STATE BUILDING CODE COUNCIL (SBCC)

INVESTIGATIVE COMMITTEE'S REPORT ON FIRE SPRINKLER IMPLEMENTATION IN NEW ONE- AND TWO-FAMILY DWELLINGS

Report Dated:
May 8, 2013

Contents

Introduction 1
Members of the Committee 1
Executive Summary 2
Scope of Work 3
Water Purveyor 4
Water Delivery Infrastructure 6
Land Use Planning 6
Infrastructure Costs and Financing 7
Vertical Systems 9
Contractor/Industry Costs 11
Certified Fire Sprinkler Designers/Installers 12
Fire Sprinkler Incentives 12
Residential Fire Sprinkler Considerations 14
Legislation 14
Education and Training 16
Liability Issues 18
Sustainability 19
Stakeholder Issues Pros/Cons 19
Conclusion and Recommendations 21

Appendix A 23

Appendix B 27

Appendix C 28

Appendix D 29

Appendix E 33

Appendix F.....34

Introduction

This report is the result of an investigative committee's (Committee) collaborative effort. The Committee, which was formed by the SBCC to identify various issues relating to infrastructure and vertical fire sprinkler system requirements for the installation of automatic fire sprinklers in new one- and two-family dwellings, is comprised of a broad range of stakeholders.

All model building codes in the United States (U.S.) require that residential fire sprinkler systems be installed in new one- and two-family dwellings.[1] As such, the SBCC began reviewing the International Building Code (IBC) and the International Residential Code (IRC), 2012 Editions and bypassed the 2009 Editions.

The SBCC believed that a comprehensive review for and against implementing such a requirement was necessary. Supporters of fire sprinklers believe that requiring residential fire sprinklers in new one- and two-family dwellings will dramatically reduce fire fatalities, injuries, and property loss for future generations. Opponents cite the added cost and its subsequent impact on home prices and the public's dissatisfaction with government mandates. All stakeholders were invited to participate on this Committee.

House Resolution (HR) 47, House Draft (HD) 1 (see Appendix A), which was adopted during 2011 Regular Session, requested that the SBCC adopt the requirement to install automatic fire sprinklers in new one- and two-family dwellings in compliance with the latest editions of nationally recognized safety codes; clarify the definition of one- and two-family dwellings; and address issues of accessibility and availability of water to all dwellings. A report of its findings, recommendations, and actions taken relating to this Resolution will be submitted to the Legislature no later than 20 days before the 2015 Regular Session convenes.

The Committee held monthly meetings at the Honolulu Fire Department (HFD) Headquarters between January 25, 2010, and March 25, 2013. Those who were unable to travel to the HFD were included via teleconference.

Members of the Committee*

Socrates Bratakos, Committee Chair, State Fire Council (SFC), HFD
Gantry Andrade, Hawaii Fire Department (HCFD)
Bill Brizee, American Institute of Architects
Daryl Date, Kauai Fire Department
Ray Bizal, National Fire Protection Association (NFPA)
John Graham, Blazemasters Fire Protection
Garon Hamasaki, Honolulu Board of Water Supply (BWS)
Mel Harano, Society of Fire Protection Engineers Hawaii (SFPE)
Tim Hiu, Honolulu Department of Planning and Permitting (DPP)

[1] The IBC and the IRC, 2009 Editions and NFPA 5000, 2012 Edition require fire sprinklers in new one- and two-family dwellings.

Jeff Hudson, NFPA
Derick Kam, SFPE
David Kamakea, United Association of Plumbers and Pipefitters, Local 675 (UA 675)
Justin Kessler, BWS
Bruce Lecair, National Fire Sprinkler Association
Kimo Marion, BWS
Gladys Marrone, Building Industry Association
Harold McDermott, UA 675
Robert Peirreira, HCFD
Lloyd Rogers, SFC
Greg Serikaku, Plumbing and Mechanical Contractors Association
Chuck Shima, UA 675
Dean Shimizu, BWS
Mark Tanner, Lubrizol Corporation (representing BlazeMaster CPVC Fire Sprinkler Systems)
Michael Vairin, Brookfield Homes

* Participants who attended two or fewer meetings are listed in Appendix B

Executive Summary

Fire sprinklers in Hawaii's new one- and two-family dwellings are not required. They are installed voluntarily or as an alternative to more costly fire department access road or water supply.

The residential fire sprinkler permit approval process is similar in each county; however, water standards vary slightly. There are basically two fire sprinkler system types utilized in residential applications: a stand-alone fire sprinkler system, which is separate from the domestic water system, and a multipurpose fire sprinkler system, which is a combined domestic/fire sprinkler system. The stand-alone fire sprinkler system is more common and familiar to contractors and code enforcers.

The cost of fire sprinkler design, plans review, and special inspections is estimated at $2,250-$3,250. The charge for a one-inch water meter by county water purveyors ranges from $2,300 to $26,400 and greatly impacts the system's overall cost. Estimates from Honolulu-based fire sprinkler contractors for a residential system were approximately $4-$5 per square foot. Maui County reported an installation cost of $1.65 per square foot.

At $4.50 per square foot, a fire sprinkler system in a 1,500-square foot home would cost $6,750. If the home's cost were calculated at $200 per square foot, a 1,500-square foot home would cost $300,000, and the fire sprinkler system would be 2.25% of the total cost. Where the water supply from a municipal or private agency is inadequate or nonexistent, an additional charge of approximately $2,100 for a pump and water storage tank would be necessary.

Fire sprinkler incentives for the builder, the homeowner, and the community include possible homeowner insurance premium discounts, property development allowances, and higher appraisal values. Alternatives to fire sprinklers include upgrading structural building components that were reduced in the 2009 IRC; delaying the actual implementation date for requiring fire sprinklers; and requiring fire sprinklers in certain occupancies, such as adult residential care homes or large-sized homes. It is necessary to promote the cost versus benefits of installing fire sprinklers to homeowners. Nationwide, fire fatality and property damage rates are highest in one- and two-family dwellings.

Scope of Work

The Committee's initial scope of work is to include the residential fire sprinkler horizontal infrastructure up to the riser's first flange, including the meter, for new one- and two-family dwellings.

The IRC defines detached one- and two-family dwellings as not more than two stories above grade plane with a separate means of egress. Detached is defined as not connected, with the exception that townhouses are defined as single-family dwelling units constructed in a group of three or more attached units in which each unit extends from foundation to roof and has a yard or public way on at least two sides.

A dwelling unit is defined as a single unit that provides complete, independent living facilities for one or more persons for living, sleeping, eating, cooking, and sanitation.

These definitions are predicated on life-safety requirements for occupants, not zoning requirements, which are intended to regulate the different uses to which land may be utilized.

As the fire sprinkler infrastructure information was being finalized, the Committee decided to include the vertical system for the interior of the dwelling beyond the first flange of the riser.

The Committee also considered provisions for stand-alone systems with pressurized tanks or pumps and tanks as acceptable water sources when water supply infrastructure is inadequate, unavailable, or economically infeasible.

The Committee developed a draft work plan with various categories relating to fire sprinkler systems that included costs, possible incentives, and design standards. The scope of work does not include additions, alterations, or renovations to existing structures or retrofitting existing one- and two-family dwellings.

The Committee believes that in-fill, one- and two-family dwellings in existing residential areas may not have the infrastructure to support fire sprinklers; therefore, this report does not purport to include such residences. New, in-fill residences require building, water, and fire department approval, and each county must determine requirements for

what is considered "new." This does include new, residential subdivisions where infrastructures are planned or Condominium Property Regime (CPR) units on properties that may not meet fire department access or water supply requirements.

Water Purveyor

Hawaii counties have municipal water agencies and private water suppliers. State and federal regulations define a public water system as a system that serves 25 or more individuals at least 60 days per year or has at least 15 service connections. Public and private water system owners and operators must comply with Hawaii Administrative Rules, Title 11, Chapter 20, Rules Relating to Potable Water Systems.

Most urban areas in each county have an adequate water supply system for fire protection and domestic use. On Oahu, small pockets in urban areas, such as Tantalus and Kalihi, and rural areas, such as Kunia and Waialua, are examples of inadequate or nonexistent municipal water supplies. Rural areas in each county have a limited water supply system and are more prone to an inadequate or nonexistent water supply. Each county has agreements between fire and water agencies to utilize its water supply for fire protection and a building permit approval process for new construction.

In areas where there is an inadequate or nonexistent water supply, fire sprinklers can be supplied by a pump and tank, a pressurized tank, or a private well. A stand-alone catchment system may also be utilized for fire sprinkler and domestic systems. Water purveyor fees, permit approval processes, and fire flow standards differ by county. Fire flow requirements for each county are provided as Appendix C.

Hawaii County

Hawaii County's Department of Water Supply's (DWS) process involving a one-inch meter for a fire sprinkled residence requires water demand calculations from a professional engineer who is licensed in the state of Hawaii. The calculations should include the peak flow (in gallons per minute [gpm]) and the maximum daily water demand in gallons per day. A service lateral installation plan prepared by a licensed engineer should show a reduced pressure-type backflow prevention assembly within five feet of the meter. The applicant must hire a contractor to install the service lateral for the one-inch meter.

City and County of Honolulu

Prior to the BWS approving a building permit application, the applicant must submit water demands for domestic and fire sprinkler use, if applicable. The total must equal the fire sprinkler demand plus five gpm for domestic use for each dwelling served by the common meter. However, if the domestic demand is greater than the fire sprinkler demand plus five gpm, the domestic demand is used to size the meter.

To calculate applicable charges, the equivalent meter size for domestic use from the domestic water demand must be determined. A Water System Facilities Charge (WSFC)/Impact Fee is assessed based on the domestic water demand. If the total fire sprinkler demand plus five gpm is used to size the meter and the meter size is greater than the equivalent meter size for domestic use, the determination will be from the equivalent meter size for domestic use and the required meter size. If the total fire sprinkler demand plus five gpm is equal to or less than the equivalent meter size required for domestic use, then one-time fire charge will not be assessed. The water meter installation charge is based on the required meter size.

If the domestic water and fire sprinkler will have separate dedicated meters, the size of the individual meters will be based on individual water demands. WSFC/Impact Fee assessments and the one-time fire charge will be based on individual water demands. Water meter installation charges will be based on individual water meter sizes.

The BWS approval of a building permit application is dependent on the water system infrastructure's adequacy to provide the requested water demand and protect the potable water supply from cross-connection hazards. If such hazards are identified, the installation and annual testing of a BWS-approved backflow prevention assembly will be required. A licensed plumber and a certified backflow prevention assembly tester must perform the installation and annual testing of the backflow prevention assembly.

Final BWS comments are dependent on each situation. An average residence without a fire sprinkler system would use a ¾-inch meter. An equivalent residence with a fire sprinkler system would use a one-inch meter and may have a backflow prevention assembly installed after the meter. Based on a typical scenario of 13 gpm per head, a home would require a one-inch meter (two heads = 26 gpm, 26 gpm + 5 = 31 gpm).

The BWS has requirements for off-site fire protection on public roadways. The HFD has requirements for on-site or private property fire protection and follows the BWS' requirements.

Kauai County

Kauai County's Department of Water (DOW) process requires the applicant to submit water demand calculations and a request for water meter service to provide adequate flow. Fees are dependent on the approved water meter size and/or the number of dwellings. Permit approval requires an adequate water source and storage and transmission facilities to provide the demand requested. Approval for backflow prevention that is tested by a certified backflow prevention tester is required. Final water board permit comments are dependent on each residential situation.

Maui County

Maui County's DOW verifies and approves water flow requirements. The fire department reviews and approves plans for those served by private water suppliers.

Water Delivery Infrastructure

The BWS installs a minimum 8" water main in residential areas to provide the required fire flow of 1,000 gpm for one hour duration and hydrants spaced every 350 feet. A possible modification of BWS standards, including cost incentives for subdivisions constructed with fire sprinklers, will be evaluated by water purveyors and fire officials.

The current and future fire codes allow for modifying fire flow requirements when fire sprinklers are installed in residences.

The design standard for an IRC, Section P2904 or an NFPA 13D residential system requires sufficient flow and pressure to operate two fire sprinklers. This standard will be used in one- and two-family dwellings and is less extensive than the NFPA 13 standard, which is used in commercial buildings.

In a stand-alone fire sprinkler system, a backflow prevention assembly may be required to prevent potable water contamination. Backflow prevention assemblies required by the water purveyor must be tested annually to ensure proper function. The owner is responsible for incurred costs.

The Uniform Plumbing Code, 2012 Edition allows for alternate water sources, including reclaimed or recycled water, rainwater, gray water, and onsite-treated water, for nonpotable applications. Water closets, urinals, and trap primers in residential and commercial properties may also use these alternate water sources in lieu of potable water. In residences with potable and a nonpotable systems, it is extremely important that trained, licensed technicians install and repair residential water systems to prevent cross-connection contamination.

Separate or stand-alone residential fire sprinklers systems can be shut off without affecting the domestic water system. The combined or multipurpose residential fire sprinkler system cannot be shut off without shutting off the domestic water system.

Land Use Planning

Honolulu's subdivision street standards have varying street widths, which are dependent on the type of road use. Wider widths are required for higher traffic volume, collector streets, and public transit carriers that accommodate several traffic lanes. When determining width allowances, factors such as medians, parking/no parking, bike lanes, and trees or planters are considered.

Narrower road widths are allowed for alleys and cul-de-sacs; however, their widths must accommodate automated refuse pickup. Turn-around requirements also apply on dead-end streets.

Setbacks require five feet on the sides and ten feet in the front. A three-foot side setback would require an amendment to the land use ordinance; however, five feet

would more than likely be the minimum due to resident privacy issues. The ten-foot front setback also considers resident/guest parking in driveways to allow for clear road widths. CPR-divided lots allow a maximum of eight units, and if there are private roads, the fire department will set road width and water supply requirements.

Road width and setback reductions for residential fire sprinkled subdivisions are highly unlikely due to the various considerations listed above. Road width reductions may be possible for collector streets; however, the approving agency must consider all criteria before making a decision.

The Committee identified the possibility that communities where residential homes are sprinkled or have a broader standard of coverage require fewer fire stations. Locations for shopping, parks, schools, and fire and police protection are identified during community planning. Fewer fire stations equal less construction/land, personnel, equipment, and fuel costs. As such, developer, municipal operating, and taxpayer expenses will be reduced without compromising fire and life safety. A similar case may also be made for water storage to supply the reduced demand on infrastructure, maintenance, and personnel costs.

It may be necessary for building officials to evaluate the plans review process for homes constructed with fire sprinkler systems to determine a consistent, streamlined process.

Infrastructure Costs and Financing

The Committee did not identify any infrastructure cost-savings for subdivisions constructed with fire sprinklers compared to those without fire sprinklers. If the various reductions in infrastructure standards are implemented, the reduced cost in raw materials should be realized. It was noted that infrastructure costs and interest are financed by the residential project's developer until the homes are sold. An on-site water tank, pump, and meter upgrade cost comparison for each county is found in Appendix D.

Hawaii County

Hawaii County's DWS charges $13,750 for a one-inch meter. A similar-sized residence without a fire sprinkler system and using a ⅝-inch meter would cost $1,190 for the first service and $5,500 for additional services. The DWS will install up to two ⅝-inch meters for $3,000 per meter if the lateral is on the same side of the street as the water main and $4,000 per meter if the lateral crosses the street. If the meter is on a state road, the cost would be $12,000 per meter if the lateral is on the same side of the road and $17,000 per meter if the lateral is on the opposite side of the road.

City and County of Honolulu

The BWS has a fee schedule for new construction. The BWS also has a one-time fire charge, which varies according to the fire sprinkler system's water demand and meter

size. In addition, there is a WSFC assessment, which is determined by the total fixture unit value installed.

Lateral piping from the service main to the meter must increase from 1 inch to 1½ inches and extend from the meter to the fire sprinkler riser. The added material cost is dependent on the total distance needed. Most residential fire sprinkler systems would require an upgrade to a one-inch meter at an approximate installation cost of $2,300. This is an increase of approximately $500 compared to the installation cost of a ¾-inch meter for a home without fire sprinklers.

Kauai County

Kauai County's DOW gave estimates that assumed adequate water source, storage, and transmission facilities are available. The Facilities Reserve Charge (FRC) for a ⅝-inch, ¾-inch, and 1-inch water meter is $4,600, $14,300, and $26,400, respectively. Because the larger meter provides more water volume, the higher charge is basically the cost to obtain water service (i.e. cost of source, storage, and transmission facilities). This cost is required per the DOW's rules and regulations.

The FRC is not dependent on location or field conditions. However, it may be dependent on the number of units in hotels, multifamily dwellings/apartments, etc. If the DOW can perform the work, the fixed cost to install a ⅝-inch or ¾-inch meter is $1,725. If the DOW is unable to perform the installation, the installation cost for a ⅝-inch, ¾-inch, and 1-inch meter would be borne by the applicant.

The applicant must provide construction drawings for water meter service connection installation to the contractor. Other scenarios that may increase costs include installing a ⅝-inch meter where there is curb and gutter, a second ⅝-inch meter for an additional dwelling unit on the same lot that does not create a CPR (DOW does not install), a ⅝-inch meter on a state highway, etc.

Maui County

Maui County's DOW charges $6,030 for a ⅝-inch meter, $8,442 for ¾-inch meter, and $15,678 for a 1-inch meter.

Applicants are also charged a water system development fee for water meter installations. These fees are necessary to fund water capacity increases in new developments and replace existing water facilities to maintain capacity, which includes having adequate water sources, tanks, and transmission and distribution water lines to provide services to customers.

An upgrade from a ⅝-inch to a ¾-inch meter will not require a service lateral upgrade. An upgrade from a ⅝-inch to a 1-inch meter will require the service lateral assembly (the connection from the water main up to and including the meter box and shutoff valve) to be replaced. The cost to upgrade to a 1-inch meter is estimated to be $9,000,

which includes $2,500 for design, $6,000 for construction, $400 for backflow prevention, and $160 for meter installation. The monthly fee of $9.25 would remain, as consumption would be within the ⅝-inch range, and higher flows would only occur during fire sprinkler activation.

A backflow prevention device costs between $400 and $1,000 for design and installation, depending on the meter upgrade size. A backflow prevention device for a ¾-inch meter upgrade will cost approximately $1,000. An upgrade to a 1-inch meter is approximately $400, as the design cost to replace the service lateral includes the backflow prevention device.

The permit fee for a new, sprinkled residential dwelling with an estimated construction cost of $300,000 is $2,030, which is an increase of $35. The fire department reviews and approves fire sprinkler plans; however, it does not charge a fee. The DOW reviews residential building permits served by county water, and the fire department reviews those serviced by a private water supply. An estimated fee of $25-$50, depending on the total number of sprinkler heads, may be implemented if residential fire sprinkler systems were required in all new one- and two-family dwellings.

Vertical Systems

The following costs were based on California, which requires residential fire sprinkler systems in new one- and two-family dwellings. For purposes of this report, the home's square foot size and associated information was adjusted to account for Hawaii's standard home size of 1,500-square feet and economic climate. Although adjusted dollar amounts changed, the identified percentages did not change significantly.

All residential fire sprinkler installations are unique due to available water pressure and a home's layout and design, including multilevel floors and open beam ceilings.

The home design plan used as model for this discussion consisted of 1,500 square feet, 2 stories, 3 bedrooms, and 2½ baths. It utilized 16' x 16' spacing, Reliable Model RFC heads, and no flow switch and added 5 gpm to the supply demand.

Water supply parameters were a single, common water service of 40 linear feet; using a municipal water supply at 80 pounds per square inch available pressure at the street, and adding 5 gpm to the supply demand.

A cost comparison was done for the following designs, which are listed in ascending cost order:

1. SAF-T system
2. Multipurpose tree chlorinated polyvinyl chloride (CPVC)
3. Multipurpose loop with CPVC pipe and fittings
4. Stand-alone loop system
5. Stand-alone tree system
6. Multipurpose cross-linked polyethylene (PEX) system

Stand-alone systems are usually separated from the domestic water supply before entering the home.

Multipurpose systems combine domestic and fire protection water in one main pipe system with tees and branches feeding various fire sprinklers or domestic plumbing fixtures.

The SAF-T system is a stand-alone, flow through system that has one plumbing fixture (toilet) connected to the fire sprinkler system. It does not have a pressure regulator or a backflow prevention assembly on the main water line. The SAF-T and stand-alone systems primarily utilize a ¾-inch or a 1-inch CPVC pipe.

The multipurpose systems require a 1-inch or a 1¼ -inch pipe. The larger diameter pipe is required due to regulator's lower inlet pressure.

The stand-alone system is a proven and efficient way to design a residential fire sprinkler system. It is extremely competitive in the marketplace, especially if a backflow prevention assembly is not required. This system is the most user-friendly, as maintenance only requires an annual safety system check to ensure proper operation. In addition, there is no potential problem, such as voiding or jeopardizing the fire sprinkler system's correct operation, when adding future plumbing fixtures.

The SAF-T system provides all the advantages of a stand-alone system without a backflow prevention assembly. However, fire sprinkler and plumbing interaction and the placement of an additional pressure regulator is required. Possible installation problems can be avoided if the plumbing contractor has been adequately trained and certified on fire sprinkler systems and the materials being used.

A multipurpose system is less familiar to the market and government regulators and poses complications not found in a stand-alone system. It requires significant trade interaction with fire sprinkler and plumbing contractors, and the builder does not necessarily save on material costs.

Regardless of how much labor a multipurpose PEX system saves due to piping flexibility, it cannot make up the differences in material costs.

Contractor/Industry Costs

An Oahu developer received an estimate of approximately $6,500 ($4.64 per square foot) to sprinkle a new 1,400-square foot, 2-story home. The system was installed by a reputable fire sprinkler company using union labor. Additional costs for annual system maintenance and an audible monitoring device for fire sprinkler activation were not calculated, as they are not required.

Two Kailua homeowners were planning to renovate their existing residence; however, they did not meet the required distance to a fire hydrant. The estimated costs to install fire sprinkler systems in their homes were between $10,000 and $15,000.[2]

Four fire sprinkler contractors on Oahu submitted materials, fabrication, installation, flushing, testing, and inspection costs for two new, separately designed, single-family residences. The average cost for a 2-story, 1,536-square foot home with 18 sprinkler heads was $4.42 per square foot. The average cost for a 2-story, 1,480-square foot home with 15 sprinkler heads was $4.20 per square foot. The actual contractor costs for the two plan designs per contractor are included in Appendix E.

The Maui Fire Department estimated that the cost to install a fire sprinkler system in a newly constructed 1,500-square foot home is $2,475 or $1.65 per square foot. Without any cost savings, the total fire sprinkler cost would be $5,225 in this example. Costs to design, review plans, and special inspections were estimated to be $2,250-$3,250. As more single-family homes become sprinkled, competition and business volume could reduce the fire sprinkler system's overall costs.

Where water supply infrastructure is inadequate or nonexistent, the cost for a stand-alone system for a fire pump, a 500 to 600-gallon holding tank, and a float valve for water level is approximately $1,350. Talco Fire Systems of Portland, Oregon, provided price ranges from $1,600 to $2,600 for a stand-alone pump and 400 to 500-gallon tank system. Water supply piping to the riser would range between $5 per foot for copper and $1.50-$1.75 per foot for polyvinyl chloride. This estimate was derived from Maui County. If a 400-gallon tank is determined to be adequate, the overall cost may be lower.

In a 2008 report, the Fire Protection Research Foundation used ten case study communities: nine in the U.S. and one in Canada.[3] The total fire sprinkler costs for 30 homeowners ranged from $2,386 to $16,061 or $0.38 to $3.66 per fire sprinkled square feet. The average cost is $1.61 per fire sprinkled square foot. The low-end represents a California house in a community with a long-standing ordinance; sprinkler heads in the living space, attic, and garage; and potential pricing benefits from a volume relationship with the fire sprinkler contractor. The high-end represents a Colorado house that utilizes well water and a system constructed with copper piping that requires antifreeze protection during the winter. These estimates include all costs to the builder associated

[2] Honolulu Star Advertiser "Revised Fire Hydrant Rules Lets Building Resume" article, November 3, 2011
[3] Fire Protection Research Foundation, Home Fire Sprinkler Cost Assessment Final Report, September 10, 2008

with fire sprinkler design, installation, permits, additional equipment, and increased tap and water meter fees. The wide range of fire sprinkler costs demonstrates varying factors of regional differences within the U.S.

Certified Fire Sprinkler Designers/Installers

Hawaii State licensing laws govern requirements for fire sprinkler contractors, while county code dictates fire sprinkler system designs. Pursuant to Chapter 444 of the Hawaii Revised Statutes (HRS), the Contractors Licensing Board governs the licensure of contractors who perform residential, commercial, or public works construction, alterations, or improvements. Additionally, pursuant to Chapter 448E of the HRS, the Electricians and Plumbers Board governs the licensure of plumbers and electricians. The State Department of Commerce and Consumer Affairs' Professional and Vocational Licensing administers licenses for contractors, plumbers, and electricians.

There are over 100 Specialty Contractor licenses in addition to the "A" general engineering license and "B" general building contactor. The following licenses are required but may be subject to change by statute or rule:

A C-20 license for a fire protection contractor to install a fire sprinkler system

A C-37 license for a plumbing contractor to install a plumbing system

An individual who is under the supervision of an individual with a C-20 or C-37 license or a licensed mechanical engineer may install a fire sprinkler system. A residential fire sprinkler system must be designed by a mechanical engineer for permit approval.

Fire Sprinkler Incentives

The use of residential fire sprinkler systems in new or retrofitted homes has not been readily adopted in Hawaii. However, the installation of fire sprinkler systems has been heavily debated due to amendments to building codes and ordinances. Many times, the cost of installing fire sprinklers in residential homes, its aesthetics and convenience, and the availability of an adequate water supply are prohibiting factors. The use of incentives may encourage developers and homeowners to consider fire sprinkler installation and be a key tool in increasing fire sprinkler systems in new homes.

A homeowner's insurance discount may be an incentive for homeowners to install fire sprinklers. A local insurance company and committee members with fire sprinkled homes reported an 8%-15% premium discount on homeowner's insurance. Three other local insurance companies do not provide a discount for fire sprinklers, and one company offered a 1% discount. The Hawaii Insurance Bureau does not consider the adoption and application of the current national model building and fire codes as part of the classification criteria in its grading schedule; therefore, its nonuse in the Public Protection Classification has no grading impact of the community with respect to fire protection.

Three Honolulu residential appraisal companies believe that fire sprinklers in one- or two-family dwellings are rare in Hawaii; therefore, determining a dollar value would be difficult. Although they agreed that fire sprinklers would increase a home's value, it probably would not be as much as the fire sprinkler system's total cost.

An existing incentive is to allow fire sprinkler installation as an alternative to home or cluster home construction that would be denied a permit due to inadequate water supply or fire department access requirements. The much higher cost to install a fire hydrant or create a road of sufficient width may prevent a single-family home or a cluster homes from being built.

According to Honolulu's DPP, where work on existing, nonconforming structures located in flood zone areas is required, construction is limited to 50% of the home's replacement value to allow it to remain nonconforming. Fire sprinkler installation that reduces damage to under 50%, in the event of a fire, would keep the structure nonconforming by the limited amount of repair work. For a fire damaged structure in a flood zone that exceeded 50% an existing, nonconforming structure with its floor elevation located below the regulatory elevation, would be required to be elevated above the regulatory flood elevation. In Honolulu, zoning nonconformity is treated similarly. Damages exceeding the repair/replacement value would not be permitted to be restored to its pre-event condition.

A 2010 report by The Fire Protection Research studied 16 communities that offered one or more incentives that encouraged fire sprinkler use in new single-family homes. The report characterized incentives as "Financial Tradeoffs (e.g. reduced impact fee, reduced property taxes). On-Site Design Flexibility (e.g. reduced fire ratings for building assemblies, and Off-Site Design Flexibility (e.g. spacing fire hydrants further apart, allowing longer dead-end streets)."[4]

The report also describes incentive as a "trade-off considered to be some sort of benefit which originates from state/local government, the local water utility, or a nonprofit group, which directly results from the use of residential sprinklers in a project and would not otherwise be available to a developer, builder or homeowner."

This report may be a good source for lawmakers to review upon considering the use of incentives to encourage developers and homeowners to install fire sprinklers in new residential homes.

Residential Fire Sprinkler Considerations

Alternatives that equal the active life-safety protection of residential fire sprinklers have not been identified. A representative from the International Code Council provided information regarding differences in 2009 and 2012 from the 2006 IRC requirements

[4] The Fire Protection Research Foundation, "Incentives for the Use of Residential Fire Sprinkler Systems in U.S. Communities", October 2010

due to fire sprinklers being required in new one- and two family residences. In townhouse construction each townhouse must be separated from one another by a two-hour fire rated wall. In the IRC's 2009 and 2012 Editions, it was reduced to a one-hour rated wall as a result of the residential fire sprinkler requirement. Section 501.3 of the 2012 IRC requires that ½-inch gypsum wallboard be placed on lightweight floor joists (open web joist and I-joists) or joists that are less than 2" x 10" or have the space below the floor joists (other than a crawl space) be sprinklered. The 2012 IRC also allows a three-foot fire separation distance to the lot line; however, if a fire sprinkler system is not installed, a five foot separation is required. For a subdivision, if one yard is six feet or greater, the other yard can be built on the property line (zero feet) and there is no requirement for fire rated exterior wall or opening protection. These were identified as the most significant differences with and without fire sprinklers. A thorough review of the model codes should be conducted to determine if fire fighter safety may be compromised as a result of not providing fire sprinkler protection.

The SBCC proposed to delay the fire sprinkler requirement for new one- and two-family dwellings until 2015. This would allow developers and builders enough time to implement added costs, materials, and labor.

Another alternative is to only implement fire sprinkler installations in new, large residences, i.e., over 5,000 square feet in living area. The justification is that bigger homes require a larger water supply or fire flow and have more occupants and open space rooms, which present greater fire fighting challenges. Requiring fire sprinkler installation in townhouses should also be considered. Although they are built according to the same standards as one- and two-family dwellings, fire fighting efforts are complicated due to multiple adjacent residences.

Adult residential care homes are allowed up to five nonrelated occupants. This is an alternative to larger, adult residential homes that allow up to 18 occupants or skilled nursing home facilities where fire sprinkler systems are required. According to regulations regarding a care home with five persons or less, only one of its residents may be physically incapable of exiting the home without assistance under fire conditions. If the home is sprinkled, it may allow for more than one occupant to be incapable of self-preservation.

Legislation

During the 2012 Legislative Session, the Hawaii State Legislature passed Act 83, Senate Bill 2397, Senate Draft (SD) 1, HD 3, which prohibits counties from requiring the installation or retrofitting of automatic fire sprinklers in new or existing one- or two-family dwellings and nonresidential agricultural and aquacultural buildings, with the exception of a variance for fire department access road or water supply requirements. Act 83 is subject to sunset on June 30, 2017, and is included as Appendix F.

In recognizing the legislative intent of Act 83, the Senate Committee on Public Safety, Government Operations, and Military Affairs stated in its Standing Committee Report

Number 2055 that "mandatory installation of automatic fire sprinklers is unnecessary at this time because new homes are built with better fire safety measures; fire sprinklers are not cost-effective; targeted fire safety education programs work; fire sprinklers have not been proven to enhance the safety of occupants; and if a homeowner wants to install a fire sprinkler that option should be left to the homeowner."[5] Similarly, the Senate Committee on Water, Land, and Housing's Standing Committee Report Number 2465, reported that there have been significant improvements to the fire safety of homes over the past few decades. This has led to a dramatic and continued decrease in fire incidents, injury, death, and property loss. Further, data that suggests that the installation or retrofitting of automatic sprinklers will significantly improve the fire safety of homes does not exist.[6]

Two current federal bills, Senate (S.)1035 and the companion House of Representatives (H.R.) 1792, cited as the Fire Sprinkler Incentive Act[7], was introduced in 2011 to allow a shorter depreciation time for a homeowner to recover fire sprinkler installation costs; however, it only includes buildings higher than 75 feet.

In 2011, the Hawaii State House of Representatives passed HR 47, HD 1[8], which was introduced and supported by the SFC to bring attention to state legislators regarding the IRC, 2009 Edition requirement of installing fire sprinklers in new one- and two-family dwellings. There was much legislative concern as to the system's cost to builders and eventually homeowners. The legislative sentiment was that although fire sprinklers are a fire safety and prevention initiative, it should be installed on a voluntary basis.

The legislative intent behind HR 47, HD 1 is reflected in the House Committee on Housing and Water, Land, and Ocean Resources' committee report, which states that it "acknowledge[d] the intent of the SFC and the county fire departments in highlighting the importance of having automatic fire sprinklers installed in family dwellings and other buildings as a way of controlling or suppressing fires, and preventing fires from going undetected and growing to dangerous proportions."[9] HR 47, HD 1 also requested that the SBCC "adopt the requirement that automatic fire sprinklers be installed when constructing new one- and two-family dwellings, in compliance with the latest editions of nationally recognized safety codes."[10]

As of March 26, 2013, two states adopted the requirement to install fire sprinklers in new one- and two-family dwellings. Twenty-six states, through legislative mandate or a building code rulemaking entity, prohibit the mandated use of fire sprinklers in new one-

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[5] Act 83 Senate Committee on Public Safety, Government Operations, and Military Affairs' Standing Committee Report Number 2055, 26th Legislative Session of 2011

[6] Act 83 Committee on Housing and Water, Land, and Ocean Resources' Standing Committee Report Number 1268, 26th Legislative Session of 2011

[7] 112 Congress 1st Session, S. 1035 and H.R. 1792 to amend the Internal Revenue Code of 1986 to include automated fire sprinkler systems as section 179 property and classify certain automated fire sprinkler systems as 15-year property for purposes of depreciation

[8] See Appendix A

[9] HR 47, HD 1, Committee on Housing and Water, Land, and Ocean Resources' Standing Committee Report Number 1268, 26th Legislative Session of 2011

[10] See Appendix A

and two-family dwellings. Seventeen states have no statewide residential fire sprinkler requirement; however, they allow local jurisdictions to require fire sprinklers.[11]

Between 2005 and 2009, the SFC submitted and supported state legislation to allow a tax deduction for homeowners who install fire sprinkler systems as a means to recover part of the system's cost. This could be similar to tax credits for installing solar water heating or photovoltaic systems. Uncertain international and state economic events prohibited these bills from gaining legislative support. Securing federal grant funding to allow tax credits at the state level, similar to photovoltaic and past solar water heating credits, may be necessary.[12]

Education and Training

In most settings where there is a municipal water supply, fire sprinklers operate off the household water main. However, water can also be supplied by a well, a pump and tank, or a pressured tank. Fire sprinklers are linked by a network of piping, which are typically hidden behind walls and ceilings (similar to domestic water piping and plumbing).

The elevated temperature of an early-stage fire (135°-165°F) will usually cause a single sprinkler head to activate; however, depending on fire conditions, an additional sprinkler head may also activate. Only an elevated temperature will initiate the fire sprinkler system to flow water; smoke or a smoke alarm will not activate the system. Only the sprinkler head closest to the fire will activate and flow water directly on the fire. This quick action will control or extinguish the fire.

Fire sprinklers also slow the spread of deadly heat and toxic smoke, thus preventing flashover. This provides residents more time to safely escape.

Each fire sprinkler system will have a minimum required pressure and water flow that is necessary for it to adequately operate and control the anticipated fire. This minimum requirement is based on the hydraulic demand of each sprinkler system.

Nationally, the greatest fire death and property damage rates are in one- and two-family dwellings. In 2003-2011, one- and two-family dwelling fires accounted for an average of 78% of dollar losses, 66% of civilian fire injuries, and 80% of civilian fire deaths.[13] In 2006-2012, single-family fires in the City and County of Honolulu accounted for 48% of dollar losses, 52.9% of injuries, and 68.2% of fatalities.[14] Fires in structures equipped with fire sprinklers accounted for 1.6% of dollar losses, 4.3% of injuries, and 4.5% of fatalities.[15]

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[11] Fire Sprinkler Initiative, Sprinkler Requirements by state and community, March 26, 2013
[12] Act 204, 2008 Legislative Session required solar water heater systems in new single-family residences permitted on or after January 1, 2010. The tax credits were subsequently eliminated.
[13] Fire Estimates: Residential and Nonresidential Buildings, National Estimates by Property Use, U.S. Fire Administration
[14] National Fire Incident Reporting System (NFIRS), City and County of Honolulu, 2006-2012 Structure Fire Report
[15] Ibid

Numerous facts and myths regarding fire sprinklers are not well known or understood. Fire department website information on home fire sprinklers should be updated and promoted regularly through media and various presentations. As life spans of the population increases, more elderly residents will be living in their homes. This group is most at risk to suffer death or injury from a home fire. Fire sprinklers present a safety factor that significantly increases their survival rate.

There is no regulatory agency or code requirement to monitor/test residential fire sprinkler systems. If residential fire sprinklers are required in new one- and two-family dwellings, it will be necessary to educate the homeowner on fire sprinkler system maintenance, which includes:

1. Monthly inspection of all valves to ensure they are open

2. Monthly inspection of tanks, if present, to ensure they are full

3. Monthly testing of pumps, if present, to ensure they operate properly and do not trip circuit breakers upon starting

4. Semiannual testing of all water flow devices, including monitoring service, when provided

5. Ongoing visual inspection of all sprinkler heads to ensure they are not obstructed. Decorations should not be attached or hung from the sprinkler heads.

6. When painting or performing home improvements, special attention should be paid to ensure sprinklers are not painted or obstructed. Sprinkler heads should be covered when painting in the vicinity and removed immediately after painting.[16]

Training for fire sprinkler designers will evolve as technological advances improve and become more efficient. As fire sprinkler systems become required in new, single-family homes, designers must obtain more training in the NFPA 13D-compliant systems, which may require on-site water supply systems. There is a definite design criteria difference between a commercial building in NFPA 13 and a single-family home.

Training for fire sprinkler installers will also be necessary as systems become combined with the domestic water supply and in dual systems due to the possibility of cross-contamination of potable and nonpotable water supplies becoming more common. Training for plans checking must also keep pace with new designs and technological advances in the industry, as more single-family homes become fire sprinkler-compliant.

[16] NFPA 13D, Annex A.4.1.1, 2010 Edition

Liability Issues

A home designer's and builder's failure to provide fire sprinklers or offer a fire sprinkler system as an option during the construction of a new home could arguably create liability, as fire sprinklers are an effective means of lifesaving intervention in the event of a house fire.[17] If a lawsuit resulting from a fire-related injury is brought against a designer or builder who did not provide or offer a fire sprinkler system in a newly constructed one- or two-family dwelling, the cause of action could be negligence if it is in a jurisdiction that requires the inclusion or an offer to include fire sprinklers. Negligence refers to situations in which liability arises through the violation of a law.

In jurisdictions that do not legally require the offering or inclusion of fire sprinklers in newly constructed homes, ordinary negligence or strict liability would likely be the theory on which an action is based. A strict liability theory would argue that the home designer or builder had an absolute duty to use fire sprinklers to make the residence safe. One might expect that a defense in such a negligence action would be that few, if any, designers and builders in that jurisdiction provide fire sprinkler systems in newly constructed one- or two-family dwellings.

Another possible defense could be an aspect of pre-emption in which a defendant argues that the state's or locality's decision not to mandate fire sprinkler systems in newly constructed homes is dispositive of policy-making on the subject, and therefore, prevents a court's imposition of liability. However, in 2002, the Supreme Court ruled that lawsuits are not pre-empted simply because government has considered an issue and chosen not to take regulatory action in a particular area.[18]

Media sources indicate that lawsuits against home builders and resident managers, which allege that a lack of a fire sprinkler system contributed to injuries or deaths, have been filed. However, we could not identify any reported cases in this area as of 2010. Since homes are built utilizing a contract agreement between the builder and the owner, a liability contention would not likely be valid against a builder.

Sustainability

Factory Mutual Global and the Home Fire Sprinkler Coalition conducted research on the environmental impact of fires. Tests were conducted using identically constructed and furnished residential living rooms.

In one test, fire extinguishment was solely achieved by fire service intervention. In the other test, a single sprinkler head controlled the fire until final extinguishment was achieved by the fire service.

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[17] Residential Sprinkler Systems: Consideration of Policy and Litigation Strategies for Reducing Residential Fire Injuries, developed in collaboration with the Johns Hopkins Center for Injury Research and Policy and Johns Hopkins Center for Law and the Public's Health

[18] Sprietsma v. Mercury Marine, Supreme Court of the United States, 2002

Fire sprinklers reduced greenhouse gas emissions, which consist of carbon dioxide, methane, and nitrous oxide, by 97.8%.

When water usage was compared, it was found that in order to extinguish the fire, the combination of sprinkler and hose stream discharge was 50% less that the hose stream alone. Additional analysis indicated that the reduction in water use achieved by using fire sprinklers could be as much as 91% if the results are extrapolated to a full-sized home.

Fewer persistent pollutants, such as heavy metals, and solids were detected in the wastewater sample from the sprinkled test compared to that of the nonsprinkled test. The pH value of the nonsprinkled test wastewater exceeded the allowable discharge range of 5.5 to 9.0, which is required by most environmental agencies. It was also four orders of magnitude higher in alkalinity that wastewater from the sprinkled test.

In the sprinkled room, flashover never occurred; however, in the nonsprinkled test, flashover occurred approximately five minutes after ignition. The occurrence of flashover prior to fire service intervention indicates that the fire would have propagated to adjacent rooms, thus resulting in greater production of greenhouse gases and water demand to extinguish the fire and additional materials to be disposed of in landfills.

It has been known for years that automatic fire sprinklers provide life safety and limit property damage. The current study has shown quantitatively that automatic fire sprinklers are also a key factor in achieving sustainability.[19]

Stakeholder Issues Pros/Cons

New homes built to current codes require fire-rated materials, such as double-wall construction utilizing noncombustible gypsum wallboard, insulated electrical wiring, and smoke alarms. In a 2005 study, it was found that fatalities from one- and two-family dwelling fires are much lower in newer homes.[20]

Incidents may be further reduced with new, safer housing stock; maintenance of existing smoke alarms; and fire safety education. Working smoke alarms in a home reduces the chance of dying in a house fire by 50%.[21] The home building industry believes that fire sprinklers are not as cost-effective as smoke detectors and maintains that fire safety education programs have been working to reduce fire fatalities, injuries, and property losses. As such, fire sprinklers should be an optional choice for the homeowner. Current downward trends in the number of fire incidents do not warrant the mandatory installation of fire sprinklers; home fires continue to decline despite the growth in housing stock.

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[19] Environmental Impact of Automatic Fire Sprinklers, FM Global, March 2010
[20] Eisenberg, Elliot F., Ph.D., Fire Death Rates in Newer Homes, January 10, 2005
[21] Burn Institute, Smoke Detectors Facts and Info

The 2012 IRC requires that smoke alarms be installed and maintained in accordance with the National Fire Alarm Code (NFPA 72), which calls for smoke alarms to be installed inside every bedroom, on every level of the dwelling, and in the immediate vicinity outside bedrooms. Smoke alarms must receive power from a primary power source and have a battery backup in case of power outages. Smoke alarms are also required to be interconnected so that if one smoke alarm detects a fire, smoke alarms throughout the house will alarm. NFPA 72 also requires that smoke alarms be tested annually and replaced after ten years of service.

The 2009 and 2012 IRCs also require that carbon monoxide detectors be installed in dwellings that have fuel-fired appliances or an attached garage. While carbon monoxide detectors do not detect fires, they do detect conditions resulting from an occupant's misuse of heating equipment or cooking appliances that can lead to a potential fire.

Fire injuries and fatalities continue to decline despite population growth. In 1977, there were 5,865 civilian fire fatalities in one- and two-family dwellings, including manufactured homes and apartments. In 2011, there were 2,520 fatalities, which is a decrease of 51%.[22]

In 2011, home fire fatalities accounted for 84% of all civilian fatalities, and fire safety initiatives targeted for home safety remain the key to reductions in the overall death toll.[23] The fire sprinkler system's cost is a major concern to builders, as the cost is ultimately passed on to the consumer. Construction cost factors are especially important in Hawaii, particularly on Oahu, as the median price of a single-family home is $664,000.[24] By 2015, the median price of a home on Oahu is projected to be approximately $800,000.[25]

Fire officials, along with other fire sprinkler supporters and various industry related interests, must increase their educational efforts on the benefits of fire sprinklers to the general public, home builders, legislators, and regulatory and private entities. Although there are educational programs, fire sprinklers are only one part of the overall fire safety message, which include installing and maintaining working smoke alarms, having and practicing a home escape plan, and general cooking, electrical, and housekeeping safety.

The cost versus benefits of installing fire sprinklers must be promoted. Installing smoke alarms and a fire sprinkler system reduces the risk of death in a home fire by 82%.[26]

Lightweight construction uses engineered lumber, a term generally used to describe a wood structural member that is fabricated through use of bonded fibers and materials

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[22] Fire Loss in the United States During 2011, Michael J. Karter, September 2012
[23] Ibid
[24] Honolulu Star-Advertiser, June 7, 2012
[25] Honolulu Star-Advertiser, "$800,000 Homes Around the Corner", August 5, 2012
[26] "Home Fire Sprinkler Facts", www.homefiresprinkler.org/home-fire-sprinkler-facts

and is put together as a composite joist or beam. It encompasses several building component types, including metal plates connected wood trusses, open web steel trusses, and I-joists. Lightweight construction allows builders to implement long spans and open rooms that are prevalent in modern-era home construction.

Test experiments by Underwriters Laboratories (UL)[27] documented striking differences between traditional and engineered systems. A traditionally constructed floor system without a drywall ceiling to protect its underside, withstood a fire test fire for 18 minutes. By comparison, a similar system using I-joists survived approximately six minutes.[28] This means fire fighters face a greater risk of floor or ceiling collapse during fire conditions.

However, where increased fire resistance is desired beyond what is traditionally required by the IRC and IBC, a minimum of ½-inch gypsum wallboard or other material that increases fire resistance of the floor assembly should be applied to unprotected floor applications, regardless of the structural framing materials that make up the floor assembly.[29] The safest fire endurance performance approach to protecting unprotected structural elements is by implementing the use of fire sprinklers. The next safest fire endurance performance approach is through the application of ½-inch gypsum wallboard membrane in accordance with IBC Table 722.6.2(1).[30]

Conclusion and Recommendations

The Committee brought together many groups that will have a vested interest should fire sprinklers be required in newly constructed one- and two-family dwellings.

Thank you to those who contributed to this final report. Their contributions include consistently attending monthly meetings and providing information in the referenced documents.

Although financial incentives to offset the cost of fire sprinklers were identified, the decision to modify current standards and fees will rely upon fire, building, and water officials to work cooperative agreements satisfactory to each agency's requirements.

In addition, it is strongly recommended that these three groups meet to discuss and review existing policies and regulations that may require revision or modification to address various impediments to fire sprinklers new one- and two-family dwellings.

Cost estimates for new residential fire sprinklers are much higher in Hawaii than the national average, especially with the addition of various county water meter charges. County water purveyors must be solicited to review these charges to ascertain if they can be revised. It appears that in larger, planned residential subdivisions, fire sprinklers

[27] Report on Structural Stability of Engineered Lumber in Fire Conditions UL Inc. September 30, 2008
[28] Ibid
[29] Technical Evaluation Report No. 1106-02, Structural Building Components Research Institute & Qualtim, Inc., May 29, 2012
[30] Technical Evaluation Report No. 1106-01, Structural Building Components Research Institute & Qualtim, Inc., May 29, 2012

may have the least impact when materials and labor costs are evenly distributed over a greater number of owners.

Fire sprinklers have a proven safety record of saving lives and property nationwide. Gaining acceptance of fire sprinklers in new one- and two-family dwellings by all stakeholders, including home buyers, will require a greater degree of education on life safety benefits versus construction costs.

HOUSE OF REPRESENTATIVES
STATE OF HAWAII
STATE CAPITOL
HONOLULU HAWAII 96813

777

May 9, 2011

Mr. Ken Silva
Chair
Department of Labor & Industrial Relations
State Fire Council
690 South Street
Honolulu, HI 96813

Dear Mr. Silva:

I transmit herewith a copy of House Resolution No. 47, H.D. 1, which was adopted by the House of Representatives of the Twenty-Sixth Legislature of the State of Hawaii, Regular Session of 2011.

Sincerely,

Brian L. Takeshita

for Patricia Mau-Shimizu
Chief Clerk
House of Representatives

HONOLULU FIRE DEPT
2011 MAY 18 A 8:56

HOUSE OF REPRESENTATIVES
TWENTY-SIXTH LEGISLATURE, 2011
STATE OF HAWAII

H.R. NO. 47 H.D. 1

HOUSE RESOLUTION

REQUESTING THE STATE BUILDING CODE COUNCIL TO ADOPT THE REQUIREMENT THAT AUTOMATIC FIRE SPRINKLERS BE INSTALLED IN NEW ONE- AND TWO-FAMILY DWELLINGS.

WHEREAS, the State is concerned with the health, safety, and welfare of its citizens; and

WHEREAS, this includes, among other things, providing fire protection to its citizens and property, and protecting the safety of fire fighters who respond to emergencies in the State; and

WHEREAS, fire departments in the United States responded to an estimated 399,000 home structure fires in 2007, which caused 2,865 civilian deaths, 13,600 civilian injuries, and $7,400,000,000 in direct damage; and

WHEREAS, approximately 84 percent of all civilian fire deaths in 2007 resulted from home structure fires, and an average of eight people died in home fires in the United States every day; and

WHEREAS, in the City and County of Honolulu alone, there were 120 home structure fires in 2007, resulting in two civilian deaths, 23 civilian injuries, and $9,600,000 in direct damage; and

WHEREAS, in the City and County of Honolulu 100 percent of all fire deaths, 77 percent of the fire injuries, and 51 percent of the fire-related dollar loss in 2007 resulted from home structure fires; and

WHEREAS, automatic fire sprinklers are a proven life-saving system with quick and effective response to the presence of nearby fires; and

HR47 HD1 HMS 2011-3136

I do hereby certify that the within document is a full, true and correct copy of the original on file in this office.

for Chief Clerk
House of Representatives
State of Hawaii

WHEREAS, the presence of fire sprinklers in the home reduces the chance of death in a fire by approximately 80 percent; and

WHEREAS, people in homes with fire sprinklers are protected against significant property loss, as fire sprinklers reduce the average property loss by 71 percent per fire; and

WHEREAS, two international building codes, the "International Residential Code" 2009 edition and the "National Fire Protection Association 5000 Building and Construction and Safety Code" 2009 edition, mandate fire sprinklers in new one- and two-family dwelling construction; and

WHEREAS, the operation of just one fire sprinkler head will contain a fire approximately 90 percent of the time; and

WHEREAS, the most cost-effective time to install fire sprinklers is during new construction; and

WHEREAS, the State Building Code Council is studying the issues related to requiring the installation of automatic fire sprinklers in new one- and two-family dwellings; now, therefore,

BE IT RESOLVED by the House of Representatives of the Twenty-sixth Legislature of the State of Hawaii, Regular Session of 2011, that the State Building Code Council is requested to adopt the requirement that automatic fire sprinklers be installed when constructing new one- and two-family dwellings, in compliance with the latest editions of nationally-recognized safety codes; and

BE IT FURTHER RESOLVED that the State Building Code Council is requested to:

(1) Clarify the definition of one- and two-family dwellings; and

(2) Address the issues of accessibility and availability of water to all dwellings;

and

BE IT FURTHER RESOLVED that the State Building Code Council is requested to submit a report of its findings, recommendations, and actions taken pursuant to this Resolution, to the Legislature no later than 20 days before the convening of the Regular Session of 2015; and

BE IT FURTHER RESOLVED that certified copies of this Resolution be transmitted to the Comptroller, Chairperson of the State Building Code Council, Chairperson of the State Fire Council, and Fire Chief of each county.

APPENDIX B

Investigative Committee Members Who Attended Two or Fewer Meetings

Aaron Kane, HFD
Ann-Ogata Deal, Department of Business, Economic Development and Tourism
Brett Lomont, HFD
Brian Zablan, HFD
C. Mike Kido, Pacific Resource Partnership
Carl Lorenzo, HFD
Clark "Skip" Morgan, GCA
Denise Wong, BIA
Dominic Dias, Board of Water Supply
Engineers
Evan Fujimoto, Graham Builders
Faye Hanohano, Hawaii State Representative
Gladys Hagemann, General Contractors Association of Hawaii (GCA)
Jeffrey LePage, HFD
Karen Nakamura, Building Industry Association of Hawaii (BIA)
Kenneth Bogowitz, HFD
Kenneth Tenn, HFD
Kerry Yoneshige, Department of Accounting and General Services
Kevin Mokulehua, HFD
Kraig Stevenson, International Code Council
Mark Kennedy, Haseko
Michelle Kidani, Hawaii State Senator
Mike Kujubu, American Institutes of Architects
Ponciana Galera, Jr. HFD
Ralph Nagamine, Department of Public Works, County of Maui
Ryan Yamane, Hawaii State Representative
Sam Dannaway, Society of Fire Protection Engineers of Hawaii
Sam Gillie, American Society of Heating, Refrigerating and Air-Conditioning
Scot Seguirant, HFD
Shane Peters, Hawaii Developers' Council
Shannon Alivado, GCA
Sheldon Yasso, Honolulu Fire Department (HFD)
Terio Bumanglag, HFD
Tom Waite, BIA
Warren Iseke, HFD
Will Espero, Hawaii State Senator

Table 100-19 - FIRE FLOW REQUIREMENTS				
LAND USE	FLOW (GPM)/DURATION (HRS)/FIRE HYDRANT SPACING (FT.)			
	HAWAII	KAUAI	MAUI	OAHU
Agriculture	500/0.5/600 (1)	250/1/500	500/2/500	1000/0.5/700
Rural			1000/2/500	
Single Family	(2)	(4)	1000/2/350	1000/1/350
Duplex	1500/1/300	(4)	1250/2/350	1000/1/350
PUD Townhouse and Low Rise Apartments	1500/1/300	(4)	(5)	1500/1/250
Schools, Neighborhood Businesses, Small Shopping Centers, Hotels (except Maui), and High Rise Apartments	2000/2/300	2000/2/350	2000/2/250	2000/2/250
Light Industry, Downtown Business, Large Shopping Center, and Hospitals	2,000/2/300	3000/3/350	2000/2/250	4000/3/250
Heavy Industry, Hotels	2,000/2/300	3000/3/350	2,500/2/ 250	(3)

(1) - Applies to one acre lot size or less
(2) - 10,000 sq. ft. or larger lot size = 500/2/600; Less than 10,000 sq. ft. lot size = 1000/1/600
(3) - Subject to special review and control by Manager
(4) - R-2 = 500/1/500 R-4 = 750/2/500 R-6 = 1000/2/500 R-10 = 1250/2/350
R-20 = 1500/2/350 RR-10 = 1500/2/350 RR-20 = 2000/2/350
(5) - A-1 = 1500/2/250 A-2 = 2000/2/250

Note:
1. On dead end streets, the last F.H. shall be located at one half the spacing distance for F.H.s from the last house/unit (frontage property line or to the driveway/access for the property).
2. Spacing of fire hydrant shall be measured along the roadway.

TANK AND PUMP OPTION VS. UPGRADED 1" WATER METER

HAWAII COUNTY

Tank and Pump Option		Sprinkler	Upgrade to 1 Inch Meter		Difference
5/8 inch meter	1,190		1 inch meter	13,750	12,560
Lateral	3,000		Lateral	3,000	0
200 feet of 1 inch pipe ($5.06 / Lineal Feet)	1,012		200 feet of 1-1/2 inch pipe ($10.40 / Lineal feet)	2,080	1,068
Tank and Pump	2,100	2,100	Tank and Pump	0	
Concrete Slab (27 square feet at $6.15 / square feet)	166	166	Concrete Slab	0	
Sprinkler System ($4.50 / square feet for 1500 square feet home)	6,750	6,750	Sprinkler System ($4.50 / square feet for 1500 square feet home)	6,750	6,750
Extra 27 square feet of home area ($200 / square feet)	5,400	5,400	Extra 27 square feet of home area ($200 / square feet)	0	
Backflow Preventer Assembly	0		Backflow Preventer Assembly	?	
Cost	**$ 19,618**	$14,416	**Cost**	**$ 25,580**	$20,378
Note: Of the $19,168, the cost of the fire sprinklers is **$14,416**.			Note: Of the $25,580, the added cost of the fire sprinklers is **$20,378** plus the cost of the backflow preventer.		

ASSUMPTIONS:

1. Costs are based on a 1,500 SF house with an average cost of $200 per SF. Cost of fire sprinklers is $4.50 per SF. Cost of tank and pump is $2,100.
2. 5/8 inch water meter cost is $1,190. 1 inch water meter cost is $13,750. Cost of the supply pipe lateral from the near side of the street is $3,000. Cost of lateral from the far side of the street or on State roads are higher.
3. Assume the house is setback 200 feet from the frontage road. Cost of 1 inch PVC pipe is $5.06 / LF. Cost of 1-1/2 inch PVC pipe is $10.40 / LF
4. Assume 27 SF of extra area is needed with a 6 inch thick concrete slab for the tank and pump option.
5. Backflow preventer is needed for the 1 inch meter sprinkler option only.

TANK AND PUMP OPTION VS. UPGRADED 1" WATER METER

CITY AND COUNTY OF HONOLULU

Tank and Pump Option		Sprinkler	Upgrade to 1 Inch Meter		Difference
3/4 inch meter	1,800		1 inch meter	2,300	500
Water System Facilities Charge (20 Fixture Units)	3,707		Water System Facilities Charge (20 Fixture Units)	3,707	0
Lateral 1 inch	1,710		Lateral 1-1/2 inch	2,115	405
One Time Fire Charge	600		One Time Fire Charge	700	100
200 feet of 1 inch pipe ($5.06 / Lineal Feet)	1,012		200 feet of 1-1/2 inch pipe ($10.40 / Lineal feet)	2,080	1068
Tank and Pump	2,100	2,100	Tank and Pump	0	
Concrete Slab (27 square feet at $6.15 / square feet)	166	166	Concrete Slab	0	
Sprinkler System ($4.50 / square feet for 1500 square feet home)	6,750	6,750	Sprinkler System ($4.50 / square feet for 1500 square feet home)	6,750	6,750
Extra 27 square feet of home area ($200 / square feet)	5,400	5,400	Extra 27 square feet of home area ($200 / square feet)	0	
Backflow Preventer Assembly	0		Backflow Preventer Assembly	440	440
Cost	**$ 23,245**	$14,416	**Cost**	**$ 18,092**	$9,263
Note: Of the $20,932, the cost of the fire sprinklers is **$14,416**.			Note: Of the $18,09292, the added cost of the fire sprinklers is **$9,263**		

Assumptions

1. Costs are based on a 1,500 SF house with an average cost of $200 per SF. Cost of fire sprinklers is $4.50 per SF. Cost of tank and pump is $2,100.
2. Cost of 3/4 inch water meter, 1 inch lateral, and water use charges is $5,504. Cost of 1 inch water meter, 1-1/2 inch lateral and water use charges is $6,03
3. Assume the house is setback 200 feet from the frontage road. Cost of 1 inch PVC pipe is $5.06 / LF. Cost of 1-1/2 inch PVC pipe is $10.40 / LF
4. Assume 27 SF of extra area is needed with a 6 inch thick concrete slab for the tank and pump option.
5. Backflow preventer is needed for the 1 inch meter sprinkler option only.

TANK AND PUMP OPTION VS. UPGRADED 1" WATER METER

KAUAI COUNTY

Tank and Pump Option		Sprinkler	Upgrade to 1 Inch Meter		Difference
5/8 inch meter	4,600		1 inch meter	26,400	21,800
5/8 inch meter installation (Provided DOW can install)	1,725		1 inch meter installation (Assume Contractor Install)	4,000	2,275
200 feet of 1 inch pipe ($5.06 / Lineal Feet)	1,012		200 feet of 1-1/2 inch pipe ($10.40 / Lineal feet)	2,080	1,068
Tank and Pump	2,100	2,100	Tank and Pump	0	
Concrete Slab (27 square feet at $6.15 / square feet)	166	166	Concrete Slab	0	
Sprinkler System ($4.50 / square feet for 1500 square feet home)	6,750	6,750	Sprinkler System ($4.50 / square feet for 1500 square feet home)	6,750	6,750
Extra 27 square feet of home area ($200 / square feet)	5,400	5,400	Extra 27 square feet of home area ($200 / square feet)	0	
Backflow Preventer Assembly	2,500	2,500	Backflow Preventer Assembly	3,000	3,000
Cost	**$ 24,253**	16,916	**Cost**	**$ 42,230**	34,893
Note: Of the $21,753, the cost of the fire sprinklers is **$14,416**.			Note: Of the $36,955, the added cost of the fire sprinklers is **$29,618** plus the cost of the backflow preventer.		

Assumptions

1. Costs are based on a 1,500 SF house with an average cost of $200 per SF. Cost of fire sprinklers is $4.50 per SF. Cost of tank and pump is $2,100.
2. 5/8 inch water meter cost is $4,600. 1 inch water meter cost is $26,400.
3. Cost of installing 5/8 inch meter is $1,725. Cost of installing 1 inch meter is $1,725.
4. Assume the house is setback 200 feet from the frontage road. Cost of 1 inch PVC pipe is $5.06 / LF. Cost of 1-1/2 inch PVC pipe is $10.40 / LF
5. Assume 27 SF of extra area is needed with a 6 inch thick concrete slab for the tank and pump option.
6. Backflow preventer is needed for the 1 inch meter sprinkler option only.
7. Backflow Preventer Assembly cost estimate is based on install by contractor
8. 1 inch meter by consumer ($2000 design + $2000 construction = $4000 est.)

TANK AND PUMP OPTION VS. UPGRADED 1" WATER METER

MAUI COUNTY

Tank and Pump Option		Sprinkler	Upgrade to 1 Inch Meter		Difference
5/8 inch meter	6,030		1 inch meter	15,678	9,648
Upgrade for Tap to Water Main	0		Upgrade for Tap to Water Main	9,000	9,000
200 feet of 1 inch pipe ($5.06 / Lineal Feet)	1,012		200 feet of 1-1/2 inch pipe ($10.40 / Lineal feet)	2,080	1,068
Tank and Pump	2,100	2,100	Tank and Pump	0	
Concrete Slab (27 square feet at $6.15 / square feet)	166	166	Concrete Slab	0	
Sprinkler System ($1.67 / square feet for 1500 square feet home)	2,505	2,505	Sprinkler System ($1.67 / square feet for 1500 square feet home)	2,505	2,505
Extra 27 square feet of home area ($200 / square feet)	5,400	5,400	Extra 27 square feet of home area ($200 / square feet)	0	
Backflow Preventer Assembly	0		Backflow Preventer Assembly	400	400
Building Permit Fee	35	35	Building Permit Fee	35	
Fire Permit Fee	50	50	Fire Permit Fee	50	
Cost	**$ 17,298**	$10,256	**Cost**	**$ 29,748**	$22,621
Note: Of the $17,298, the cost of the fire sprinklers is **$10,256**.			Note: Of the $29,748, the added cost of the fire sprinklers is **$22,621**.		

Assumptions

1. Costs are based on a 1,500 SF house with an average cost of $200 per SF. Cost of fire sprinklers is $1.67 per SF. Cost of tank and pump is $2,100.
2. 5/8 inch water meter cost is $6,030. 1 inch water meter cost is $15,678. Cost of upgrade to 1 inch tap is $9,000.
3. Assume the house is setback 200 feet from the frontage road. Cost of 1 inch PVC pipe is $5.06 / LF. Cost of 1-1/2 inch PVC pipe is $10.40 / LF
4. Assume 27 SF of extra area is needed with a 6 inch thick concrete slab for the tank and pump option.
5. Backflow preventer is needed for the 1 inch meter sprinkler option only. Cost of 1 inch backflow preventer is $400.
6. Cost for Building permit fee is $35. Cost for Fire Permit Fee is $50.

APPENDIX E

Residential Fire Sprinkler System NFPA 13D

From Fire Sprinklers Contractors on Oahu

Prices are based on two Homes: Home #1 Two story Home approx. 1536 sq. ft. (Area of fire sprinkler coverage)

- Includes 18 ea. Fire sprinklers heads
- From above grade

Home #2 Two story Home approx 1480 sq. ft. (Area of firs sprinkler coverage)

- Includes 15 ea. Fire sprinkler heads
- From above grade

Included for both Homes are: Materials, fabrication, installation, flushing, testing and inspection.

Contractors	Contractor A	Contractor B	Contractor C *	Contractor D**	Average
					Cost/ sq. ft.
Home #1	$ 6,713.00	$ 5,500.00	$ 7,281.00	$ 7,680.00	
Price per sq. ft.	$ 4.37	$ 3.58	$ 4.74	$ 5.00	$4.42
Material	Copper Pro Press	CPVC	CPVC	CPVC	
Home #2	$ 6,350.00	$ 4,100.00	$ 7,015.20	$ 7,400.00	
Price per sq. ft.	$ 4.29	$ 2.77	$ 4.74	$ 5.00	$4.20
Material	Copper Pro Press	CPVC	CPVC	CPVC	
Shop drawings	included	Not included	included	included	

* was given a price based on 2000 sq. ft. home. Divided price by 2000 sq. ft. to get per sq. ft.

** Was given a price based on square ft.

GOV. MSG. NO. 1184

EXECUTIVE CHAMBERS
HONOLULU

NEIL ABERCROMBIE
GOVERNOR

April 26, 2012

The Honorable Shan Tsutsui, President
and Members of the Senate
Twenty-Sixth State Legislature
State Capitol, Room 409
Honolulu, Hawaii 96813

The Honorable Calvin Say, Speaker
and Members of the House
Twenty-Sixth State Legislature
State Capitol, Room 431
Honolulu, Hawaii 96813

Dear President Tsutsui, Speaker Say and Members of the Legislature:

This is to inform you that on April 26, 2012, the following bill was signed into law:

SB2397 SD1 HD3 — RELATING TO FIRE SPRINKLERS.
Act 083 (12)

Sincerely,

NEIL ABERCROMBIE
Governor, State of Hawaii

Approved by the Governor
on APR 2 6 2012

THE SENATE
TWENTY-SIXTH LEGISLATURE, 2012
STATE OF HAWAII

ACT 083

S.B. NO. 2397 S.D. 1 H.D. 3

A BILL FOR AN ACT

RELATING TO FIRE SPRINKLERS.

BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF HAWAII:

SECTION 1. Chapter 46, Hawaii Revised Statutes, is amended by adding a new section to be appropriately designated and to read as follows:

"**§46- Fire sprinklers; residences.** No county shall require the installation or retrofitting of automatic fire sprinklers or an automatic fire sprinkler system in:

(1) Any new or existing detached one- or two-family dwelling unit in a structure used only for residential purposes; and

(2) Non-residential agricultural and aquacultural buildings and structures located outside an urban area;

provided that this section shall not apply to new homes that require a variance from access road or fire fighting water supply requirements."

SECTION 2. New statutory material is underscored.

SECTION 3. This Act shall take effect on July 1, 2012; provided that on June 30, 2017, this Act shall be repealed.

S.B. NO. 2397 S.D. 1 H.D. 3

APPROVED this 26 day of APR , 2012

GOVERNOR OF THE STATE OF HAWAII