City of Phoenix
PLANNING & DEVELOPMENT DEPARTMENT

BUILDING CONSTRUCTION CODE CHANGE PROPOSAL

Proposed Amendment to 2018 International Energy Conservation Code (IECC)
Section C302.1

Submitted by: Roy Otterbein, PE - Otterbein Engineering

Code Section Proposed Information:

C302.1 Interior design conditions.
The interior design temperatures used for heating and cooling load calculations shall be ~~a maximum of 72°F (22°C) for heating and minimum of 75°F (24°C)~~ for cooling clearly stated on the plans and consistently used in the calculations for equipment design.

Reasons:
One set of interior temperatures will not necessarily meet the needs of all residents or businesses. There are many variables to a comfortable and healthy interior environment. It is therefore best to rely upon proven design standards such as ASHRAE and ACCA to determine the design temperatures based on the individual needs of the space; so long as the equipment and temperature control is compliant with the energy efficiency requirements of the 2018 IECC.

Cost Impact: No cost impact.

Approved in previous 2012 Code Adoption process: ☐ **YES** ☒ **NO**

Reason Denied by Subcommittee:
The intent of this section was not to regulate the temperature of the building occupants, but to determine the energy consumption allowed for a building, using the prescriptive method. The professional registrant may choose to alter the building envelope or design temperature utilizing the total building performance method in Section C407 as long as the total energy used does not exceed the total energy consumption of the standard reference design.
This amendment is denied since the design temperatures specified in this section are necessary to determine the maximum energy consumption value.

ACTION TAKEN:

2018 Code Committee	☐ Approved as submitted	☐ Modified and approved	☒ Denied	Date: March 07, 2018 ☐ No action taken
Development Advisory Board (DAB) Technical Subcommittee	☐ Approved as submitted	☐ Modified and approved	☒ Denied	Date: March 08, 2018 ☐ No action taken
Development Advisory Board (DAB)	☐ Approved as submitted	☐ Modified and approved	☐ Denied	Date: ☐ No action taken
Downtown, Aviation, Economy, and Innovation Subcommittee	☐ Approved as submitted	☐ Modified and approved	☐ Denied	Date: ☐ No action taken
City Council Action	☐ Approved as submitted	☐ Modified and approved	☐ Denied	Date: ☐ No action taken

City of Phoenix
PLANNING & DEVELOPMENT DEPARTMENT

BUILDING CONSTRUCTION CODE CHANGE PROPOSAL

Proposed Amendment to 2018 International Energy Conservation Code (IECC)
Section R302.1

Submitted by: Roy Otterbein, PE - Otterbein Engineering

Code Section Proposed Information:

R302.1 Interior design conditions.
The interior design temperatures used for heating and cooling load calculations shall be ~~a maximum of 72°F (22°C) for heating and minimum of 75°F (24°C)~~ for cooling clearly stated on the plans and consistently used in the calculations for equipment design.

Reasons:
One set of interior temperatures will not necessarily meet the needs of all residents or businesses. There are many variables to a comfortable and healthy interior environment. It is therefore best to rely upon proven design standards such as ASHRAE and ACCA to determine the design temperatures based on the individual needs of the space; so long as the equipment and temperature control is compliant with the energy efficiency requirements of the 2018 IECC.

Cost Impact: No cost impact.

Approved in previous 2012 Code Adoption process: ☐ **YES** ☒ **NO**

Reason Denied by Subcommittee:
The intent of this section was not to regulate the temperature of the building occupants, but to determine the energy consumption allowed for a building, using the prescriptive method. The professional registrant may choose to alter the building envelope or design temperature utilizing the total building performance method in Section R405 as long as the total energy used does not exceed the total energy consumption of the standard reference design.

This amendment is denied since the design temperatures specified in this section are necessary to determine the maximum energy consumption value.

ACTION TAKEN:

2018 Code Committee				Date: March 07, 2018
☐ Approved as submitted	☐ Modified and approved	☒ Denied	☐ No action taken	
Development Advisory Board (DAB) Technical Subcommittee				Date: March 08, 2018
☐ Approved as submitted	☐ Modified and approved	☒ Denied	☐ No action taken	
Development Advisory Board (DAB)				Date:
☐ Approved as submitted	☐ Modified and approved	☐ Denied	☐ No action taken	
Downtown, Aviation, Economy, and Innovation Subcommittee				Date:
☐ Approved as submitted	☐ Modified and approved	☐ Denied	☐ No action taken	
City Council Action				Date:
☐ Approved as submitted	☐ Modified and approved	☐ Denied	☐ No action taken	

City of Phoenix
PLANNING & DEVELOPMENT DEPARTMENT

BUILDING CONSTRUCTION CODE CHANGE PROPOSAL

Proposed Amendment to International Residential Code (IRC)
Section R303.4

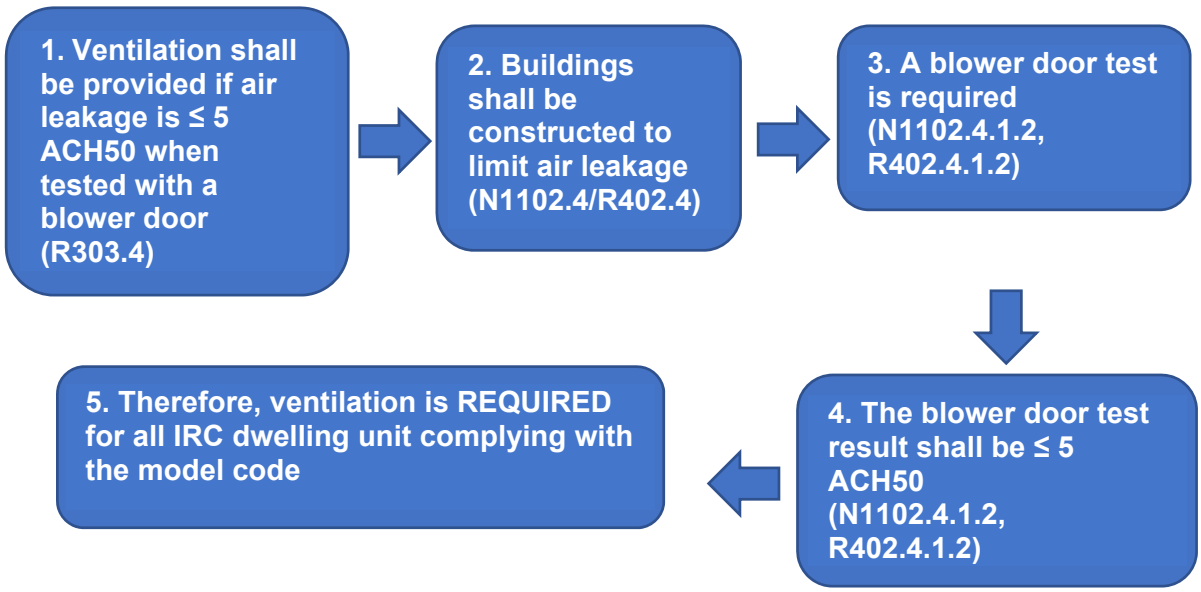
Submitted by: Mike Moore, Newport Ventures, representing the Home Ventilating Institute

Clarify that mechanical ventilation is required for IRC dwelling units. Introduce exception for dwelling units not served by space-heating or cooling equipment.

R303.4 Mechanical ventilation.
Where a dwelling unit is served by space-heating or cooling equipment, ~~the air infiltration rate of a dwelling unit is 5 air changes per hour or less where tested with a blower door at a pressure of 0.2 inch w.c. (50 Pa) in accordance with Section N1102.4.1.2, the dwelling unit~~ it shall be provided with whole-house mechanical ventilation in accordance with Section M1505.4.

Reason:
Building tight dwelling units has benefits of energy efficiency; improved comfort; and improved odor, rodent, and sound control. Tight buildings are typically the byproduct of better fire and smoke control as well. Beginning with the 2012 IRC, building tight has been code minimum practice, which is good. However, we learned in the 1970s that building tight without mechanically ventilating results in sick building syndrome.

So, since 2012, the code has required tight dwelling units to also be provided with mechanical ventilation. The problem is that we've heard from ICC staff, code officials, builders, and design professionals that it's hard to follow the code language requirements. Currently, we have a 5-step process to identify that mechanical ventilation is required for all IRC dwelling units; this introduces needless confusion. Here's what the process looks like:



Instead of a 5-step process, we can simplify the code and enforcement by jumping straight to the conclusion: ventilation is required for all dwelling units. This proposal does exactly that. Additionally, this proposal introduces an exception for the mechanical ventilation requirement in climates and situations where natural ventilation is expected to provide all of the climate control and ventilation needed (i.e., when no space-heating or cooling equipment is provided). A similar exception exists in ASHRAE 62.2.

Cost Impact: No cost impact.
Ventilation is already required for IRC dwelling units, so this proposal will not increase the cost of construction.

Approved in previous 2012 Code Adoption process: ☐ **YES** ☒ **NO**

Reason Denied by Subcommittee:

This amendment would require mechanical ventilation be installed in all IRC dwelling units that have additions and remodel permits as well as new home construction, regardless of the air infiltration rate of the structure. This is not the intent of the code, nor is it feasible. The base code requires dwellings that have an "air-infiltration rate of 5 air changes per hour or less, where tested with a blower door at a pressure of 0.2 inch w.c." to be provided with mechanical ventilation. The base code references section N1102.4.1.2 which describes the testing medium and specifications. N1102.4 in the code section title paragraph that limits the air leakage through the building thermal envelope in accordance with N1102.4.1 through N1102.4.5. These sections define sealing various building components (fireplace dampers, fenestrations, recessed lighting, etc.) and the aforementioned testing criteria.

The mechanical ventilation requirement was introduced as thermal envelope sealing in new construction became tighter, developing "sick building" syndrome, where air inside new dwellings became stale and unhealthy. Current code language limits mechanical ventilation to newly constructed dwellings by setting the air-infiltration rate threshold. Removing this language expands the requirements to any residential IRC designed structure under permit.

ACTION TAKEN:	
2018 Code Committee ☐ Approved as submitted ☐ Modified and approved ☒ Denied	Date: January 04, 2018 ☐ No action taken
Development Advisory Board (DAB) Technical Subcommittee ☐ Approved as submitted ☐ Modified and approved ☒ Denied	Date: March 08, 2018 ☐ No action taken
Development Advisory Board (DAB) ☐ Approved as submitted ☐ Modified and approved ☐ Denied	Date: ☐ No action taken
Downtown, Aviation, Economy, and Innovation Subcommittee ☐ Approved as submitted ☐ Modified and approved ☐ Denied	Date: ☐ No action taken
City Council Action ☐ Approved as submitted ☐ Modified and approved ☐ Denied	Date: ☐ No action taken

City of Phoenix
PLANNING & DEVELOPMENT DEPARTMENT

BUILDING CONSTRUCTION CODE CHANGE PROPOSAL

Proposed Amendment to 2018 International Mechanical Code (IMC)
Section R401.2

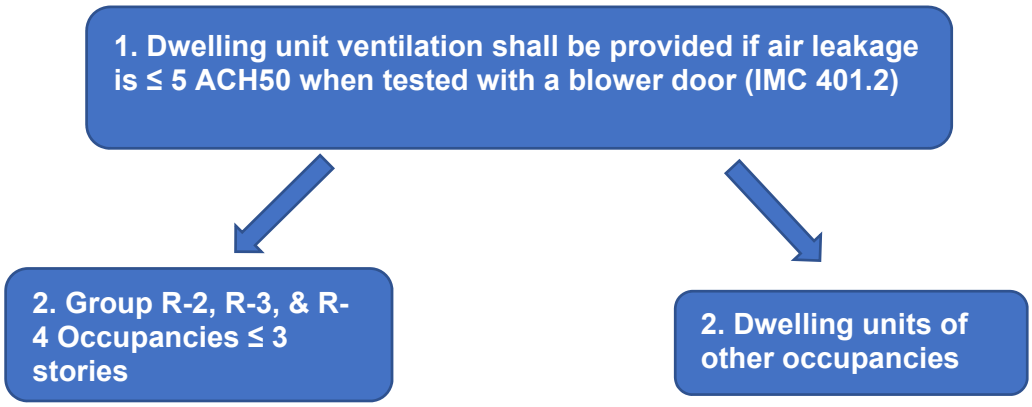
Submitted by: Mike Moore, Newport Ventures, representing the Home Ventilating Institute

Require mechanical ventilation for all dwelling units (which are already required to be air sealed in accordance with the IECC).

401.2 Ventilation required.
Every occupied space shall be ventilated by natural means in accordance with Section 402 or by mechanical means in accordance with Section 403. ~~Where the air infiltration rate in a dwelling unit is less than 5 air changes per hour when tested with a blower door at a pressure of 0.2-inch water column (50 Pa) in accordance with Section R402.4.1.2 of the International Energy Conservation Code, the~~ Group R dwelling units served by heating or cooling equipment shall be ventilated by mechanical means in accordance with Section 403. Ambulatory care facilities and Group I-2 occupancies shall be ventilated by mechanical means in accordance with Section 407.

Reason:
Building tight dwelling units has benefits of energy efficiency; improved comfort; and improved odor, rodent, and sound control. Tight buildings are typically the byproduct of better fire and smoke control as well. Beginning with the 2012 IECC, building tight has been code minimum practice, which is good. However, we learned in the 1970s that building tight without mechanically ventilating results in sick building syndrome.

So, since 2012, the code has required that when dwelling units are tested and verified to be tight, they also be provided with mechanical ventilation. The problem is that we've heard from ICC staff, code officials, builders, and design professionals that it's hard to follow the code language requirements. Currently, we have a 6-step process to identify that mechanical ventilation is required for all low-rise, Group-R IMC dwelling units. For mid- and high-rise dwelling units that are built to the IECC commercial chapter, it's not clear whether mechanical ventilation is required since they have a different testing metric than is referenced in Section 401.2 of the IMC. This introduces needless confusion. Here's what the process looks like:



3. Buildings shall be constructed to limit air leakage (N1102.4/R402.4)

4. A blower door test is required (N1102.4.1.2, R402.4.1.2)

5. The blower door test result shall be ≤ 5 ACH50 (N1102.4.1.2, R402.4.1.2)

6. Therefore, ventilation is REQUIRED for all Group R-2, R-3, & R-4 occupancies ≤ 3 stories complying with the model code

3. Buildings shall be constructed to limit air leakage (C402.5)

4. A blower door test is one method of demonstrating compliance (C402.5)

5. The blower door test result shall be ≤ 0.4 cfm/ft^2 @ 75 Pa (C402.5)

6. Ventilation requirement is unclear because test is not required and, if executed, the metric is different (ACH50 vs. cfm/ft2 @ 75 Pa)

Instead of a 6-step process, we can simplify the code and enforcement by jumping straight to the conclusion for low-rise, Group R-2, R-3, and R-4 occupancies: ventilation is required for all dwelling units. This proposal does exactly that. Additionally, this proposal recognizes that the target maximum leakage rate for high-rise dwelling units (0.4 cfm/ft2 @ 75 Pa) is comparable to that of low-rise dwelling units (5 ACH50), and the effective leakage to outdoors for all attached dwelling units is far below that of single family detached homes that are already required by the IRC to provide mechanical ventilation. Additionally, U.S. Census data show that occupancy per square foot of floor area in multifamily dwelling units is almost twice that of single family dwelling units, demonstrating a greater need for ventilation in multifamily dwelling units. For these reasons, the I-code requirement for mechanical ventilation of dwelling units should be extended beyond the current requirement for only low-rise dwelling units, to include mid- and high-rise dwelling units.

Finally, this proposal introduces an exception for the mechanical ventilation requirement in climates and situations where natural ventilation is expected to provide all of the climate control and ventilation needed (i.e., when no space-heating or cooling equipment is provided). A similar exception exists in ASHRAE 62.2.

Cost Impact:
Ventilation is already required for IMC Group R-2, R-3, and R-4 dwelling units, so this proposal will not increase the cost of construction. This proposal will increase the cost of construction for high-rise dwelling units that are not currently provided with mechanical ventilation.

Approved in previous 2012 Code Adoption process: ☐ **YES** ☒ **NO**

Reason Denied by Subcommittee:
ASHRAE 62.2 is only used for Residential Ventilation. It is not an approved reference standard for commercial applications.

ACTION TAKEN:

2018 Code Committee				Date: January 04, 2018
☐ Approved as submitted	☐ Modified and approved	☒ Denied	☐ No action taken	
Development Advisory Board (DAB) Technical Subcommittee				Date: March 08, 2018
☐ Approved as submitted	☐ Modified and approved	☒ Denied	☐ No action taken	
Development Advisory Board (DAB)				Date:
☐ Approved as submitted	☐ Modified and approved	☐ Denied	☐ No action taken	
Downtown, Aviation, Economy, and Innovation Subcommittee				Date:
☐ Approved as submitted	☐ Modified and approved	☐ Denied	☐ No action taken	
City Council Action				Date:
☐ Approved as submitted	☐ Modified and approved	☐ Denied	☐ No action taken	

City of Phoenix
PLANNING & DEVELOPMENT DEPARTMENT

BUILDING CONSTRUCTION CODE CHANGE PROPOSAL

Proposed Amendment to 2018 International Mechanical Code (IMC)
Section 403.3

Submitted by: David Brignati, Newport Ventures

List ASHRAE 62.2 as an optional ventilation compliance path in the IMC for low-rise dwelling units (previously approved by PMGCAC for the IRC, but not the IMC, which was not discussed).

403.3 Outdoor air and local exhaust airflow rates.
Group R-2, R-3 and R-4 occupancies three stories and less in height above grade plane shall be provided with outdoor air and local exhaust in accordance with Section 403.3.2 or ASHRAE 62.2. Other buildings intended to be occupied shall be provided with outdoor air and local exhaust in accordance with Section 403.3.1.

Add new standard:
ASHRAE 62.2-2016. Ventilation and Acceptable Indoor Air Quality in Residential Buildings with Addenda b, d, k, l, q, and s.

Reasons:
This proposed modification would provide ventilation system designers/specifiers of low-rise dwelling units with the OPTION of using ASHRAE Standard 62.2 to comply with the ventilation requirements of the IMC without requiring designers/specifiers to use the standard. ASHRAE 62.2 is the ANSI standard for establishing minimum acceptable indoor air quality for dwelling units. There are several reasons that designers/specifiers may want to use ASHRAE 62.2 instead of the IMC for compliance, including: greater flexibility for specifying climate-appropriate ventilation controls, ability to achieve energy and cost savings for homeowners by shifting operation of the ventilation system to times when ambient temperature and humidity are favorable, flexibility to specify innovative systems that can be demonstrated to provide equivalent exposure to pollutants, ability to down-size and save money on balanced ventilation equipment versus what may be required by the code, and 62.2's use by code-plus programs such as ENERGY STAR and LEED.

Cost Impact:
This proposal can decrease the cost of construction.

Approved in previous 2012 Code Adoption process: ☐ **YES** ☒ **NO**

Reason Denied by Subcommittee: ASHRAE 62.2 is only used for Residential Ventilation. It is not an approved reference standard for commercial applications.
ACTION TAKEN:
2018 Code Committee Date: January 4, 2018 ☒ Approved as submitted ☐ Modified and approved ☐ Denied ☐ No action taken
Development Advisory Board (DAB) Technical Subcommittee Date: March 08, 2018 ☐ Approved as submitted ☐ Modified and approved ☒ Denied ☐ No action taken
Development Advisory Board (DAB) Date: ☐ Approved as submitted ☐ Modified and approved ☐ Denied ☐ No action taken
Downtown, Aviation, Economy, and Innovation Subcommittee Date: ☐ Approved as submitted ☐ Modified and approved ☐ Denied ☐ No action taken
City Council Action Date: ☐ Approved as submitted ☐ Modified and approved ☐ Denied ☐ No action taken

City of Phoenix
PLANNING & DEVELOPMENT DEPARTMENT

BUILDING CONSTRUCTION CODE CHANGE PROPOSAL

Proposed Amendment to 2018 International Mechanical Code (IMC)
Section R403.3

Submitted by: Mike Moore, Newport Ventures, representing the Home Ventilating Institute

Require balanced ventilation systems for Group R dwelling units
Modify Section 403.3 as follows:

> **403.3.2.1 Outdoor air for dwelling units**.
> A~~n~~ balanced outdoor air ventilation system with mechanical supply and exhaust components ~~consisting of a mechanical exhaust system, supply system or combination thereof~~ shall be installed for each dwelling unit. ~~Local exhaust or supply systems, including outdoor air ducts connected to the return side of an air handler, are permitted to serve as such a system.~~ The outdoor air ventilation system shall be designed to provide the required rate of outdoor air continuously during the period that the building is occupied. The minimum continuous outdoor airflow rate shall be determined in accordance with Equation 4-9.

Reasons:
Exhaust dwelling unit ventilation systems are not permitted for mid-rise or high-rise dwelling units in the IMC (Section 403.3.5.1 requires that systems be balanced) and should not be permitted in low-rise attached dwelling units either. Such systems establish pressure imbalances across dwelling units and promote transfer of airborne contaminants and odors more than delivery of fresh outdoor air.

Exhaust dwelling unit ventilation with dedicated passive vent air inlets should also not be permitted in any multifamily dwelling unit, because research has shown that these systems consistently fail to provide the targeted outdoor air flow rates. Industry experience with dedicated makeup air inlets and a recent study conducted by the Northwest Energy Efficiency Alliance,[1] have demonstrated that occupants generally keep inlets closed. The same study concluded that, "the analysis of inlet vents failed to show clear benefits from their usage." A separate study sponsored by the U.S. Department of Energy also found dedicated passive air inlets to be ineffective: "airflow from the passive vents was 13%–36% of the exhaust ventilation rate…. most of the makeup air comes from unintentional sources—from leaks in the exterior envelope, neighboring apartments, or the corridor."[2] Further, this study demonstrated that verifying the targeted outdoor air flow rate at dedicated outdoor air inlets was not possible in the dwelling units tested.

[1] Eklund, K., Kunkle, R., Banks, A., and Hales, D. 2015. Pacific Northwest Residential Ventilation Effectiveness Study. WSUEEP14-020.
[2] Maxwell, S., Berger, D., and Zuluaga, M. 2016. Evaluation of Passive Vents in New Construction Multifamily Buildings. (Subcontractor Report, NREL/SR-5500-64758). Golden, CO: National Renewable Energy Laboratory.

Supply-only outdoor air systems with or without dedicated makeup air outlets solve some of the problems with exhaust systems (e.g., providing a known source of filtered outdoor air), but they too induce pressure differentials that can lead to transfer of odors and pollutants across dwelling units and between dwelling units and corridors/common areas, diminishing the benefit of providing filtered outdoor air. Further, supply-only systems are not permitted in the IMC for mid-rise or high-rise dwelling units, and should not be permitted for low-rise dwelling units either.

Unlike exhaust-only systems, exhaust with dedicated passive vent outdoor air inlets, and supply-only systems, **balanced mechanical ventilation systems** do not induce pressure differentials across attached dwelling units. The IMC already requires that high-rise dwelling unit "ventilation systems shall be balanced by an approved method" (2015 IMC Section 403.3.1.5). Reducing pressure differentials not only reduces the transfer of odor and pollutants between dwelling units and corridors/common areas, but it also limits the migration of moisture through building assemblies via air leakage, which can lead to condensation, mold, and durability problems. Additionally, balanced systems are able to provide filtered air directly from the outdoors and to temper the outdoor air (if provided with a heat or energy recovery core), increasing the likelihood of system operation by occupants.

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[1] Eklund, K., Kunkle, R., Banks, A., and Hales, D. 2015. Pacific Northwest Residential Ventilation Effectiveness Study. WSUEEP14-020.

[1] Maxwell, S., Berger, D., and Zuluaga, M. 2016. Evaluation of Passive Vents in New Construction Multifamily Buildings. (Subcontractor Report, NREL/SR-5500-64758). Golden, CO: National Renewable Energy Laboratory.

Cost Impact:
This proposal will increase the cost of construction in dwelling units that do not already specify a balanced system. For units that use a supply system, incremental costs could be limited to controls and wiring for coordinating the operation of a bath fan and a supply fan. Units that only use exhaust for mechanical ventilation would incur additional costs for a discrete balanced system or a supply duct, fan, and associated controls.

Approved in previous 2012 Code Adoption process: ☐ **YES** ☒ **NO**

Reason Denied by Subcommittee:
ASHRAE 62.2 is only used for Residential Ventilation. It is not an approved reference standard for commercial applications.

ACTION TAKEN:

2018 Code Committee				Date: January 04, 2018
☐ Approved as submitted	☐ Modified and approved	☒ Denied	☐ No action taken	
Development Advisory Board (DAB) Technical Subcommittee				Date: March 08, 2018
☐ Approved as submitted	☐ Modified and approved	☒ Denied	☐ No action taken	
Development Advisory Board (DAB)				Date:
☐ Approved as submitted	☐ Modified and approved	☐ Denied	☐ No action taken	
Downtown, Aviation, Economy, and Innovation Subcommittee				Date:
☐ Approved as submitted	☐ Modified and approved	☐ Denied	☐ No action taken	
City Council Action				Date:
☐ Approved as submitted	☐ Modified and approved	☐ Denied	☐ No action taken	

City of Phoenix
PLANNING & DEVELOPMENT DEPARTMENT

BUILDING CONSTRUCTION CODE CHANGE PROPOSAL

Proposed Amendment to 2018 International Mechanical Code (IMC)
Section R403.3, Chapter 15

Submitted by: Mike Moore, Newport Ventures, representing the Home Ventilating Institute

List ASHRAE 62.2 as an optional ventilation compliance path in the IMC for low-rise dwelling units (previously approved by the ICC PMGCAC for the IRC)

403.3 Outdoor air and local exhaust airflow rates.
Group R-2, R-3 and R-4 occupancies three stories and less in height above grade plane shall be provided with outdoor air and local exhaust, in accordance with Section 403.3.2 or ASHRAE 62.2. Other buildings intended to be occupied shall be provided with outdoor air and local exhaust, in accordance with Section 403.3.1.

Add new standard to chapter 15:
ASHRAE 62.2-2016. Ventilation and Acceptable Indoor Air Quality in Residential Buildings with Addenda b, d, k, l, q, and s.

Reason:
This proposed modification would provide ventilation system designers/specifiers of low-rise dwelling units with the OPTION of using ASHRAE Standard 62.2 to comply with the ventilation requirements of the IMC without requiring designers/specifiers to use the standard. ASHRAE 62.2 is the ANSI standard for establishing minimum acceptable indoor air quality for dwelling units. There are several reasons that designers/specifiers may want to use ASHRAE 62.2 instead of the IMC for compliance, including: greater flexibility for specifying climate-appropriate ventilation controls, ability to achieve energy and cost savings for homeowners by shifting operation of the ventilation system to times when ambient temperature and humidity are favorable, flexibility to specify innovative systems that can be demonstrated to provide equivalent exposure to pollutants, ability to down-size and save money on balanced ventilation equipment versus what may be required by the code, and 62.2's use by code-plus programs such as ENERGY STAR and LEED.

Cost Impact:
This proposal can decrease the cost of construction.

Approved in previous 2012 Code Adoption process: ☐ **YES** ☒ **NO**	
Reason Denied by Subcommittee: ASHRAE 62.2 is only used for Residential Ventilation. It is not an approved reference standard for commercial applications.	
ACTION TAKEN:	
2018 Code Committee ☐ Approved as submitted ☐ Modified and approved ☒ Denied	Date: January 4, 2018 ☐ No action taken
Development Advisory Board (DAB) Technical Subcommittee ☐ Approved as submitted ☐ Modified and approved ☒ Denied	Date: March 08, 2018 ☐ No action taken
Development Advisory Board (DAB) ☐ Approved as submitted ☐ Modified and approved ☐ Denied	Date: ☐ No action taken
Downtown, Aviation, Economy, and Innovation Subcommittee ☐ Approved as submitted ☐ Modified and approved ☐ Denied	Date: ☐ No action taken
City Council Action ☐ Approved as submitted ☐ Modified and approved ☐ Denied	Date: ☐ No action taken

City of Phoenix
PLANNING & DEVELOPMENT DEPARTMENT

BUILDING CONSTRUCTION CODE CHANGE PROPOSAL

Proposed Amendment to 2018 International Residential Code (IRC)
Chapter 2, Section M1505

Submitted by: Mike Moore, Newport Ventures, representing the Home Ventilating Institute

Reduce fan rate required for balanced ventilation systems.

Add a new definition to chapter 2, and revise the IRC as follows:

BALANCED VENTILATION SYSTEM

A ventilation system where the total supply airflow and total exhaust airflow are simultaneously within 10% of their average. The balanced ventilation system airflow is the average of the supply and exhaust airflows.

M1505.1 General.
Where local exhaust or whole-house mechanical ventilation is provided, the ~~equipment~~ ventilation system shall be designed in accordance with this section.

M1505.4.3 Mechanical ventilation rate.
The whole-house mechanical ventilation system shall provide outdoor air at a continuous rate not less than that ~~as~~ determined in accordance with Table M1505.4.3(1) or not less than that determined by Equation 15-1.

Ventilation rate in cubic feet per minute = (0.01 x total square foot area of house) +
Equation 15-1
[7.5 x (number of bedrooms +1)]

Exceptions:

1. Ventilation rate credit.
Where a balanced whole-house mechanical ventilation system is provided, the whole-house mechanical ventilation system rate shall be permitted to be adjusted by multiplying the mechanical ventilation rate determined in accordance with Table M1505.4.3(1) or by Equation 15-1 by 0.7.

2. Programmed intermittent operation.
The whole-house mechanical ventilation system is permitted to operate intermittently where the system has controls that enable operation for not less than 25-percent of each 4-hour segment and the ventilation rate prescribed in Table M1505.4.3(1), by Equation 15-1, or by Exception 1 is multiplied by the factor determined in accordance with Table M1505.4.3(2).

Reason:
Balanced mechanical ventilation systems provide superior ventilation to unbalanced systems, and should not be required to provide the same rate as less effective, unbalanced systems to provide equivalent ventilation. This proposed credit for balanced ventilation is a simplified version

that was derived from ASHRAE 62.2-2016 Equation 4.2 (published in addendum s). The ASHRAE equation adjusts the balanced whole house ventilation flow rate as a function of building air leakage, building height, and weather and shielding factor (which approximates climate zone). To simplify application of the ASHRAE calculation, we developed a one-size-fits-all balanced system factor using the following methodology:

1. Define a typical new, single-family detached home. The home characteristics were as follows: 2600 ft2; 3-bedroom; heights of 8, 17, and 26 feet above grade for one-, two- and three-story versions of the typical home; and leakage rate of 4.5 ACH50 in CZ 1-2 and 2.5 ACH50 in CZ 3-8. Note: Higher values for air leakage provide larger credits for balanced ventilation systems. To be conservative, we assumed that the average home was slightly tighter than the 2018 IECC maximum leakage rates of 5 ACH50 in CZ 1-2 and 3 ACH50 in CZ 3-8 (i.e., 4.5 ACH50 instead of 5 ACH50 in CZ 1-2 and 2.5 ACH50 instead of 3 ACH50 in CZ 3-8).
2. Calculate the average weather and shielding factor across each climate zone using over 1000 weather stations catalogued in Appendix B of ASHRAE 62.2.
3. Calculate the ASHRAE 62.2-2016 flow rates for balanced and unbalanced systems in the one-, two-, and three-story versions of the typical home across all IECC climate zones using Equation 4.2 and the average weather and shielding factors calculated in step 2.
4. Calculate the percent reduction in the balanced system ventilation rate versus the unbalanced systems' ventilation rate for each case. Apply weightings to the percent reductions for one-, two-, and three-story cases in each climate zone based on average U.S. Census Data (i.e., 44% are assumed to be one-story; 52% are assumed to be two-story; 4% are assumed to be 3-story in each climate zone). Sum the weighted percent reductions for the various stories to develop an estimated percent reduction for each climate zone.

Following is a table that summarizes interim and aggregate results of these steps used to calculate the balanced ventilation system multiplier of 0.7. The weighted average percent reduction in flow rate for balanced systems across each climate zone varied from 22% to 41%. The average percent reduction in flow rate for balanced systems across all scenarios for the typical home is ~30%, resulting in a multiplier of 0.7 in this proposal.

Note: this proposal was vetted and approved by the ICC PMGCAC and will be submitted as a proposal to amend the 2021 IRC.

Percent Reduction Possible in Ventilation Fan Flow Rate When Specifying Balanced vs. Unbalanced: 4.5 ACH50 in CZ 1-2 & 2.5 ACH50 in CZ 3-8				
	Stories and Distribution			Weighted Average Across All Stories
	44%	52%	4%	
CZ	1-story	2-story	3-story	
1A	31%	42%	50%	38%
2A	30%	41%	49%	37%
2B	34%	46%	55%	41%
3A	18%	25%	29%	22%
3B	20%	27%	32%	24%
3C	21%	28%	34%	25%
4A	20%	27%	32%	24%
4B	24%	33%	39%	29%
4C	23%	31%	36%	27%
5A	23%	31%	37%	28%
5B	24%	33%	39%	29%
6A	25%	34%	40%	30%
6B	27%	37%	44%	33%
7	29%	39%	46%	35%
8	34%	46%	54%	41%
Average of weighted averages				31%

Cost Impact:
This proposal can decrease the cost of construction.

Approved in previous 2012 Code Adoption process: ☐ **YES** ☒ **NO**

Reason Denied by Subcommittee:
Denied by subcommittee. Use of non-prescriptive means and methods already has a process for approval under the base code in section R104.11.

This proposal would be well suited for direct proposal to the ICC for evaluation and inclusion in future editions of the base code.

Another method is to have the product or equipment evaluated by a NRTL for compliance with the referenced standards and/or code requirement to produce a listed product. While the analysis provided is very convincing, building code officials do not perform product testing or issue evaluation reports.

ACTION TAKEN:

2018 Code Committee Date: January 04, 2018
☐ Approved as submitted ☐ Modified and approved ☒ Denied ☐ No action taken

Development Advisory Board (DAB) Technical Subcommittee Date: March 08, 2018
☐ Approved as submitted ☐ Modified and approved ☒ Denied ☐ No action taken

Development Advisory Board (DAB) Date:
☐ Approved as submitted ☐ Modified and approved ☐ Denied ☐ No action taken

Downtown, Aviation, Economy, and Innovation Subcommittee Date:
☐ Approved as submitted ☐ Modified and approved ☐ Denied ☐ No action taken

City Council Action Date:
☐ Approved as submitted ☐ Modified and approved ☐ Denied ☐ No action taken

City of Phoenix
PLANNING & DEVELOPMENT DEPARTMENT

BUILDING CONSTRUCTION CODE CHANGE PROPOSAL

Proposed Amendment to 2018 International Residential Code (IRC)
Chapter 44, Section M1505.1

Submitted by: Mike Moore, Newport Ventures, representing the Home Ventilating Institute

List ASHRAE 62.2 as an optional ventilation compliance path in the IRC (approved by the ICC PMGCAC)

Add new standard to chapter 44, and revise the IRC as follows:

M1505.1 General.
Where local exhaust or whole-house mechanical ventilation is provided, the ~~equipment~~ ventilation system shall be designed in accordance with this section, or the ventilation system shall be designed in accordance with ASHRAE 62.2.

Add new standard:

ASHRAE 62.2-2016 Ventilation and Acceptable Indoor Air Quality in Residential Buildings with Addenda b, d, k, l, q, and s.

Reason:
This proposed modification would provide builders with the OPTION of using ASHRAE Standard 62.2 to comply with the ventilation requirements of the IRC without requiring builders to use the standard. ASHRAE 62.2 is the ANSI standard for establishing minimum acceptable indoor air quality for dwelling units. There are several reasons that builders may want to use ASHRAE 62.2 instead of the IRC for compliance, including: greater flexibility for specifying climate-appropriate ventilation controls, ability to achieve energy and cost savings for homeowners by shifting operation of the ventilation system to times when ambient temperature and humidity are favorable, flexibility to specify innovative systems that can be demonstrated to provide equivalent exposure to pollutants, ability to down-size and save money on balanced ventilation equipment versus what may be required by the code, 62.2's use by code-plus programs such as ENERGY STAR and LEED, and ability to size the system as a function of measured dwelling unit air leakage instead of a one-size-fits-all approach.

Note: this proposal was vetted and approved by the ICC PMGCAC and will be submitted as a proposal to amend the 2021 IRC.

Cost Impact:
This proposal can decrease the cost of construction.

Approved in previous 2012 Code Adoption process: ☐ **YES** ☒ **NO**

Reason Denied by Subcommittee:
ASHRAE 62.2 allows for use of an equation to calculate required mechanical ventilation in residential dwellings. That equation is $Q_{fan}=0.03A_{floor} + 7.5(BR+1)$

M1505.4.3 requires mechanical ventilation rates to be calculated in accordance with Table M1505.4.3(1) or Equation 15-1. Equation 15-1 is $Q_{fan}=0.01A_{floor} + 7.5(BR+1)$. The result of equation 15-1 would be lower than the equation in ASHRAE 62.2. Therefor ASHRAE 62.2 would exceed the requirements of M1505.4 and be admissible under the base code. No amendment is necessary to allow use of ASHRAE 62.2.

ACTION TAKEN:	
2018 Code Committee ☐ Approved as submitted ☐ Modified and approved ☒ Denied	Date: January 04, 2018 ☐ No action taken
Development Advisory Board (DAB) Technical Subcommittee ☐ Approved as submitted ☐ Modified and approved ☒ Denied	Date: March 08, 2018 ☐ No action taken
Development Advisory Board (DAB) ☐ Approved as submitted ☐ Modified and approved ☐ Denied	Date: ☐ No action taken
Downtown, Aviation, Economy, and Innovation Subcommittee ☐ Approved as submitted ☐ Modified and approved ☐ Denied	Date: ☐ No action taken
City Council Action ☐ Approved as submitted ☐ Modified and approved ☐ Denied	Date: ☐ No action taken

City of Phoenix
PLANNING & DEVELOPMENT DEPARTMENT

BUILDING CONSTRUCTION CODE CHANGE PROPOSAL

Proposed Amendment to 2018 International Residential Code (IRC)
Section M1504.3

Submitted by: Mike Moore, Newport Ventures, representing the Home Ventilating Institute

Proposal IRC4: Approve intake/exhaust combination termination fittings.

Revise as follows:

IRC M1504.3 Exhaust openings. Air exhaust openings shall terminate as follows:

1. Not less than 3 feet (914 mm) from property lines.
2. Not less than 3 feet (914 mm) from gravity air intake openings, operable windows and doors.
3. Not less than 10 feet (3048 mm) from mechanical air intake openings except where <u>either of the following apply:</u>

   <u>3.1</u> The exhaust opening is located not less than 3 feet (914 mm) above the air intake opening.

   <u>3.2 The exhaust opening is part of an approved factory-built intake/exhaust combination termination fitting installed in accordance with the manufacturer's instructions, and the exhaust air is drawn from a living space.</u>

<u>4</u>. Openings shall comply with Sections R303.5.2 and R303.6.

Reason:
Intake/exhaust combination terminations are regularly installed with heating and energy recovery ventilators (H/ERVs) used for dwelling units. Their use reduces building penetrations, labor, and associated system costs. By reducing the number of penetrations, air leakage can also be reduced, resulting in space conditioning energy savings. Further, the durability of the structure can be improved through reducing entry pathways for bulk water.

Manufacturer tests conducted by Natural Resources Canada (NRC) have demonstrated that use of intake/exhaust combination terminations results in minimum cross-contamination of airflows (i.e., not exceeding 4%; see NRC report A1-007793[1]). These results are aligned with ASHRAE 62.2 approval of such devices, which limits cross-contamination to 10%, as verified by the manufacturer. If approved, this proposed modification to the IRC would limit application of intake/exhaust combination terminations to "approved", "factory-built" units. Approval of this proposed modification is expected to result in more affordable and architecturally flexible terminations.

Note: The IRC defines *living space* as, "space within a *dwelling unit* utilized for living, sleeping, eating, cooking, bathing, washing and sanitation purposes".

References:

1. Ouazia, B. 2016. Evaluation of a dual hood performance in term of contaminant re-entrainment from exhaust to supply. A1-007793. National Research Council Canada. *For a copy of the report, please contact the proponent at the email address provided. Additional reports are available from the proponent upon request.*

Cost Impact: No cost impact.
This proposal will not increase the cost of construction because no additional labor, materials, equipment, appliances or devices are mandated beyond what is currently required by the code.

Approved in previous 2012 Code Adoption process: ☐ **YES** ☒ **NO**

Reason Denied by Subcommittee:
Use of non-prescriptive means and methods already has a process for approval under the base code in section R104.11.

This proposal would be well suited for direct proposal to the ICC for evaluation and inclusion in future editions of the base code.

Another method is to have the product or equipment evaluated by a NRTL for compliance with the referenced standards and/or code requirement to produce a listed product. While the analysis provided is very convincing, building code officials do not perform product testing or issue evaluation reports.

ACTION TAKEN:				
2018 Code Committee				Date: January 04, 2018
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