

Testimony on 1309 Committee working on Adoption of the 2012 International Residential Code for the State of Minnesota

To: Department of Labor and Industry

From: Minnesota State Fire Chiefs Association
Minnesota State Fire Department Association
Fire Marshals Association of Minnesota

Re: Testimony on 2012 IRC

Date: December 14, 2011

The Minnesota State Fire Chiefs Association, Minnesota State Fire Department Association and the Fire Marshals Association of Minnesota offer the following third party independent studies, reports, research papers and the like in support of adopting the 2012 IRC without amendment to the residential sprinkler requirement with the exception of those items detailed in our letter dated December 5, 2011 specific to discussion and proposed amendments.

We believe the Department is better served by reviewing these documents as compared to our interpretation or that of those who oppose the provision and use data, as they interpret it, to make their case.

Opposition to the proposed sprinkler provision seems to focus on two main areas; smoke detectors are adequate, and the cost/benefit of sprinklers. We believe the combination of the submitted research and our proposed discussion items for amendments (and subsequent inclusion) more than adequately address these issues.

The net effect of sprinklers is indisputable – they work! Adoption of the code with the sprinkler provision will reduce the occurrence of civilian deaths and injuries, firefighter deaths and injuries, property loss. Adoption will further departments in their ability to maintain a cost efficient operation which in turn result in stable or reduced propriety taxes. Finally, when you factor in the insurance savings to property owners the question on adoption is unequivocal; adopt.

The documents we are submitting address the following issues:

Report numbers 1 and 2	Smoke detectors alone are inadequate
Report numbers 3 and 4	Firefighter injuries, deaths, and costs
Report number 5 and 6	Needs assessment and cost of fire in the US
Report numbers 7 thru 12	Fire Dangers associated with lightweight construction
Report numbers 13 and 14	Effectiveness of Fire Sprinklers
Report numbers 15 thru 18	Cost Benefit of Sprinkler Systems
Report number 19	U.S. Fire Administration response to comments
Report number 20	National Fire Protection Association Comments on IRC Proposal

Reports

1. *Smoke Alarms in U. S Home Fires* September, 2011

National Fire Protection Association

Almost all households in the U.S. have at least one smoke alarm, yet in 2005-2009, smoke alarms were present in less than three-quarters (72%) of all reported home fires and operated in half (51%) of the reported home fires. ("Homes" includes one- and two-family homes, apartments, and manufactured housing.) More than one-third (38%) of all home fire deaths resulted from fires in homes with no smoke alarms, while one-quarter (24%) resulted from fires in homes in which smoke alarms were present but did not operate. The death rate per 100 reported fires was twice as high in homes without a working smoke alarm as it was in home fires with this protection. Hardwired smoke alarms are more reliable than those powered solely by batteries.

2. *Performance of Home Smoke Alarms Analysis of the Response of Several Available Technologies in Residential Fire Settings* February 2008

National Institute of Standards and Technology

This report presents the results of the project and provides details of the response of a range of residential smoke alarm technologies in a controlled laboratory test and in a series of real-scale tests conducted in two different residential structures. The data developed in this study include measurement of temperature and smoke obscuration in addition to gas concentrations for a range of fire scenarios and residences. The results are intended to provide both insight into siting and response characteristics of residential smoke alarms and a set of reference data for future enhancements to alarm technology based on fires from current materials and constructions. Smoke alarms of either the ionization type or the photoelectric type consistently provide time for occupants to escape from most residential fires, although in some cases the escape time provided can be short. Consistent with prior findings, ionization type alarms provide somewhat better response to flaming fires than photoelectric alarms, and photoelectric alarms provide (often) considerably faster response to smoldering fires than ionization type alarms. Escape times in this study were systematically shorter than those found in a similar study conducted in the 1970's. This is related to some combination of faster fire development times for today's products that provide the main fuel sources for fires, such as upholstered furniture and mattresses, different criteria for time to untenable conditions, and improved understanding of the speed and range of threats to tenability.

3. *U.S. Firefighter Injuries 2010* 2010

National Fire Protection Association

NFPA estimates that 71,875 firefighter injuries occurred in the line of duty in 2010. An estimated 32,675 or two-fifths (45.4%) of the all firefighter injuries occurred during fireground operations. An estimated 14,190 occurred during other on duty activities, while 13,355 occurred at nonfire emergency incidents. The leading type of injury received during fireground operations was strain, sprain or muscular pain (52.8%), followed by wound, cut, bleeding, bruise (14.2%). Regionally, the Northeast had the highest fireground injury rate.

4. *The Economic Consequences of Firefighter Injuries and Their Prevention. Final Report*
August 2004

National Institute of Standards and Technology

Based on methods applied from two of the more relevant economic studies, the estimated cost of addressing firefighter injuries and of efforts to prevent them is \$2.8 to \$7.8 billion per year. The cost elements that comprised those two studies were based on workers compensation payments and other insured medical expenses, including long-term care; lost productivity; administrative costs of insurance; and others. Other costs heretofore have not been factored into assessments of firefighter injuries. The study team analyzed such elements as the labor costs of investigating injuries, along with the hours required for data collection, report writing, and filing. Another cost relates to what employers of firefighters pay to provide insurance coverage, and for safety training, physical fitness programs, and protective gear and equipment—all of these expenses are related to preventing injuries and reducing their severity. The study researchers were fortunate to obtain workers compensation information that was specific to the occupational codes for firefighters, a unique feature of this new research. Some of these expenses were applied to the total number of injuries, while others were factored around the total number of firefighters since they involve all firefighters, not just those who are injured. Estimates of these cost components alone accounted for \$830 to \$980 million in direct and indirect costs.

5. *Total Cost of Fire in the United States*
2011

National Fire Protection Association

The total cost of fire in the United States, as it is defined, is a combination of the losses caused by fire and the money spent on fire prevention, protection and mitigation to prevent worse losses, by preventing them, containing them, detecting them quickly, and suppressing them effectively. For 2008, that total cost is estimated at \$362 billion, or roughly 2.5% of U.S. gross domestic product. Economic loss (property damage) – reported or unreported, direct or indirect represents only \$20.1 billion of this total. The net costs of insurance coverage (\$15.2 billion), the cost of career fire departments (\$39.7 billion), new building costs for fire protection (\$62.7 billion), other economic costs (\$44.0 billion), the monetary value of donated time from volunteer firefighters (\$138 billion), and the estimated monetary equivalent for the civilian and firefighter deaths and injuries due to fire (\$42.4 billion), all are larger components than property loss.

6. *Third Needs Assessment of the U.S. Fire Service*
June, 2011

National Fire Protection Association

Fire service needs are extensive across the board, and in nearly every area of need, the smaller the community protected, the greater the need. Needs have declined to a considerable degree in a number of areas, particularly personal protective and firefighting equipment, two types of resource that received the largest shares of funding from the Assistance to Firefighters grants (AFG). Declines in needs have been more modest in some other important areas, such as training, which have received much smaller shares of AFG grant funds. In all areas emphasized by the AFG and SAFER grants, there is ample evidence of impact from the grants but also considerable residual need still to be addressed, even for needs that have seen considerable need reduction in the past decade.

There has been little change in the ability of departments, using only local resources, to handle certain types of unusually challenging incidents, including two types of homeland security scenarios (structural collapse and chem/bio agent attack) and two types of large-scale emergency responses (a wildland/urban interface fire and a developing major flood). However, the surveys have indicated improvement in the development of written agreements to help in the use of outside resources. This may provide the strongest base on which to build, namely, the creation of regional and national agreements to allow costs of shared resources to be shared across a much wider area while also providing a protocol for any community to respond to an unusually challenging incident that is very unlikely within the community but not so unlikely within the entire region.

7. *Fire Performance of Houses. Phase I. Study of Unprotected Floor Assemblies in Basement Fire Scenarios.*

December, 2008

Institute for Research in Construction

Details high fire hazards of lightweight truss construction in residential construction and the increased threat to occupants as well as firefighters.

8. *Report on Structural Stability of Engineered Lumber in Fire Conditions*

September, 2008

Underwriters Laboratory

This report describes the fire resistive performance of nine assemblies tested as part of a fire research and education grant sponsored by the Fire Prevention and Safety Grants under the direction of the Department of Home Security/Federal Emergency Management Agency/Assistance to Firefighters Grants.

9. *Report on Structural Stability of Engineered Lumber in Fire Conditions*

January, 2009

Underwriters Laboratory

This report describes the fire resistive performance of three assemblies tested as part of a fire research and education program in cooperation with The City of Chicago Fire Department.

10. *The Performance of Composite Wood Joists under Realistic Fire Conditions*

2008

Tyco

The results from this test series demonstrate that exposed, lightweight composite wood joists are likely to fail three to five minutes after compartment flashover for structures with typical residential loadings. Further, the time to collapse as measured from the start of flaming combustion for the fire scenarios employed in this test series was between 8 and 12 minutes. This relatively small timeframe prior to the failure of exposed composite wood joists may require the fire service to adopt alternative tactics and procedures for structures built using lightweight construction methods. This test program further highlights the dramatic differences between the sprinklered and unsprinklered scenarios, as demonstrated through photographs, observations and data collected. All of the information presented shows that the addition of a sprinkler system can greatly enhance life safety of both residents and firefighters and aid in property protection. Today's homes contain more products with higher heat release rates than in previous years and the construction of these homes has become less fire resistant due to the

use of lightweight construction materials. This combination has proven to be deadly for firefighters.

11. *A Study of Metal Truss Plate Connectors when Exposed to Fire*

January 2007

National Institute of Standards and Technology

The popularity of lightweight, metal plate connected wood truss construction is increasing due to cost effectiveness, versatility, and ease of construction. This type of construction brings many concerns to the firefighting community, since structural collapse has caused numerous injuries and fatalities in the fire service. In an attempt to determine the performance of metal plate wood truss connections during fire exposures, NIST conducted a series of twelve instrumented tests exposing one side of the test specimen to the thermal exposure. Load carrying ability of the metal plate truss connections was not measured during these tests. The tests were purely an attempt to study the heat transfer between the metal plate and the wood. Results from these tests suggest that the metal plates help to protect the wood beneath the plates. However, additional work is required to produce more detailed information.

12. *Preventing Injuries and Deaths of Firefighters due to Truss Failure Systems*

April 2005

National Institute for Occupational Safety and Health

Report provides details on in which firefighter deaths were due in some part to lightweight truss construction, the dangers of lightweight trusses in fire conditions, and need to make changes.

13. *U.S. Experience with Sprinklers and Other Automatic Fire Extinguishing Equipment.*

January 2009

Dr. John Hall, National Fire Protection Association

Automatic sprinklers are highly effective elements of total system designs for fire protection in buildings. They save lives and property, producing large reductions in the number of deaths per thousand fires, in average direct property damage per fire, and especially in the likelihood of a fire with large loss of life or large property loss. When sprinklers are present in the fire area, they operate in 93% of all reported structure fires large enough to activate sprinklers, excluding buildings under construction. When they operate, they are effective 97% of the time, resulting in a combined performance of operating effectively in 91% of reported fires where sprinklers were present in the fire area and fire was large enough to activate sprinklers. In homes (including apartments), wet-pipe sprinklers operated effectively 96% of the time. When wet-pipe sprinklers are present in structures that are not under construction and excluding cases of failure or ineffectiveness because of a lack of sprinklers in the fire area, the fire death rate per 1,000 reported structure fires is lower by 83% for home fires, where most structure fire deaths occur, and the rate of property damage per reported structure fire is lower by 40-70% for most property uses. In homes (including apartments), wet-pipe sprinklers were associated with a 74% lower average loss per fire. Also, when sprinklers are present in structures that are not under construction and excluding cases of failure or ineffectiveness because of a lack of sprinklers in the fire area, 95% of reported structure fires have flame damage confined to the room of origin compared to 74% when no automatic extinguishing equipment is present. When sprinklers fail to operate, the reason most often given (53% of failures) is shutoff of the system before fire began. (All statistics are based on 2003-2007 fires reported to U.S. fire departments, excluding buildings under construction.)

14. U.S. Experience with Sprinklers

May, 2011

National Fire Sprinkler Association

Automatic sprinklers are highly effective elements of total system designs for fire protection in buildings. They save lives and property, producing large reductions in the number of deaths per thousand fires, in average direct property damage per fire, and especially in the likelihood of a fire with large loss of life or large property loss. In 2009, 4.6% of occupied homes (including multi-unit) had sprinklers, up from 3.9% in 2007, and 18.5% of occupied homes built in the previous four years had sprinklers. When sprinklers are present in the fire area, they operate in 91% of all reported non-confined structure fires large enough to activate sprinklers, excluding buildings under construction. When they operate, they are effective 96% of the time, resulting in a combined performance of operating effectively in 87% of reported non-confined fires where sprinklers were present in the fire area and fire was large enough to activate sprinklers. In homes (including multi-unit), wet-pipe sprinklers operated effectively 92% of the time. When wet-pipe sprinklers are present in homes that are not under construction and excluding cases of failure or ineffectiveness because of a lack of sprinklers in the fire area, the fire death rate per 1,000 reported structure fires is lower by 83%, and the rate of property damage per reported home structure fire is lower by 71%. When sprinklers fail to operate, the reason most often given (65% of failures) is shutoff of the system before fire began.

15. Home Fire Sprinkler Cost Assessment

September, 2008

Fire Protection Research Foundation

Comprehensive cost analysis of residential sprinkler system installation cost in U. S. at \$1.61 per square foot as the national average. Assessment was conducted under oversight committee comprised of Fire, Home, Insurance and other interested stakeholders.

16. Benefit - Cost Analysis of Residential Sprinkler Systems

September 2007

National Institute of Standards and Technology

This report documents a benefit-cost analysis performed to measure the expected present value of net benefits resulting from the installation of a multipurpose network fire sprinkler system in a newly-constructed, single-family house. The benefits and costs associated with the installation and use of a fire sprinkler system are compared across three prototypical single-family housing types: colonial, townhouse, and ranch. The installation costs differ by housing types, with the colonial being the most expensive and the ranch the least. The benefits experienced by residents of single-family dwellings with sprinkler systems, as measured in this report, include reductions in the following: the risk of civilian fatalities and injuries, homeowner insurance premiums, uninsured direct property losses, and uninsured indirect costs. The primary costs examined are for initial purchase and installation of the sprinkler system. Maintenance and repair costs are not examined because they are negligible.

Results of the benefit-cost analysis show that multipurpose network sprinkler systems are economical. The expected present value of net benefits (PVNB) in 2005 dollars is estimated as \$2919 for the colonial-style house, \$3099 for the townhouse, and \$4166 for the ranch-style house. A sensitivity analysis is performed to measure the variability of the results to changes in the modeling assumptions. The sensitivity analysis confirms the robustness of the baseline analysis. The PVNB range from \$704 to \$4801 for the colonial-style house, from \$884 to \$4981

for the townhouse, and from \$1950 to \$6048 for the ranch-style house. Multipurpose network systems are the lowest life-cycle cost systems because homeowners can perform their own regular inspections and maintenance, and thereby save on costs they would incur with other systems. Given that they provide a similar level of performance, in terms of fire-risk mitigation, multipurpose network systems then achieve greater cost-effectiveness over alternate systems.

17. Residential Sprinklers and Housing Economics. A legislators guide to Life Safety

February 2009

Buddy DeWar

Independent analyst who debunks numerous myths about fiscal impact specific to residential fire sprinklers complete with validated data.

18. International Residential Code and Fire Sprinklers

November 2009

Minnesota Governor's Council on Fire Protection

Residential fire sprinklers were introduced in the 1970's for use in single- and two-family homes, but have never been required for installation by the model building codes in the United States on a nationwide basis. Recent action by the International Code Council has moved the requirement for the installation of these sprinklers in new single- and two-family homes into the most widely adopted of the model codes and brought the possibility of adoption to the state of Minnesota. This document provides an overview of information on residential fire sprinklers.

19. United States Fire Administration Position on Residential Fire Sprinklers

March, 2008

Federal Emergency Management Agency

20. National Fire Protection Agency Comments on IRC Proposals

