Hours of Safety

How Better Buildings Help Us Shelter In Place in Extreme Cold Events

April 13, 2022
What happens when extreme cold brings down the grid?

- Most appliances stop working
- Roads may become inaccessible
- Indoor temperatures begin to drop
Prolonged cold exposure can be deadly

**Death toll from Texas cold snap in February rises to 210**

**Cold weather-related deaths reach 17 in Iowa during winter season**

**21 People Died in Weather-Related Incidents During the Polar Vortex**

**Hundreds of Deaths as Europe Struggles With Snow Amid an Intense Cold Snap**

**More than 2 dozen deaths blamed on record-setting cold blast**

**Most Vulnerable Populations:**
- Low income residents
- Renters
- Elderly residents
- Children
- Those with prior medical conditions
- Rural/isolated areas

**Proposed Cold Stress Thresholds**

<table>
<thead>
<tr>
<th>Temp Range</th>
<th>Stress Scale</th>
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<tbody>
<tr>
<td>64 °F</td>
<td>Min safe temp for vulnerable populations</td>
</tr>
<tr>
<td>60-64 °F</td>
<td>Safe temp for healthy populations</td>
</tr>
<tr>
<td>50-60 °F</td>
<td>Mild cold stress</td>
</tr>
<tr>
<td>40-50 °F</td>
<td>Moderate cold stress</td>
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<tr>
<td>Below 40 °F</td>
<td>Severe cold stress</td>
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Building envelopes and passive resilience

A building envelope is the outer shell that separates indoor from outdoors:

- Walls
- Roofs
- Foundations, slabs, and basements
- Windows and doors

For most buildings, the envelope is your only protection from extreme weather once the grid goes down.
Better building envelopes allow residents to shelter in place through outages

RMI Modeling:

- Real weather event from Duluth, MN in 2017
- Temperature ranged between 5 to -25 °F over seven days
- Modeled a typical single family home with different levels of envelope performance:
  - 1950s era home
  - 1980s era home
  - 2009 IECC code
  - DOE Zero Energy Ready Home
  - Passive House
Better building envelopes allow residents to shelter in place through outages

Modeled Home | Hours of Safety (40 °F threshold)
--- | ---
1950s era home | 8
1980s era home | 23
2009 IECC Code | 45
DOE Zero Energy Ready Home (ZERH) | 61
Passive House | 152
This benefit isn’t quantified—and it should be!

Source: National Association for State Community Services Programs
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It’ll take time to deploy the Hours of Safety concept

- Better understand the health impacts/risks of sustained cold exposure
- Define correlation between various building characteristics and hours of safety for...
  - Different weather events (hot vs cold, short vs sustained duration)
  - Different building types
  - Different at-risk populations
- Create a standard Hours of Safety metric calculated using existing data streams
- Crafting guidelines for city/state adoption and utilization
Congress can support home resilience now

1. **Continue to scale-up funding for home retrofits** and ensure programs and incentives for weatherization, health and safety, clean energy, and affordability can be easily stacked together to create holistic, one-stop-shop retrofit programs.

2. **Support High Efficiency Home Rebate Program in reconciliation:** As envelopes tighten, IAQ becomes more of a concern, so it will be important to also support electrification. This program also provides funding for insulation and air sealing.
For more information...

https://rmi.org/insight/hours-of-safety-in-cold-weather/

Contact: mgartman@rmi.org