH at 50 Pa = (CFM50 x 60) / building volume in cubic feet</small>	Climate Zone 1 & 2	5 ACH50		
	3 & 4	5 ACH50		
	5, 6 & 7	4 ACH50		
	8	3 ACH50		
Insulation	Climate Zone	Ceiling R-Value	Wall R-Value	Floor R-Value
	1 & 2	38	19	13
	3	38	19	19
	4 except Marine	32	19	19
	5 and Marine 4	38	23	30
	6	49	23	30
	7 & 8	49	25	30
Windows	Climate Zone	U-Factor	SHGC	
	1 & 2	0.4	0.25	
	3	0.35	0.25	
	4 except Marine	0.32	0.4	
	5 and Marine 4	0.3	Any	
	6	0.3	Any	
Water Heater	Gas	40 gallon tank= .61EF	50 gallon tank= 0.57EF	80 gallon tank= 0.53EF
	Electric	40 gallon tank= .93EF	50 gallon tank= 0.92EF	80 gallon tank= 0.89EF
Lighting and Appliances	Five (5) or more ENERGY STAR® qualified appliances, light fixtures, ceiling fans equipped with light fixtures and/or ventilation fans.			



OPTIONAL PRESCRIPTIVE PATH CRITERIA - In addition to the mandatory requirements above

BOP 1 - requires (One) additional option BOP 2 - requires (Two) additional options BOP 3 - requires (Three) additional options
Incentive Amount | BOP 1 = \$200.00/unit | BOP 2 = \$300.00/unit | BOP 3 = \$400.00/unit | Major Renovation = \$200.00/unit ❶ |

❶ Major renovation projects will adhere to the BOP 1 requirements.

OPTIONS	Hot Climates - Climate Zones 1-3 (based on 2004 IRC)	Mild and Cold Climates - Climate Zones 4-8 (based on 2004 IRC)
OPTION 1: HVAC EQUIPMENT	ENERGY STAR® qualified 15 SEER A/C -OR- Heat Pump (15 SEER /8.2 HSPF)	ENERGY STAR® qualified Gas Furnace (95% AFUE) -OR- ENERGY STAR® qualified Heat Pump -OR- ENERGY STAR® qualified Boiler (85% AFUE) -OR- ENERGY STAR® qualified Oil Furnace (85% AFUE)
OPTION 2: LIGHTING AND/OR WINDOWS	75% ENERGY STAR® Lighting	75% ENERGY STAR® Lighting AND Window U-value 0.30 AND Window SHGC 0.35
OPTION 3: LIGHTING, WINDOWS and/or FAN MOTOR	50% ENERGY STAR® Lighting AND Homes with 1 detached wall less than or equal to 10% WFA Homes with 2 detached wall less than or equal to 12% WFA Homes with 3 detached wall less than or equal to 14% WFA	50% ENERGY STAR® Lighting AND Furnace with 2 stage burner and fan motor with at least 2 speeds AND Homes with 1 detached wall less than or equal to 10% WFA Homes with 2 detached wall less than or equal to 14% WFA
OPTION 4: DUCTWORK	All ducts and air handling equipment must be located in the conditioned space.	All ducts and air handling equipment must be located in the conditioned space.
(1) To determine domestic hot water (DHW) EF requirements for additional tank sizes, use the following equations: Gas DHW EF ≥ 0.69 - (0.002 x Tank Gallon Capacity); Electric DHW EF ≥ 0.97 - (0.001 x Tank Gallon Capacity).	Definitions	
	ACH- Air Changes per Hour AFUE- Annual Fuel Utilization Efficiency CFM- Cubic Feet per Minute EF- Energy Factor EFR- Energy Efficiency Ratio	IRC- International Residential Code HSPF- Heating Seasonal Performance Factor SEER- Seasonal Energy Efficiency Ratio SHGC- Solar Heat Gain Coefficient WFA- Window to Floor Area

Building Option Packages (BOP) - Performance Path

Participants may install any combination of measures as long as the building's performance meets the minimum Home Energy Rating System (HERS) scores listed below when tested by a certified HERS rater.

	Minimum HERS score	Incentive
BOP 1	70	\$200.00
BOP 2	65	\$300.00
BOP 3	60	\$400.00



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APS - MEEP REBATE PROGRAM

RESIDENTIAL ENERGY ANALYSIS (Summary)

Builder/Developer: Smithfield Builders

Project: Sunrise Apartments

Municipality: Glendale, AZ

Date: August 26, 2015

Energy Efficiency Design Features:

2x6 framing w/ R-19 batt insulation + R-4 stucco foam, R-11 batts in shared walls and floors, R-38 batts @ attic floor. 14 SEER Heat Pumps. 0.95 EF electric water heaters. Double-pane, vinyl frame, low-e windows. ENERGY STAR appliances & exhaust fans. 100% CFL lighting. Envelope Leakage: 5.00 ACH50. Duct Leakage: 4% Total/cond. sq ft.

Utilities: APS

Unit Type Option	ENERGY COST		Cond. Square Feet	Occpnts	Orient	Window		Thermal Envelope				HVAC/DHW				Ventilation			HERS	# Units	SVC**	
								AGW	Lid	Window Specs		Furn AFU	DHW		Tonnage		Type*	cyc %				Rate cfm
	R-Val	R-Val				U-Val	SHGC	cap	EF	SEER	S1		S2									
Unit A																						
Slab Floor	\$73.42	\$881.00	783	2	W.C.	84	11%	R-23	R-11	0.34	0.23	N/A	40	.95	14	2	EXF	50%	43	60	38	N
Second Floor	\$70.50	\$846.00	783	2	W.C.	84	11%	R-23	R-11	0.34	0.23	N/A	40	.95	14	2	EXF	50%	43	58	40	N
Top Floor	\$75.83	\$910.00	783	2	W.C.	84	11%	R-23	R-38	0.34	0.23	N/A	40	.95	14	2	EXF	50%	43	66	40	N
Unit B																						
Slab Floor	\$88.17	\$1,058.00	1049	3	W.C.	127	12%	R-23	R-11	0.34	0.23	N/A	50	.95	14	2.5	EXF	50%	62	58	32	N
Second Floor	\$84.00	\$1,008.00	1049	3	W.C.	127	12%	R-23	R-11	0.34	0.23	N/A	50	.95	14	2.5	EXF	50%	62	57	32	N
Top Floor	\$91.00	\$1,092.00	1049	3	W.C.	127	12%	R-23	R-38	0.34	0.23	N/A	50	.95	14	2.5	EXF	50%	62	65	32	N
Unit C																						
Slab Floor	\$101.50	\$1,218.00	1276	4	W.C.	193	15%	R-23	R-11	0.34	0.23	N/A	50	.95	14	3	EXF	100%	40	60	26	N
Second Floor	\$96.83	\$1,162.00	1276	4	W.C.	193	15%	R-23	R-11	0.34	0.23	N/A	50	.95	14	3	EXF	100%	40	59	24	N
Top Floor	\$105.50	\$1,266.00	1276	4	W.C.	193	15%	R-23	R-38	0.34	0.23	N/A	50	.95	14	3	EXF	100%	40	67	8	N
Unit L1																						
Top	\$79.33	\$952.00	726	2	W.C.	165	23%	R-23	R-38	0.34	0.23	N/A	40	.95	14	2.5	EXF	50%	42	66	6	N
Unit L2																						
Top	\$95.58	\$1,147.00	1000	3	W.C.	176	18%	R-23	R-38	0.34	0.23	N/A	50	.95	14	3	EXF	50%	61	65	8	N

HERS Score (Weighted Average)

61

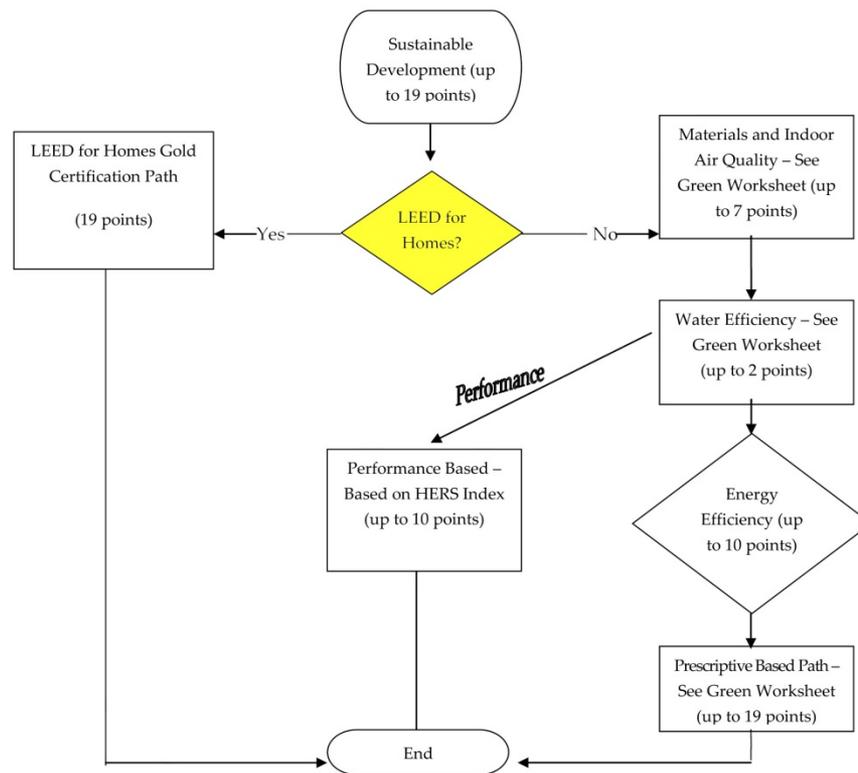
APS MEEP Program
Qualifies: BOP2 (\$300/unit)
286 Units Total

MEEP



Multifamily Homes Drivers

- LEED for Homes
 - Lenders look favorably at LEED certification
 - LEED option in Arizona Low Income Housing Tax Credit application process



Multifamily Homes Drivers

- Low Income Housing Tax Credits (LIHTC)
 - U.S.Treas. Reg. § 1.42-10(b)(4)(ii)(E) specifies the use of an “energy consumption model” for establishing “utility allowances”
 - “Utility allowances shall be based on the energy consumption modeland must be prepared by a qualified professional as described in this paragraph. For purposes of this Section...., a qualified professional is a Certified RESNET Home Energy Rater who is in good standing with the Residential Energy Services Network (RESNET)”
 - For new projects, use HERS estimates for first 12 months
 - For all projects, existing LIHTC and new projects 12 months into operation, actual utility bills are used to establish utility allowances



Multifamily Homes Drivers

- **Low Income Housing Tax Credits (LIHTC)**

Example:

Monthly rent for 1 bedroom unit = \$750

Monthly PHA “utility allowance” for 1 bedroom unit = \$100

Monthly rent collectable by property owner = \$650

- “Public Housing Authority” (PHA) utility allowances are typically high, taking into account older housing stock
- Property owner is incentivized to make properties more energy efficient, both existing and new properties

Example:

Monthly rent for 1 bedroom unit = \$750

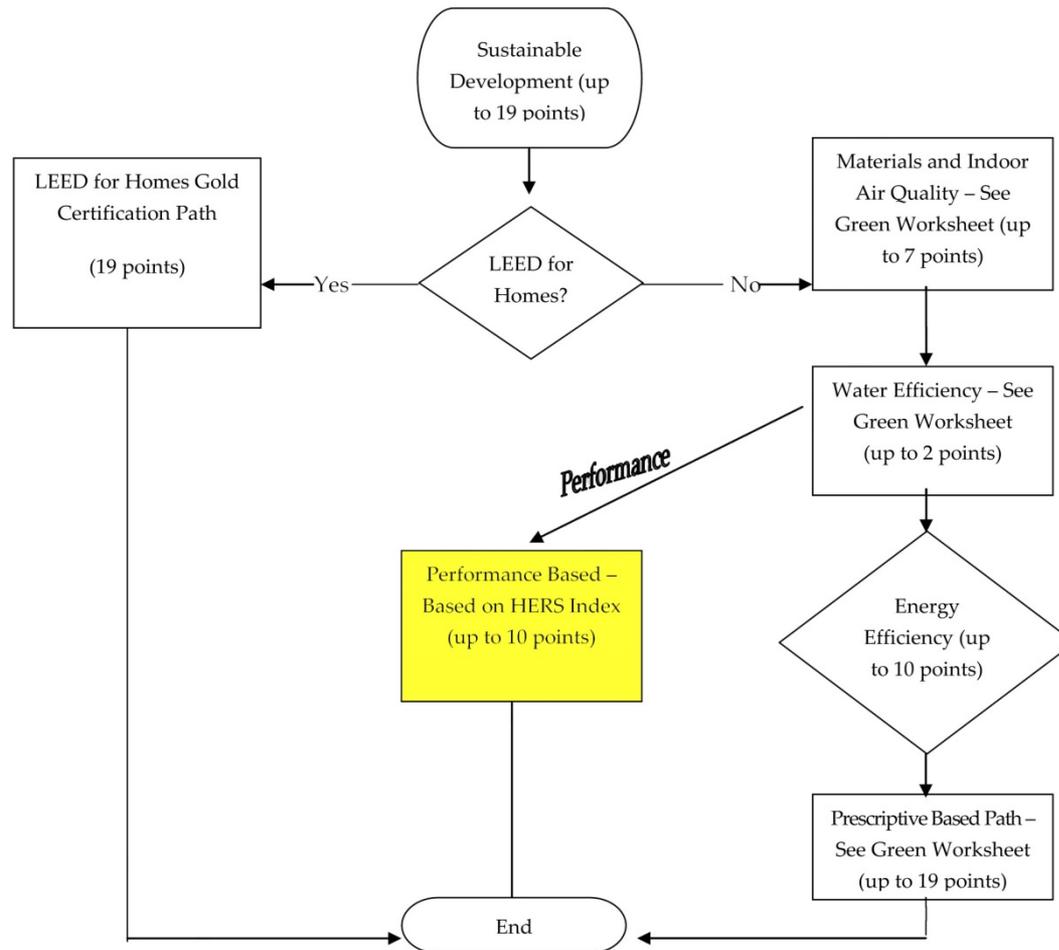
Monthly “utility allowance” for 1 bedroom unit = \$50

Monthly rent collectable by property owner = \$700

100 unit property, 100% 1 bedroom units = $\$50 \times 100 \times 12 \text{ months} = \$60,00$

Multifamily Homes Drivers

- Low Income Housing Tax Credits (LIHTC)



Challenges

- Lack of trained trade contractor base
- Batts vs. blown cellulose vs. foam



Challenges

- Lack of trained trade contractor base
- Batts vs. blown cellulose vs. foam



Challenges

- Lack of trained trade contractor base
- Batts vs. blown cellulose vs. foam



Challenges

- Lack of trained trade contractor base
- Batts vs. blown cellulose vs. foam



Challenges

- Lack of trained trade contractor base
- Batts vs. blown cellulose vs. foam
- Blower door testing

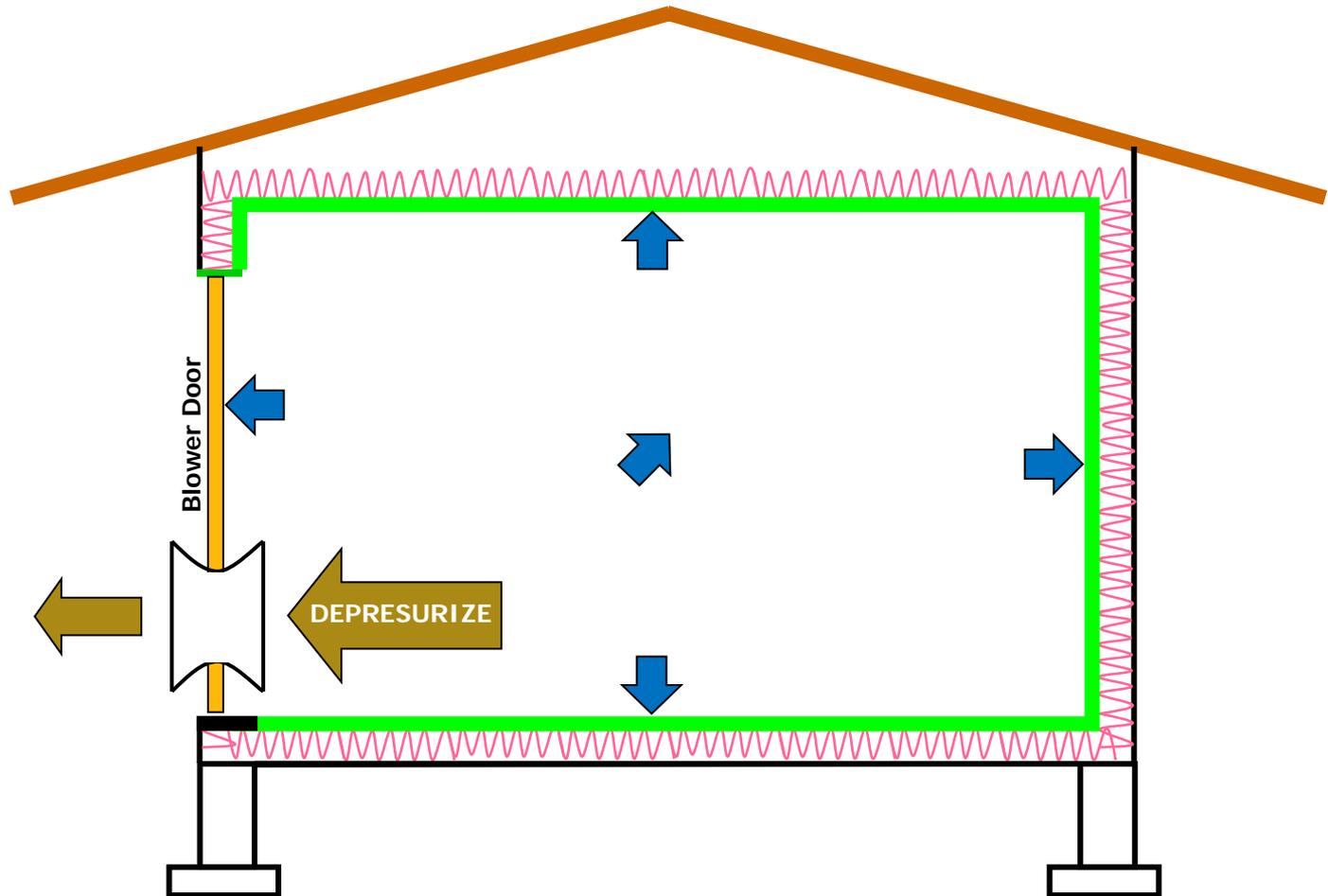
Challenges

R402.4.1.2 Testing

The building or dwelling unit shall be tested and verified as having **an air leakage rate of not exceeding 5 air changes per hour in Climate Zones 1 and 2**, and 3 air changes per hour in Climate Zones 3 through 8. Testing shall be conducted with a blower door at a pressure of 0.2 inches w.g. (50 Pascals). Where required by the code official, testing shall be conducted by an approved third party. A written report of the results of the test shall be signed by the party conducting the test and provided to the code official. Testing shall be performed at any time after creation of all penetrations of the building thermal envelope.



Challenges



Presentation Outline

- Drivers behind making multifamily homes more energy efficient in Phoenix (Arizona)
- Challenges
= Opportunities

