A Look Inside the Crystal Ball: The Top 10 Potential Changes to the Commercial Provisions of the Next Michigan Energy Code

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Disclaimer

• This top ten list of POTENTIAL changes to the Michigan Energy Code (MEC) is neither exhaustive nor guaranteed. Instead, it highlights significant updates to the ASHRAE 90.1-2013 standard on which the current MEC is based, and which may be incorporated into the next iteration of the MEC.

• Material in this presentation is not written in code language; and many code excerpts are paraphrased.

• Exceptions apply to many provisions. Users of the code are encouraged to consult the complete texts of 2015 MEC, ASHRAE Standard 90.1-2013, ASHRAE 90.1-2019 and the IECC 2021 for complete details, criteria, requirements and exceptions.
State Energy Code Development

We Are Here

- Model Promulgation
- Federal Guidance
- State Regulatory Action
- Notice of Intent
- Public Review & Comment
- Code Revision
- Code Adoption
The report provides analysis of two LCC scenarios:

- **Scenario 1**, representing publicly-owned buildings, considers initial costs, energy costs, maintenance costs, and replacement costs—without borrowing or taxes.
- **Scenario 2**, representing privately-owned buildings, adds borrowing costs and tax impacts.

Figure 1 compares annual energy cost savings, first cost for the upgrade, and net annualized LCC savings. The net annualized LCC savings per square foot is the annual energy savings minus an allowance to pay for the added cost under scenario 1. Figure 2 shows overall state-weighted net LCC results for both scenarios. When net LCC is positive, the updated code edition is considered cost-effective.
Primary Sources for the Current MEC-2015

EXCEPT the following sections:

- C107 – Fees
- C108 – Stop Work Order
- C301.2 – Warm Humid Counties
- C302 – Design Conditions
- C401 – General Requirements
- C403 – Building Mechanical Systems
- C404 – Service Water Heating
- C405 – Electrical Power & Lighting Systems
- C406 – Additional Efficiency Options
- C407 – Total Building Performance
- C508 - Commissioning
- C502 – Additions to Existing Buildings
- C503 – Alterations
- C503.2 – Changes in Space Conditioning
- C503.3 – Building Envelope
- C503.4 – HVAC Systems
- C503.5 – Service Hot Water
- C503.6 – Lighting Systems

EXCEPT the following sections:

- 8.4.2 – Automatic Receptacle Control
- 8.4.3 – Electrical Energy Monitoring

Data excerpted and adapted from 2015 IECC, 2021 IECC, ASHRAE 90.1-2013 and/or ASHRAE 90.1-2019. Exceptions may apply. See the source documents for complete details.
Primary Sources for the Proposed MEC

EXCEPT the following sections:
- C104 – Fees
- C109 – Stop Work Order
- C110 – Board of Appeals
- C405.12 – Energy Monitoring

EXCEPT the following sections:
- 8.4.3 – Electrical Energy Monitoring

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Energy Impacts to Advances in ASHRAE 90.1

Data excerpted and adapted from 2015 IECC, 2021 IECC, ASHRAE 90.1-2013 and/or ASHRAE 90.1-2019. Exceptions may apply. See the source documents for complete details.
Terminology Updates

New terminology to reflect advancing concerns and concepts in energy efficiency. Examples include:

- Ceiling fan, large diameter
- Combined Energy Efficiency Ratio (CEER)
- Commissioning
- Enthalpy Recovery Ratio
- Fan Energy Index (FEI)
- Functional Performance Testing (FPT)
- Integrated Seasonal Coefficient of Performance (ISCOP)
- Integrated Seasonal Moisture Removal Efficiency (ISMRE)
- IT Equipment Energy
- Occupied Standby Model
- Off-mode power consumption
- Regulated Energy Use
- Standby Power Consumption
- Unregulated Energy Use

Data excerpted and adapted from 2015 IECC, 2021 IECC, ASHRAE 90.1-2013 and/or ASHRAE 90.1-2019. Exceptions may apply. See the source documents for complete details.
Changes in Climate Zones

<table>
<thead>
<tr>
<th>County</th>
<th>Current Climate Zone</th>
<th>Potential New Climate Zone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baraga</td>
<td>7</td>
<td>6A</td>
</tr>
<tr>
<td>Chippewa</td>
<td>6</td>
<td>6A</td>
</tr>
<tr>
<td>Gogebic</td>
<td>7</td>
<td>6A</td>
</tr>
<tr>
<td>Houghton</td>
<td>7</td>
<td>6A</td>
</tr>
<tr>
<td>Huron</td>
<td>6A</td>
<td>5A</td>
</tr>
<tr>
<td>Iron</td>
<td>7</td>
<td>6A</td>
</tr>
<tr>
<td>Luce</td>
<td>7</td>
<td>6A</td>
</tr>
<tr>
<td>Mackinac</td>
<td>7</td>
<td>6A</td>
</tr>
<tr>
<td>Marquette</td>
<td>6A</td>
<td>7</td>
</tr>
<tr>
<td>Ontonagon</td>
<td>7</td>
<td>6A</td>
</tr>
</tbody>
</table>

Data excerpted and adapted from 2015 IECC, 2021 IECC, ASHRAE 90.1-2013 and/or ASHRAE 90.1-2019. Exceptions may apply. See the source documents for complete details.
Benefits of Commissioning

Percent of Projects with Deficiencies Identified through Commissioning

- Total HVAC: 34% Existing, 61% New
- Cooling Plant: 37% Existing, 55% New
- Heating Plant: 29% Existing, 46% New
- Thermal Distribution: 21% Existing, 33% New
- Terminal Units: 21% Existing, 33% New
- Lighting: 26% Existing, 37% New
- Envelope: 2% Existing, 5% New
- Plug Loads: 8% Existing, 3% New
- Controls: 20% Existing, 50% New
- Other: 18% Existing, 7% New

Project Commissioning Updates

Building Systems Verification & Testing Requirements

• Functional Performance Testing for:
  – Building Systems
  – Controls
  – Building Envelope

• Construction Documents (CD) to Identify the V&T service providers

• V&T service providers to review CDs and verify that
  • Sensors, locations & control sequences are properly specified
  • Performance and testing criteria are specified
  • Equipment to be test is accessible for both testing and on-going maintenance

• V&T service provider to
  • certify completion of V&T
  • Provide a plan for completing and deferred testing

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Building Commissioning (Cx) Requirements

• In accordance with the current version of ASHRAE Standard 202 or other generally accepted engineering standard acceptable to the AHJ for projects with conditioned space ≥ 10,000 ft² and a combined heat, cooling & service water heating load of ≥ 960 MBH.

• Applies to:
  − Controls
  − Building Systems
  − Building Envelope

• Commissioning service providers to:
  − Submit design review report to owner prior to permit issuance
  − Ensure that commissioning requirements to be included in construction documents
  − Certify completion of the commissioning process with required documentation
  − Document completion of all V&FPT prior to building occupancy
  − Provide Owner all V&FPT documentation OR the preliminary Commissioning Report

• Owner to provide the AHJ with either:
  a) Transmittal letter acknowledging receipt and acceptance of V&FPT and Cx documents, OR
  b) Copy of the certified V&FPT results and the plan for deferred V&FPT

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## Project Commissioning Updates

<table>
<thead>
<tr>
<th>Building Systems Verification &amp; Testing Requirements</th>
<th>Building Commissioning Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Building Envelope</td>
<td>The Energy Performance of the:</td>
</tr>
<tr>
<td>• The following are calibrated, adjusted, configured and operating in accordance with applicable criteria:</td>
<td>• Building Envelope</td>
</tr>
<tr>
<td>• HVAC Controls</td>
<td>• HVAC Mechanical Systems</td>
</tr>
<tr>
<td>• SWH Controls</td>
<td>• SWH Systems</td>
</tr>
<tr>
<td>• Automatic Receptacle Controls</td>
<td>• Power Systems</td>
</tr>
<tr>
<td>• Lighting Control Devices and Systems</td>
<td>• Lighting System</td>
</tr>
<tr>
<td>• Service Water Booster System Controls</td>
<td>• Service Water Booster System Controls</td>
</tr>
<tr>
<td>• Elevator Standby Control</td>
<td>• Elevators, Escalators, and Moving Walks</td>
</tr>
<tr>
<td>• Whole-Building Energy Monitoring</td>
<td>• Air Curtains</td>
</tr>
<tr>
<td></td>
<td>• Whole-Building Energy Monitoring</td>
</tr>
<tr>
<td></td>
<td>• Pumps</td>
</tr>
</tbody>
</table>

Data excerpted and adapted from 2015 IECC, 2021 IECC, ASHRAE 90.1-2013 and/or ASHRAE 90.1-2019. Exceptions may apply. See the source documents for complete details.
### EXCERPTED

<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Items to Verify</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.4.3.1.2</td>
<td>Air Barrier</td>
<td>Continuity at all transitions; surfaces clean; installed within allowed weather conditions; adequately seal and attached to substrate</td>
</tr>
<tr>
<td>6.4.2</td>
<td>Load Calculations</td>
<td>HVAC equipment matches the load and pump head calculations</td>
</tr>
<tr>
<td>6.5.1.1</td>
<td>Air Economizers</td>
<td>Damper control sequences are properly configured; damper leakage rate; high limit shut-off properly set; sensor accuracy and calibration</td>
</tr>
<tr>
<td>6.5.3.2</td>
<td>Fan Control</td>
<td>Fan have VSD/VFD/MSC where required. Sensors and control sequences are properly implemented. VAV static pressure set point is reset.</td>
</tr>
<tr>
<td>7.4.5.3</td>
<td>Pool Time Switch Controls</td>
<td>Pool heater and pump controls are properly configured.</td>
</tr>
<tr>
<td>8.4.2</td>
<td>Automatic Receptacle Control</td>
<td>Proper control integration and receptacle labeling</td>
</tr>
<tr>
<td>9.9.1</td>
<td>Lighting Functional Testing</td>
<td>Required functional testing for occupant sensors, automatic time switches, and daylight responsive controls is completed.</td>
</tr>
</tbody>
</table>

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New Requirement: Air Leakage Testing

MAXIMUM AIR LEAKAGE

0.4 cfm/ft² under a pressure differential of 0.3 in w.c.,
OR
≤ 0.6 cfm/ft² with smoke tracer or infrared imaging under pressurization

<table>
<thead>
<tr>
<th>EXCEPTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ASHRAE 90.1-2019</strong></td>
</tr>
<tr>
<td>Buildings &gt; 50,000 ft² allows testing on building portions</td>
</tr>
<tr>
<td>A continuous air barrier design &amp; installation verification program is in place.</td>
</tr>
</tbody>
</table>

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Commercial Building Entrance Updates

Air Curtains can be used in lieu of vestibules or revolving doors for buildings with:

- Self-closing doors
- ≤15 stories
- Design Jet Velocity of 6.6 ft/s
- Angle to door < 20 deg
- Automatic controls
- Commissioned

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Vestibule Temperature Control Update

• Controlled by a thermostat
• Automatic controls to shut off heating when OAT > 45°F
• Maximum space heating setpoint of 60°F
• Minimum space cooling setpoint of 85°F

• Exceptions:
  • Vestibules tempered with transfer or site-recovered air that would otherwise be exhausted

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Energy Recovery System Updates

• VAV system optimization required with ERVs
• Dwelling units require ERVs
• Must be used when:
  • Designs require > 135% of the generally ventilation level
  • Acute, in-patient, 24-hour hospitals:
    • Use hot water for space heating
    • Have design cooling load of > 3,600 MBH
    • Have simultaneous heating and cooling at OATs above 60°F
    • Natatorium heated pools are > 500 ft²
• Clarified requirement that ERVs should be sized heating AND cooling design conditions
• Threshold at which ERVs are required is raised

Exceptions
• Not required in Climate Zone 7
• Not required for building sourcing ≥ 60% of reheat energy from on-site renewables or recovered energy

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# Exhaust Air Energy Recovery Update

## CURRENT MEC (ASHRAE 90.1-2013) EXHAUST AIR ENERGY RECOVERY REQUIREMENT

<table>
<thead>
<tr>
<th>Annual Run-Hours</th>
<th>% Outdoor Air at Design Flowrate</th>
<th>10% ≤ X ≤ 20%</th>
<th>20% ≤ X ≤ 30%</th>
<th>30% ≤ X ≤ 40%</th>
<th>40% ≤ X ≤ 50%</th>
<th>70% ≤ X ≤ 80%</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 8000</td>
<td>Climate Zone</td>
<td>Design Supply Fan Airflow Rate, cfm</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5A, 6A</td>
<td>≥ 26,000</td>
<td>≥ 16,000</td>
<td>≥ 5,500</td>
<td>≥ 4,500</td>
<td>≥1,000</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>≥ 4,500</td>
<td>≥ 4,000</td>
<td>≥ 2,500</td>
<td>≥ 1,000</td>
<td>&gt; 0</td>
<td></td>
</tr>
<tr>
<td>≥ 8000</td>
<td>Climate Zone</td>
<td>Design Supply Fan Airflow Rate, cfm</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5A, 6A, 7</td>
<td>&gt; 0</td>
<td>&gt; 0</td>
<td>&gt; 0</td>
<td>&gt; 0</td>
<td>&gt; 0</td>
<td></td>
</tr>
</tbody>
</table>

## POTENTIAL NEW MEC (ASHRAE 90.1-2019) EXHAUST AIR ENERGY RECOVERY REQUIREMENT

<table>
<thead>
<tr>
<th>Annual Run-Hours</th>
<th>% Outdoor Air at Design Flowrate</th>
<th>10% ≤ X ≤ 20%</th>
<th>20% ≤ X ≤ 30%</th>
<th>30% ≤ X ≤ 40%</th>
<th>40% ≤ X ≤ 50%</th>
<th>70% ≤ X ≤ 80%</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 8000</td>
<td>Climate Zone</td>
<td>Design Supply Fan Airflow Rate, cfm</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5A, 6A</td>
<td>≥ 26,000</td>
<td>≥ 16,000</td>
<td>≥ 5,500</td>
<td>≥ 4,500</td>
<td>≥1,000</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>≥ 4,500</td>
<td>≥ 4,000</td>
<td>≥ 2,500</td>
<td>≥ 1,000</td>
<td>&gt; 100</td>
<td></td>
</tr>
<tr>
<td>≥ 8000</td>
<td>Climate Zone</td>
<td>Design Supply Fan Airflow Rate, cfm</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5A, 6A, 7</td>
<td>&gt; 200</td>
<td>&gt; 130</td>
<td>&gt; 100</td>
<td>&gt; 80</td>
<td>&gt; 50</td>
<td></td>
</tr>
</tbody>
</table>

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Removed Separate Requirement: Computer Room Economizers

Minimum Fan Cooling Size for which Economizer is Required

<table>
<thead>
<tr>
<th>Application</th>
<th>Zone</th>
<th>Size at which Economizer is Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comfort or Computer Rm</td>
<td>5A, 6A, 7</td>
<td>≥ 4.5 tons</td>
</tr>
</tbody>
</table>

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New Requirement: Fault Detection

• Applies to DX equipment with economizers.
• Notifies operators that equipment is malfunctioning.

DIAGNOSTIC EXAMPLES
• Check if outdoor-air damper is modulating
• Detect sensor faults
• Detect if the RTU is not economizing when it should
• Detect if the RTU is economizing when it should not

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New Requirement: Occupied Standby Mode

Applies to zones /rooms:
• Required to have automatic partial or full OFF lighting controls
• Ventilation Rate Procedure of ASHRAE 62.1 is used
• Permitted by ASHRAE 62.1 to have zero ventilation in the occupied standby mode.
• Allows standby period airflow only when zones are outside of their temperature limits

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# Parking Lot Lighting Controls Update

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Occupancy Based-Control</strong></td>
<td>Lighting for each luminaire automatically reduced by at least 30%-50% when no activity detected for 20-10 minutes</td>
</tr>
<tr>
<td><strong>Transition Lighting</strong></td>
<td>Lighting for each luminaire automatically reduced by at least 50% to ( \leq \text{general lighting level} ) from sunset to sunrise</td>
</tr>
<tr>
<td><strong>Perimeter Lighting</strong></td>
<td>Lighting for each luminaire within 20 ft of any perimeter wall having a net opening to wall area ratio ( \geq 40% ) wall opening of ( \geq 24 \text{ ft}^2 ) must have \textit{continuous dimming} day-light responsive control that maintains the required illuminance level with the lowest sufficient power input.</td>
</tr>
</tbody>
</table>

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Simplified Building Method for Lighting

- At least 80% of floor area must support at least one (1) of these building types:
  - Office buildings
  - Retail buildings
  - School buildings
- \( \leq 25,000 \text{ ft}^2 \)
- Similar to BAM Approach
- Occupancy Based Automatic Controls

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<table>
<thead>
<tr>
<th>Simplified Lighting Method Required Control</th>
<th>Office Bldg</th>
<th>School Bldg</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Parking Garage</strong>&lt;br&gt;<strong>All Other Interior Spaces</strong></td>
<td>0.70 W/ft²&lt;br&gt;0.13 W/ft²</td>
<td>0.70 W/ft²&lt;br&gt;0.13 W/ft²</td>
</tr>
<tr>
<td>All lighting automatically OFF when unoccupied or scheduled to be unoccupied.</td>
<td>All other than stairwell, corridors, &amp; parking</td>
<td></td>
</tr>
<tr>
<td><strong>Manual control allowing occupant to reduce lighting power by ≥ 50% and to turn lighting OFF</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Manual ON occupant sensors</strong></td>
<td>• &lt;250 ft²&lt;br&gt;• Meeting&lt;br&gt;• Training&lt;br&gt;• Storage</td>
<td>• Class&lt;br&gt;• Conference&lt;br&gt;• Break</td>
</tr>
<tr>
<td><strong>Occupant Sensors</strong></td>
<td>• &gt;250 ft²&lt;br&gt;• Restrooms</td>
<td></td>
</tr>
<tr>
<td><strong>Automatic occupant sensors that reduce lighting power ≥ 50% when no activity detected for 20 minutes and OFF when unoccupied or scheduled to be unoccupied</strong></td>
<td>• Stairwells&lt;br&gt;• Corridors</td>
<td></td>
</tr>
<tr>
<td><strong>Automatic occupant sensors controlling ≤ 3600 ft² to OFF during garage non-operating hours and to reduced power of ≥ 50% when no activity detected for 20 minutes.</strong></td>
<td>• Parking Garage</td>
<td></td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>Simplified Lighting Method Required Control</th>
<th>Bldg Exterior Area</th>
<th>Bldg Exterior LPD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Luminaires OFF or power reduced by 75% during non-operating hours</td>
<td>• Base Allowance</td>
<td>200 W/ft²</td>
</tr>
<tr>
<td>Luminaires OFF or power reduced by 75% during non-operating hours</td>
<td>• Façade Lighting</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Special Features</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Walkways</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Plazas</td>
<td>0.10 W/ft²</td>
</tr>
<tr>
<td>Luminaires OFF or power reduced by 75% during non-operating hours</td>
<td>• Landscaping</td>
<td>0.04 W/ft²</td>
</tr>
<tr>
<td>Luminaires OFF or power reduced by 75% during non-operating hours</td>
<td>• Entry Doors</td>
<td>14 W/ft</td>
</tr>
<tr>
<td>No additional</td>
<td>• Stairs</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Ramps</td>
<td>0.70 W/ft²</td>
</tr>
<tr>
<td>Luminaires mounted 25 ft above grade controlled to reduce lighting power $\geq$ 50% when no activity detected for $\leq$ 15 minutes.</td>
<td>• Parking Lot</td>
<td>0.05 W/ft²</td>
</tr>
<tr>
<td></td>
<td>• Drives</td>
<td></td>
</tr>
<tr>
<td>Luminaires OFF or power reduced by 75% during non-operating hours</td>
<td>• All Other</td>
<td>0.20 W/ft²</td>
</tr>
</tbody>
</table>

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The Result is Savings of...

from the design and construction of commercial buildings for efficient energy consumption over their useful life.
Thank you!

For additional questions or to chat more about the Michigan Energy Code, contact

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