July 11, 2018

Chairman Furnish
Indiana Fire Prevention and Building Safety Commission
Residential Code Committee
302 West Washington Street
Indianapolis, IN 46204

Re: MEEA’s comments in support of adopting Chapter 11 of the 2018 International Residential Code

Dear Chairman Furnish and members of the Indiana Residential Code Committee:

Thank you for the opportunity to provide feedback on Indiana’s code adoption process. The Midwest Energy Efficiency Alliance (MEEA) is a member-based non-profit organization that promotes cost-effective energy efficiency policies in the Midwest. We have worked with previous Administrations on Indiana’s building energy codes.

MEEA strongly recommends the adoption of Chapter 11 of the 2018 International Residential Code (2018 IRC) without weakening amendments, as the statewide minimum residential energy code. We recommend this adoption because:

1. An update to the full 2018 IRC Chapter 11 is cost effective and residents would save money and reduce energy use over the life of the building

As outlined in this letter and attached documents, the adoption of the full 2018 IRC provides a significant opportunity to advance minimum building performance in the state and reduce operating costs for residents. On a per home basis, updating to the full 2018 IRC is cost-effective and would save residents approximately $500 annually and reduce energy use by over 25%.1 In the first year alone, this would result in a collective statewide cost savings of $6,600,000 and enough energy savings to power over 6,200 homes in Indiana.2

However, first year savings only tell a fraction of the positive impact from an updated energy code because energy and cost savings from efficiency measures are cumulative in nature. MEEA estimates that the cumulative savings from adoption of the 2018 IRC would put more than $250,000,000 back into the pockets of Indiana residents over the next decade.3 An investment in cost-effective updated building energy codes will put more money into Hoosiers’ pockets, improving local economies for years to come.

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1 See MEEA attached factsheet. Residential Energy Use Comparison: IN (CZ 4 + 5) IN 2009 IECC, 2018 IECC
3 See MEEA attached factsheet. Building Energy Codes: Saving Energy & Money for Indiana
2. An update to the 2018 IRC Chapter 11 will ensure homes maintain healthy indoor air quality, comfortable temperatures, and a resilient building envelope.

Whether at work or at home, on average, Americans spend 90% of their time indoors where the concentration of pollutants is often 2 to 5 times higher than outside. Studies have shown that homes with a building enclosure and duct system that is tightly sealed, combined with a proper ventilation system, have fewer indoor air pollutants. By controlling the movement of air into and out of the home (instead of letting the air filter in and out through dusty attics or damp crawl spaces) pollutants entering the home can be minimized, and those that still enter can be quickly exhausted to the outside.

As building practices advance, builders are constructing homes that meet and exceed air leakage requirements without much effort. However, in states like Indiana, where performance testing of the building envelope is not required, code officials, builders, and homeowners do not know the exact tightness of their home. In a study of new construction homes in Kentucky, MEEA found that 68% of homes that were visually inspected for code compliance had an air exchange rate of 5 ACH50 or lower when tested. Some of these homes were as tight as 2 ACH50 and the vast majority did not have any mechanical ventilation systems installed.

This has potential repercussions for indoor air quality: without consistent and controlled ventilation, homes can accumulate higher concentrations of mold growth and indoor air pollutants, triggering negative health effects like increased rates of asthma and allergies. The 2018 IRC prevents this potential mishap by requiring builders to perform a blower door test to determine the air tightness of new homes. The 2018 IRC also ensures whole house mechanical ventilation for homes meeting 5 ACH 50 or less is installed, guaranteeing occupants have safe and healthy air to breathe.

In addition, increased insulation and window efficiency will improve occupant comfort and create a more resilient building that is better able to withstand the increasing uncertainties in weather and energy costs. It is important to note that improvements to the building thermal envelope, such as increased insulation in the walls, are difficult and cost-prohibitive to retrofit after the building is constructed. The most cost-effective time to install these long-lasting measures that improve building resiliency and occupant comfort is during the time of construction.

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5 See U.S. Environmental Protection Agency. The total exposure assessment methodology (TEAM) study; Summary and analysis. EPA/600/6-87/002a. (Washington, DC: 1987)
3. **Indiana has an opportunity to become a leader in creating healthy, more resilient and better performing homes in the Midwest**

An update to the 2018 IRC will give Indiana an opportunity to join other states in the process of adopting the most recent model energy code including Illinois, Ohio, Minnesota and parts of Missouri. It will also showcase Indiana as a national leader in claiming the demonstrated economic and social benefits of more efficient residential buildings. As shown in the timeline of residential state adoption efforts below, Indiana last updated their energy code in 2012 when they updated to a code based on Ch. 11 of the 2009 IRC. Although the 2009 IRC was good at the time, construction practices and advancements in the building sector make this code, written almost a decade ago, in need of an update. The 2018 IRC builds on the 2009 IRC by including key provisions that will help ensure all residential buildings are constructed to meet current standards for building efficiency and occupant health, safety, and comfort.

![Residential Building Energy Code Adoption Timeline](image)

4. **Adopting the 2018 IRC Chapter 11 will provide more flexibility in terms of compliance paths than the current code**

Included in the 2018 IRC is a key update that provides more flexibility to the builders when complying with the code. With the adoption of the unamended 2018 IRC, builders will now have another option for compliance, the new Energy Rating Index (ERI) compliance path (R406). The ERI is a unique performance compliance path which uses an energy model - typically a Home Energy Rating Score (HERS) - to account for all efficiency aspects in a home, including measures that are not covered in the other three paths of compliance. The ERI path allows for full credit for more efficient HVAC equipment, water heaters, appliances and renewable energy. With this path, builders need to meet the ERI target number, and all mandatory requirements in the code. Additionally, the 2009 International Energy Conservation Code (IECC) building thermal envelope provisions are included as the minimum level requirements. This leaves significant opportunities for builders to trade off the
efficiency of other components in the code for, say, a more efficient HVAC system, tighter building envelope or more attic insulation.

Increased flexibility is incorporated into other provisions in the code as well. The 2018 IRC gives more flexibility for duct design, allowing sealed and insulated ductwork that is buried in the attic insulation to be considered to be in conditioned space. Also, although the sealing and testing of ducts are mandatory, the total leakage number a builder must meet for code compliance is considered a prescriptive component. This means that if a builder were using the two performance paths for compliance (R405 and R406) they would have the flexibility to improve the efficiency of a different component in exchange for a less sealed duct system.

5. Meeting key requirements listed in the 2018 IRC Chapter 11 is well within the capabilities of residential builders in Indiana

A recent statewide analysis of HERS rated homes (2014-2016), shows that over 50% of newly constructed single-family homes built in Indiana received a HERS rating. This robust dataset not only reveals that builders are building efficient homes - average HERS score of 66 - but also demonstrates that a high percentage of builders are regularly meeting or exceeding key code requirements in the 2018 IRC.11

In terms of performance testing, over 50% of builders in the state are already meeting the 2018 IRC mandatory code requirement to test the level of air leakage in their homes. Those tests reveal that all builders in the dataset meet the state’s current energy code requirement of 7 ACH50, with half already meeting or exceeding the 2018 IRC home tightness levels (3 ACH50).

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Regarding duct leakage in an HVAC system, builders in this dataset are required to comply with the requirements in the current state code (2009 IRC) by either installing ducts entirely within the building thermal envelope (12% of builders) or meeting a leakage rate to the outside of 8% (8 cfm/25/100 sq. ft.) or lower for ducts in unconditioned space. The 2018 IRC improves this standard by requiring ducts in unconditioned space meet a 4% (4 cfm/25/100 sq. ft.) total duct leakage test. The graph below which shows that 74% of HERs rated homes currently meet 4% leakage to the outside – an encouraging sign that builders can cost-effectively construct duct work with the ability to meet the 2018 IRC requirements.

Additionally, the vast majority of rated homes already meet or exceed the 2018 IRC requirement for window efficiency. As shown in the graph below, 84% of homes in the dataset have windows that meet or exceed a U-factor of .32 and half exceed a .30, the prescriptive requirements for CZ 4 and 5 of the 2018 IRC.
The level of construction for the three energy code measures discussed above is consistent with the findings from the recent single-family residential energy code field studies funded by the U.S. Department of Energy. Results from these eight studies in various climate zones indicate that builders have consistently exceeded energy code requirements for air sealing, duct leakage and window efficiency.\textsuperscript{12}

The adoption of the unamended chapter 11 of the 2018 IRC is a cost-effective way to gradually increase the level of residential efficiency while remaining competitive with neighboring states throughout the region. Over the past four years most of the surrounding states have updated their residential building energy code to the 2012 IECC or better with Illinois, Minnesota, Ohio and parts of Missouri currently adopting the 2018 IECC. We urge the council to support the adoption of Chapter 11 of the 2018 IRC in Indiana to reduce the long-term energy use and costs for residents, create healthier and more comfortable indoor environments and increase the resiliency of the building stock so new residential dwellings last for the next 75-100 years.

If you have any questions about this testimony, noted reports and references, or the general impact and analysis of building energy codes, please contact Ian Blanding, Senior Building Policy Associate for MEEA at iblanding@mwalliance.org or 312-784-7269.

Sincerely,

Stacey Paradis
Executive Director

Residential Energy Use Comparison: IN (CZ 4 + 5)

IN 2009 IECC, 2018 IECC

The adoption of the unamended 2018 International Energy Conservation Code (IECC) will greatly benefit Indiana residents by improving the comfort, air quality, efficiency and performance of newly constructed residential buildings. In addition to improving building performance, the 2018 IECC will ensure critical efficiency components are installed - for all income levels - when its most cost-effective to do so, during the initial construction of the building. Below are findings which highlight the potential for energy and energy cost savings when building to the unamended 2018 IECC in climate zone 4 and 5.¹ On the back of this sheet MEEA provides a description of specific code improvements that largely influence building improvements.

Comparison of Current Indiana Code against the 2018 IECC as Written

- If the unamended 2018 IECC were adopted, a future homeowner could expect to reduce energy use by 25% and save ~$500 per year on energy bills.
- If the 2018 IECC were passed as written, the local economy could expect to gain $6.6 million in the first year.

<table>
<thead>
<tr>
<th>Reduced Energy Use Per Home</th>
<th>Annual Energy Cost Savings Per Unit</th>
<th>Simple Payback Period¹</th>
<th>Net Positive Cash Flow²</th>
<th>Life-cycle Cost Savings²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Climate Zone 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24%</td>
<td>$427</td>
<td>5.2 years</td>
<td>10 months</td>
<td>$5,670</td>
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<tr>
<td>Climate Zone 5</td>
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</tr>
<tr>
<td>25%</td>
<td>$491</td>
<td>4.4 years</td>
<td>8 months</td>
<td>$6,825</td>
</tr>
</tbody>
</table>

Annual Statewide Economic Gain: ³ $6,600,000/yr
Annual Statewide Energy Savings: 607,000 MMBTU

Importance for Low-Income Households

Low-income households - which include an increasingly larger share of elderly adults - operate on fixed incomes and tight budgets.⁴ Both the energy savings and building health benefits associated with adopting the 2018 IECC are especially critical to improving the lives of this at-risk community for the following reasons:

- This population spends double the amount of their income on energy bills compared to the national average.⁵
- These residents do not have the opportunity to retrofit after the home is built; improving comfort, efficiency, and occupant health needs to be done during construction.
- Considering buildings are around for 50 -100 years, all newly built homes could eventually be occupied by low-income residents.

* Sources listed on the back of this page
Sources:
1. Based on MEEA REM/Design analysis using DOE model home specifications - IN 2009 IECC to 2018 IECC home. Determined energy savings and multiplied that by EIA Indiana 2016 residential energy costs.
2. Based on the US DOE methodology for residential cost-effectiveness in energy codes. Incremental Costs of $2,260 (cz4) and $2,197 (cz 5) were derived from the following sources: PNNL, RS Means, Home Depot, and local energy raters.
4. Now over 25 million American’s 60+ live at or below 250% of the federal poverty level. Incremental Costs of $2,260 (cz4) and $2,197 (cz 5) were derived from the following sources: PNNL, RS Means, Home Depot, and local energy raters.
5. Based on 14,640 new construction building permits in 2016. Source: U.S. Census data, 2016 1+2 Unit residential homes in Indiana. See ACEEE and EE for All. Lifting the High Energy Burden in America’s Largest Cities. Incremental Costs of $2,260 (cz4) and $2,197 (cz 5) were derived from the following sources: PNNL, RS Means, Home Depot, and local energy raters.

Significant Improvements from Adopting the 2018 IECC:

Building Thermal Envelope
- **Air Infiltration**: Tighter building envelopes and envelope testing
  - A tighter building envelope and a reduced air leakage rate will improve air quality, comfort and building efficiency.
  - This is verified by diagnostic blower door test; it is difficult to meet the requirement and realize energy benefits without testing.
- **Insulation**: Increased wall, ceiling and basement insulation (Climate zone dependent)
  - Increasing insulation is most cost-effective during initial construction and is not often addressed after the home is constructed.
- **Windows**: More efficient windows
  - More efficient windows and increased insulation improve the building thermal envelope resulting in improved efficiency and comfort.
- **Mechanical Ventilation**: Whole house mechanical ventilation that meets the 2015 IRC/IMC is required
  - Controlled ventilation guarantees the exchange of fresh and filtered air in the home, resulting in better indoor air quality.

HVAC System
- **Duct Tightness**: More effective duct systems through reduced leakage
  - A tighter duct system and a reduced leakage rate improve air quality and duct system efficiency.
  - This requirement is verified with a diagnostic duct leakage test when the ducts are not entirely within conditioned space.

Lighting
- **Lighting**: 40% increase in efficient lighting
  - This change will result in cost-effective electricity savings for the homeowner.
How do building energy codes benefit Indiana residents?

- Lower energy bills
- Healthier indoor air
- A stronger economy

If Indiana adopts the 2018 IECC, over the next 10 years residents will save:

**Energy Savings (dollars)**

$250,163,000

That's enough savings to:

- Pay for **6,481** students to attend 4 years of college
- Build **1,924** miles of new bike lanes
- Buy **357,376** new laptop computers

**Energy Savings (MMBTU)**

16,847,000

In energy, that's like:

- Powering **177,314** homes for a year
- Installing **416** new wind turbines
- Powering **7,168,936** refrigerators for a year

**About MEEA:** The Midwest Energy Efficiency Alliance (MEEA) is a collaborative network focused on advancing energy efficiency in the Midwest for sustainable economic development and environmental stewardship.

**Contact:** Ian Blanding, Sr. Building Policy Associate
iblanding@mwalliance.org, (312)784-7269
Robust Energy Codes Result in Healthier Buildings and Healthier Residents

Outdated or unenforced energy codes can lead to buildings with poor indoor air quality, dangerous mold growth and rotting structural members, which not only cost the owner more money in higher operating costs, but also impact their health.

Just like all building codes, energy codes are truly life-safety codes. They exist to protect building occupants and communities.

Buildings are Systems – Energy Codes Make Them Work

Buildings are complex, interconnected systems, much in the same way that a car is a system. If an auto manufacturer installs just one faulty component, it is not just a daily annoyance, it can send a ripple effect across the car. A poorly installed suspension negatively impacts ride comfort, tire wear, gas mileage and, most importantly, it effects safety by degrading steering control.

Energy codes are critical to ensuring that buildings operate as intended. They integrate electrical, heating, cooling, ventilation and building envelope components to provide a safe, healthy and comfortable place to live and work.

Indoor Air Quality

Adequate ventilation is necessary to remove indoor pollutants and provide a healthy indoor environment. But not all ventilation is good ventilation. A leaky home allows for air to move uncontrolled through cracks in walls, attics, crawlspaces and other areas where harmful contaminants often freely collect. Just like plumbing codes assure safe drinking water, energy codes help assure the quality of the indoor air. The energy code requires that homes be well sealed to keep pollutants out and properly ventilated to control the source of incoming fresh air, making the home healthier and safer for occupants. As the saying goes: “Build tight and ventilate right.”

Moisture Management

Moisture infiltration can lead to rotting construction materials and harmful mold growth. A well-sealed envelope is the first defense, but no moisture barrier is perfect. Understanding this, the energy code also provides options for building materials to dry out. Additionally, by requiring a well-insulated building envelope, the energy code helps keep old outside air from the warm interior, reducing condensation and ice damming.

Resilient Buildings

Homes built to newer energy codes are more resilient. A study conducted after Superstorm Sandy found that homes built to newer energy codes enabled residents to safely stay in their homes longer after a power outage. The ability to shelter in place longer saves lives and provides critical flexibility for deploying first responder resources. This benefit is a direct result of the improvements newer energy codes make to the building envelope.
How the Energy Code Improves a Home

**EFFICIENT LIGHTING**
Installing LEDs or CFLs dramatically lowers electricity usage and reduces unwanted heat in the home.

**HVAC SYSTEM SIZING**
Properly sizing the HVAC system reduces capital costs, prolongs the life of the system, and improves system efficiency.

**CEILING INSULATION**
Installing adequate insulation properly reduces heat transfer and prevents destructive ice-damming in the winter.

**THERMAL BARRIER**
Installing adequate insulation on all sides of the home improves occupant comfort and reduces the heating and cooling load.

**AIR BARRIER**
Sealing cracks and penetrations prevents unwanted air movement and improves indoor air quality by reducing contaminants in the living environment.

**EFFICIENT WINDOWS**
It is critical that windows be well insulated and well-sealed to prevent unwanted heat transfer and moisture infiltration.

**DUCT SEALING**
Sealing all components of the HVAC system, and testing to verify, improves indoor air quality, system efficiency, and increases occupant comfort by ensuring air is evenly distributed to all rooms in the home.

**MECHANICAL VENTILATION**
Installing a dedicated exhaust, supply or balanced ventilation system improves indoor air quality by guaranteeing source-controlled fresh air is being supplied to the home.

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