Energy Codes and New Multifamily Construction

Henry Odum, P.E.
Transformation of the building industry to energy efficient carbon neutral buildings
WA State Law: 70% Reduction in Energy Use by 2030
Incremental Improvement Compared to Targets

<table>
<thead>
<tr>
<th>Year</th>
<th>Residential</th>
<th>Commercial</th>
<th>Target: 8.75% savings compared to the 2006 WSEC</th>
<th>Target: 14% savings compared to each previous code</th>
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<tbody>
<tr>
<td>2006</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
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<tr>
<td>2009</td>
<td>82.7%</td>
<td>86.8%</td>
<td>91%</td>
<td>86%</td>
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<tr>
<td>2012</td>
<td>76.1%</td>
<td>82.0%</td>
<td>83%</td>
<td>74%</td>
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<tr>
<td>2015</td>
<td>68.0%</td>
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<td>74%</td>
<td>64%</td>
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<tr>
<td>2018</td>
<td></td>
<td></td>
<td>65%</td>
<td>55%</td>
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<td>2021</td>
<td></td>
<td></td>
<td>56%</td>
<td>47%</td>
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<td>2024</td>
<td></td>
<td></td>
<td>48%</td>
<td>41%</td>
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<td>2027</td>
<td></td>
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<td>39%</td>
<td>35%</td>
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<td>2030</td>
<td></td>
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<td>30%</td>
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Seattle Midrise Baseline

\[ EUI \approx 40 \text{ kBtu/ft}^2/\text{yr} \]

Multifamily Energy End Uses

EUI BY END USE (TYPICAL MID-RISE)

- Domestic Hot Water: 10 kBtu/ft²/yr
- Common Space Heat: 5 kBtu/ft²/yr
- Apartment Space Heat: 5 kBtu/ft²/yr
- Common Electric: 10 kBtu/ft²/yr
- Apartment Electric: 10 kBtu/ft²/yr
Central Heat Pump Water Heating
Ecotope Central HPWH Design Portfolio

**Low Rise | 10-65 dwelling units**
- Elizabeth James - 65 units - (4) Sanden CO2 Heat Pumps, Retrofit
- Grow Communities - 3 bldgs, 12 units each - Daikin Altherma
- Puyallup Tribal - 20 units - VRF Plant, GSHP Plant
- Alma Gamble – 12 units – Daikin Altherma retrofit

**Mid Rise | 50-400 dwelling units**
- Stream - 134 units - (2) 10T Colmac Air-Source HP in below-grade parking
- Sunset Electric - 92 units - Colmac in below-grade parking
- Stackhouse - 120 units - Colmac in underground parking deck
- Augusta Apartments - 224 units - Colmac in below-grade parking
- Batik Apartments - 195 units - Colmac in underground parking deck
- Yesler 3 - 227 units - Colmac in underground parking deck
- Jackson Apartments - 526 units - Colmac in underground parking deck
- Colina Apartments – 131 units, Sanden - Decentralized
- The Vale Apartments - 134 units - Versati 2, Multi-Pass
- Waterfront Place - 137 units - Versati 2, Multi-Pass
- Hopeworks – 67 units - Sanden CO2 Stacks
- Meridian Manor – 90 units - Aermec Retrofit

**High Rise | 200-450 dwelling units**
- 4700 Brooklyn - 284 units - Colmac with VRF Temp Maintenance
- Cascade - 430 units - Colmac with VRF Temp Maintenance
- 1200 45th -245 units - In Design
- Security House – 107 units - Daikin Altherma preheat
Investigation of Airtightness and Ventilation Interactions in New Multifamily Buildings
Field Study
Methodology

10 mid-rise and 2 high-rise MF

9 exhaust-based and 3 balanced-flow ventilation systems

Whole-building airtightness test required

Top/bottom floors preferred (stack effect)

5 different test scenarios
Differential Pressure with respect to Exterior - Envelope Tightness

(Mid-Rise Exhaust-Based Ventilation)
Differential Pressure with respect to Exterior – Relative Height (Mid-Rise Only)
Differential Pressure with respect to Exterior – Base Ventilation Rate

(High-Rise Only)
Differential Pressure with respect to Exterior – Base and All-ON
(All Mid-Rise Buildings)
Airtightness and Appliances

Traditional dryers impacted
(Ventless!)

Kitchen range hoods unaffected
Airtightness and Ventilation

Balanced flow ventilation with ERV/HRV:

1. Whole Building
2. Floor-by-floor
3. Unit-by-unit
   - Ducted
   - Through-the-wall
Thank you!

Henry Odum, P.E.

henry@ecotope.com