

Building Codes Save: Fire Hazards Pilot Study

September 2024

About

The Building Codes Save (BCS) – Fire Hazards Pilot Study built upon the “Building Codes Save: A Nationwide Study of Loss Prevention” by evaluating financial and life safety savings due to modern building codes. Specifically, the Pilot Study expands the hazards analyzed to include structure fire and wildfire.

For the purpose of this Pilot Study, structure fire is defined as any building fire not caused by wildfire, while wildfire is any building fire caused by wildfire.

The Pilot Study was conducted using data from California (statewide) and Colorado (Boulder and El Paso counties).

For structure fires, the results demonstrate considerable savings for building and contents, reaching nearly \$1.8 billion over the 75-year useful life of residential structures in California and over \$44.9 million in Boulder and El Paso counties, Colorado, due to modern codes. For wildfire, modern building codes savings of \$24.4 billion are estimated in California and \$457.7 million in Boulder and El Paso counties, Colorado, over the useful life of the properties.

Analysis

The analysis assessed savings by comparing structures built to pre-modern and post-modern codes. For structure fire, the year 2000 was used as a baseline for modern codes which follows the publication of

the 2000 International Residential Code (IRC) in both California and Colorado. For wildfire, 2008 was used in California, which aligns to the statewide implementation of California Building Code (CBC) Section 7A, Materials and Construction Methods for Exterior Wildfire Exposure. In Colorado, 2014 was used as the baseline year for modern codes, generally aligning to adoption of the International Wildland Urban Interface Code (IWUIC), or similar provisions, in the study area.

The Pilot Study was limited to:

- Single family residential (SFR) structures to narrow the types of codes considered; and
- Building codes, meaning non-code prevention measures, such as defensible space and public education, were not included as they are not typically incorporated into building codes.

Key Building Code Provisions Evaluated



Advancements in fire-rated assemblies



Introduction of early warning systems (i.e. smoke alarms)



Introduction of fire sprinkler systems



¹ The structure data used, including building value, is current through 2022. As a result, all dollar values presented in the Building Codes Save: Fire Hazards Pilot Study are 2022 U.S. dollars, unless stated otherwise.




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Results

Adoption of post-2000 I-Codes and CBC Section 7A/IWUIC will save billions of dollars in avoided future losses throughout the nation. The following tables provide a summary of fire hazard building code savings found in the Pilot Study over the 75-year SFR structure useful life and the average annual savings.

Building Code Savings - Buildings & Contents									
California Statewide				Colorado Boulder & El Paso Counties					
		75-year SFR Useful Life		Average Annual		75-year SFR Useful Life		Average Annual	
Structure Fire 2000 and later for CA and CO 		\$1.8 Billion	\$58.2 Million	\$44.9 Million	\$4.0 Million				
Wildfire 2008 and later for CA 2014 and later for CO 		\$24.4 Billion	\$325.1 Million	\$457.7 Million	\$6.1 Million				

Building Code Savings - Life Safety									
		Fatalities Averted		Injuries Averted		Fatalities Averted		Injuries Averted	
		#	\$	#	\$	#	\$	#	\$
Structure Fire 2000 and later for CA and CO* 		122	\$1.5 Billion	1,076	\$1.4 Billion	7	\$91.8 Million	66	\$83.9 Million

Of note, fatalities and injuries were only assessed for structure fires. While wildfires do cause significant fatalities and injuries, such losses were not investigated as part of the Study.

Modern Building Codes for Structure Fires:

- Reduced impacts due to earlier warnings (e.g., smoke alarms), faster suppression (e.g. sprinklers), and reduced spread between buildings;
- Reduced civilian and firefighters' injuries and fatalities;
- Approximately two-thirds of the estimated savings are attributable to reductions in structure fire-related fatalities and injuries;
- In California, more than \$4.7 billion in avoided losses of SFR structures constructed between 2000 and 2022 (building, contents, injuries, and fatalities over the 75-year useful life); and
- In Colorado (Boulder and El Paso counties), more than \$320.7 million in combined losses avoided from buildings constructed between 2000 and 2022.

Modern Building Codes for Wildfires:

- Codes focus on roof cover, enclosed eaves, meshed vents, and fire-resistant exterior siding material, which help suppress ignition around the building and prevent wildfire embers from entering homes;
- SFR structure more likely to survive in high-risk;
- In California, more than \$24.4 billion in total losses avoided and \$325.1 million annually (buildings and contents; over the 75-year SFR useful life); and
- In Colorado, more than and \$457.7 million in total losses avoided and \$6.1 million annually.

Next Steps & Contact

FEMA and USFA intend to expand the study nationally in the future, which will provide comprehensive insights into the benefits of modern building codes and identify best practices by region. For additional FEMA building science information, or to ask questions, please contact the following:

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