2007-08 Code Changes to International Residential Code Affecting Residential Sprinklers

Prepared by Jeffrey Shapiro on behalf of the IRC Fire Sprinkler Coalition (JShapiro@IRCFireSprinkler.org)

Proposal Number	Proponent	Topic	Discussion
RB62	National Association of State Fire Marshals	Mandates Sprinklers in all residential construction.	Supported by the IRC Fire Sprinkler Coalition, but RB64 may ultimately be viewed as more acceptable to the ICC membership since it takes a more moderate stance. RB64's delayed implementation will provide time to "ramp up" to the residential sprinkler requirement.
RB63	American Society of Plumbing Engineers	Mandates Sprinklers in all residential construction.	Supported by the IRC Fire Sprinkler Coalition, but RB64 may ultimately be viewed as more acceptable to the ICC membership since it takes a more moderate stance. RB64's delayed implementation will provide time to "ramp up" to the residential sprinkler requirement.
RB64	IRC Fire Sprinkler Coalition	Mandates Sprinklers in all residential construction effective Jan. 1, 2011.	Supported by the IRC Fire Sprinkler Coalition. RB64's delayed implementation will provide time to "ramp up" to the residential sprinkler requirement. This approach to phasing in residential sprinklers should appeal to those who believe sprinklers should eventually become part of the IRC, but not right away. Viewed in combination with RB67 and RP8, this represents a very moderate approach to bringing sprinklers into the IRC. The three proposals offer a delayed implementation; construction, design and land-use incentives; and a prescriptive methodology for designing and installing residential sprinkler systems.
RB65	City of Lenexa, KS	Mandates Sprinklers in all townhouses.	Supported by the IRC Fire Sprinkler Coalition, but not to the exclusion of RB64 (which will also include townhouses). This proposal will likely be viewed by some ICC members as a compromise, as compared to also sprinklering 1- and 2-family dwellings.
RB66	AvalonBay Communities	Mandates Sprinklers in all townhouses and includes an incentive package.	Should be supported by the IRC Fire Sprinkler Coalition, but not to the exclusion of RB64 (which will also include townhouses). This proposal will likely be viewed by some ICC members as a compromise, as compared to also sprinklering 1- and 2-family dwellings, or adding an outright mandate to sprinkler townhouses without an incentive package. It is important to note that this proposal actually comes from a major multi-family builder, as opposed to a fire-service organization, and is backed by others in the multi-family industry because it takes a "balanced" approach by adding sprinklers, which are not currently required, and modifying other fire protection features. With the building industry supporting this change, it has a high probability for success. Nevertheless, it will likely be opposed by special interest groups who traditionally back fire-resistive construction and related features because they will perceive the proposal as eroding their interest.
RB67	International Association of Fire Chiefs, Fire & Life Safety Section	Adds a residential construction incentive package to encourage the use of residential sprinklers.	Should be supported by the IRC Fire Sprinkler Coalition. When viewed as part of a package of three proposals that also includes RB64 and RP3, this is a moderate approach to bringing sprinklers into the IRC. The combination of these three proposals adds a time-delayed sprinkler requirement along with reasonable incentives to help offset cost, improve design and property use flexibility, and simplify the sprinkler system design and installation regulations, which will be added directly into the IRC plumbing chapter.

Proposal Number	Proponent	Topic	Discussion
RB68	International Association of Firefighters	Mandates Sprinklers in residential construction with selected lightweight construction methods.	Supported by the IRC Fire Sprinkler Coalition, but not to the exclusion of RB64, RB63 or RB62.
RB69	National Association of Home Builders	Adds a residential construction incentive package to encourage the use of residential sprinklers.	Should be supported, at least in part, by the IRC Fire Sprinkler Coalition, but not to the exclusion of RB67. While it's better to have some incentives in the IRC versus none, including incentives in the Appendix will require local legislation to permit their use. There is no apparent reason why the incentive approach should require jurisdictional discretion. RB67 takes a better approach by putting these provisions in the body of the code. Note that there are a few technical differences between this package of incentives and those in RB67 (beyond the body-of-code vs. Appendix issue). The membership of ICC will need to review these differences to determine if the NAHB's added/modified incentives are reasonable vs. those submitted by IAFC.
RB70	National Association of Home Builders	Adds a residential construction incentive package to encourage the use of residential sprinklers AND a set of simplified, prescriptive requirements for the design and installation of sprinkler systems. Proposals are recommended for inclusion in the Appendix.	Should be supported, at least in part, by the IRC Fire Sprinkler Coalition, but not to the exclusion of RB67 and RP3. This proposal is essentially a combination of NAHB's RB69 and RP8. Why NAHB submitted this as a separate proposal, versus simply relying on RB69 and RP8 is unclear. While it's better to have these provisions in the Appendix of the IRC than not at all, including the provisions in the Appendix will require local legislation to permit their use. There is no apparent reason why jurisdictional discretion should be needed to allow the use of incentives or prescriptive design/installation provisions.
RP3	International Association of Fire Chiefs, Fire & Life Safety Section	Adds a set of simplified, prescriptive requirements for the design and installation of sprinkler systems. Note that the published proposal is limited to multi-purpose systems, but there will be a floor amendment proposed at the Palm Springs hearing to expand the scope of this proposal to include stand-alone systems as well.	Should be supported by the IRC Fire Sprinkler Coalition. When viewed as part of a package of three proposals that also includes RB64 and RB67, this is a moderate approach to bringing sprinklers into the IRC. The combination of these three proposals adds a time-delayed sprinkler requirement along with reasonable incentives to help offset cost, improve design and property use flexibility, and simplify the sprinkler system design and installation regulations, which will be added directly into the IRC plumbing chapter.
RP8	National Association of Home Builders	Adds a set of simplified, prescriptive requirements for the design and installation of sprinkler systems. Similar to RP3, but puts material into the Appendix.	Should be supported by the IRC Fire Sprinkler Coalition, but not to the exclusion of RP3. While it's better to have these provisions in the Appendix of the IRC than not at all, including the provisions in the Appendix will require local legislation to permit their use. There is no apparent reason why jurisdictional discretion should be needed to allow the use of prescriptive design/installation provisions. RP3 takes a better approach by putting these provisions in the body of the code.

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STEP IN CODE DEVELOPMENT CYCLE	DATE
DEADLINE FOR RECEIPT OF APPLICATIONS FOR CODE COMMITTEES	July 2, 2007
DEADLINE FOR RECEIPT OF CODE CHANGE PROPOSALS	August 20, 2007
PUBLICATION DATE FOR MONOGRAPH OF "PROPOSED CHANGES TO THE I-CODES"	December 18, 2007
CODE DEVELOPMENT HEARING (CDH)	**February 18-March 2, 2008** Palm Springs Convention Center Palm Springs, CA
PUBLICATION DATE FOR "REPORT OF THE PUBLIC HEARING"	April 24, 2008
DEADLINE FOR RECEIPT OF PUBLIC COMMENTS	June 9, 2008
PUBLICATION DATE OF PUBLIC COMMENTS "FINAL ACTION AGENDA"	August 15, 2008
FINAL ACTION HEARING (FAH)	**September 17-23, 2008** Minneapolis Convention Center Minneapolis, MN
ANNUAL CONFERENCES	**September 30- October 3, 2007** 2007 ICC Annual Educational Conference Grand Sierra Resort Reno, NV **September 14 – 23, 2008** 2008 ICC Annual Conference and FAH Minneapolis Convention Center Hotel TBD
RESULTING PUBLICATION	2009 Editions

Publication dates indicate when the printed copy of the document will be available. These documents will be posted on the ICC website approximately 4 weeks prior to availability of the printed version.

June 29, 2007

2007/2008 ICC CODE DEVELOPMENT CYCLE
CROSS INDEX OF PROPOSED CODE CHANGES

Some of the proposed code changes include sections that are outside of the scope of the chapters or the code listed in the table of 2007/2008 Staff Secretaries on page ix. This is done in order to facilitate coordination among the International Codes which is one of the fundamental principles of the International Codes.

Listed in this index are proposed code changes that include sections of codes or codes other than those listed on page ix. For example, IFC Section 509.1 is proposed for revision in Item 2 of code change G46-07/08, which is to be heard by the IBC-General Code Committee. The IFC is typically the responsibility of the IFC Committee as listed in the table of 2007/2008 Staff Secretaries. It is therefore identified in this index. Another example is Section 704.5 of the International Building Code. Chapter 7 is normally maintained by the IBC-Fire Safety committee, but Section 704.5 will be considered for revision in proposed code change G173 (Item 2) and will be placed on the IBC-General Committee agenda. In some instances, there are other subsections that are revised by an identified code change that is not included in the list. For example, numerous sections in Chapter 10 of the International Fire Code would be revised by the proposed changes to Chapter 10 of the IBC. This was done to keep the list brief enough for easy reference.

This information is provided to assist users in locating all of the proposed code changes that would affect a certain section or chapter. For example, to find all of the proposed code changes that would affect Chapter 7 of the IBC, review the proposed code changes in the Volume 1 monograph for the IBC Fire Safety Committee (listed with a FS prefix) then review this cross reference for Chapter 7 of the IBC for proposed code changes published in other code change groups. While care has been taken to be accurate, there may be some omissions in this list.

Letter prefix: Each proposed change number has a letter prefix that will identify where the proposal is published. The letter designations for proposed changes and the corresponding publications are as follows:

PREFIX	**PROPOSED CHANGE GROUP (see monograph table of contents for location)**
E	International Building Code - Means of Egress
EB	International Existing Building Code
EC	International Energy Conservation Code
F	International Fire Code
FG	International Fuel Gas Code
FS	International Building Code - Fire Safety
G	International Building Code - General
M	International Mechanical Code
PC	ICC Performance Code
P	International Plumbing Code
PSD	International Private Sewage Disposal Code
PM	International Property Maintenance Code
RB	International Residential Code - Building
RE	International Residential Code - Energy
RM	International Residential Code - Mechanical
RP	International Residential Code - Plumbing
S	International Building Code - Structural
WUIC	International Wildland-Urban Interface Code
Z	International Zoning Code

INTRODUCTION

The proposed changes published herein have been submitted in accordance with established procedures and are distributed for review. The publication of these changes constitutes neither endorsement nor question of them but is in accordance with established procedures so that any interested individuals may make their views known to the relevant code committee and others similarly interested. In furtherance of this purpose, the committee will hold an open public hearing at the date and place shown below for the purpose of receiving comments and arguments for or against such proposed changes. Those who are interested in testifying on any of the published changes are expected to be represented at these hearings. **Please note that the 2007/2008 code changes have been assembled in two volumes. Be sure to bring Volumes 1 & 2 to the public hearings.**

2008 ICC CODE DEVELOPMENT HEARINGS

These proposed changes will be discussed in public hearings to be held on February 18, 2008 through March 1, 2008 at the Palms Springs Convention Center, 277 N. Avenida Caballeros, Palm Springs, California. The code committees will conduct their public hearings in accordance with the schedule shown on page xxxv.

PROCEDURES, REGISTRATION AND VOTING

The procedures for the conduct of the public hearing are published in *Council Policy #28-Code Development (CP#28)* ("Procedures") in page xi. The attention of interested parties is specifically directed to Section 5.0 of the Procedures. These procedures indicate the conduct of, and opportunity to participate in the ICC Code Development Process.

All members of ICC may vote on any assembly motion on proposed code changes to all International Codes. **For identification purposes, eligible voting members must register, at no cost, in order to vote**. The registration desk will be open in the lobby of the convention center according to the following schedule:

Sunday, February 17	10:00 am to 4:00 pm
Monday, February 18-Friday, February 29	7:00 am to 6:00 pm

Council Policy #28-Code Development (page xi) requires that ICC's membership records regarding ICC members reflect the eligible voters 10 days prior to the start of the Code Development Hearings. This includes new as well as changes to voting status. Section 5.7.4 of CP #28 (page xix) reads as follows:

> **5.7.4 Eligible Voters:** All members of ICC in attendance at the public hearing shall be eligible to vote on floor motions. Only one vote authorized for each eligible attendee. Code Development Committee member shall be eligible to vote on floor motions. Application, whether new or updated, for ICC membership must be received by the Code Council ten days prior to the commencement of the first day of the public hearing.

As such, new membership applications as well as renewal applications must be received by ICC's Member Services Department by February 8, 2008. These records will be used to verify eligible voter status for the Code Development Hearings. Members are strongly encouraged to review their membership records for accuracy well in advance of the hearings so that any necessary changes are made prior to the February 8th deadline. For information on application for new membership and membership renewal, please go to www.iccsafe.org/membership/join.html or call ICC Member Services at 1-888-ICC SAFE (422-7233)

2007/2008 ICC CODE DEVELOPMENT HEARING SCHEDULE

February 18 – March 1, 2008

Palm Springs Convention Center; Palm Springs California

(www.iccsafe.org/codesforum)

Unless noted by "Start no earlier than X:00," (see Note 4 below) each Code Committee will begin immediately upon completion of the hearings for the prior Committee. Thus the actual start times for the various Code Committees are tentative. The hearing volume is considerably high. The schedule anticipates that Track 1 hearings will finish on Saturday, March 1 and that Track 2 hearings will finish on Wednesday, February 27.

	Monday February 18	Tuesday February 19	Wednesday February 20	Thursday February 21	Friday February 22	Saturday February 23	Sunday February 24
TRACK 1	Start 8 am IRC-Bldg/Energy End 8 pm	Start 8 am IRC-Bldg/Energy End 8 pm	Start 8 am IRC-Bldg/Energy IBC-Means of Egress (Start no earlier than 6 pm) End 8 pm	Start 8 am IBC-Means of Egress End 8 pm	Start 8 am IBC-Means of Egress IBC-General (Start no earlier than 1 pm) End 8 pm	Start 8 am IBC-General End 8 pm	Start 10 am IBC-General IBC-Fire Safety (Start no earlier than 1 pm) End 8 pm
TRACK 2	Start 8 am IEBC IPM/ZC IECC (Start no earlier than 5 pm) End 8 pm	Start 8 am IECC End 8 pm	Start 8 am IECC End 8 pm	Start 8 am IECC IFGC (Start no earlier than 8 am) IRC-Plumbing/ Mechanical End 8 pm	Start 8 am IRC-Plumbing/ Mechanical IMC (Start no earlier than 1 pm) End 8 pm	Start 8 am IMC IPC (Start no earlier than 1 pm) End 8 pm	Start 10 am IPC IBC-Structural (Start no earlier than 5 pm) End 8 pm

	Monday February 25	Tuesday February 26	Wednesday February 27	Thursday February 28	Friday February 29	Saturday March 1	
TRACK 1	Start 8 am IBC-Fire Safety End 8 pm	Start 8 am IBC-Fire Safety IWUIC/IFC (Start no earlier than 4 pm) End 8 pm	Start 8 am IFC End 8 pm	Start 8 am IFC End 8 pm	Start 8 am IFC End 8 pm	Start 8 am IFC End 8 pm	
TRACK 2	Start 8 am IBC-Structural End 8 pm	Start 8 am IBC-Structural End 8 pm	Start 8 am IBC-Structural End 8 pm				

Notes:

1. Hearing times may be modified at the discretion of the Chairman. Breaks will be announced.
2. Proposed code changes submitted to the International Wildland-Urban Interface Code (IWUIC) to be heard by the IFC Committee.
3. Proposed code changes submitted to the International Zoning (Z) and Property Maintenance (PM) Codes to be heard by the IPM/Z Committee.
4. Due to the uncertainties in the hearing process, start times indicated as "start no earlier than X:00" are conservatively estimated and are not intended to be scheduled targets.
5. See page vii of the code change book concerning a scheduled Members Forum in Palm Springs.

2007/2008 PROPOSED CHANGES TO THE INTERNATIONAL RESIDENTIAL CODE – BUILDING & ENERGY

IRC –BUILDING & ENERGY CODE COMMITTEE

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City of Central
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JRuth Code Consulting
New Lenox, IL
Rep: American Architectural Manufacturers Association (AAMA)

Alan G. Steinle
President
Steinle Construction Engineers Inc.
Wilmington, DE
Rep: National Council of Structural Engineers Association (NCSEA)

Staff Secretary:
Larry Franks, PE
Senior Staff Engineer
International Code Council

Staff Secretary:
Marc Nard, CBO
Senior Technical Staff
International Code Council

Post attachment methods that rely on nails, screws, blocking, and bolts have been tested and have failed to meet the target load capacity. However, guard post assemblies that incorporate a lateral anchor have consistently achieved results that met or exceeded the target load values as established by the ICC. Lateral anchors have been shown to effectively transfer load and the associated moment to the deck floor joists. This code revision prescribes a method of post-to-deck attachment that will provide guard systems the capacity to meet or exceed code prescribed performance levels.

Bibliography:

1, M. Morse, D. Walsh, 2005. Alternative Hardware for Guardrail to Post Connection, Professional Deck Builder, Vol. 4, (2). 51,59
2. M. Morse, B. Corwin, R. Morse, A. Johnson, 2007. Safety Alert: Study Reveals Sharp Increase in Deck Failures, ICC Safe
3. R. Tichy, 2005. Wood Materials and Engineering Laboratory Report No. WMEL 07-019, Washington State University
4. J. Loferski, F. Woeste, D. Albright, 2005. Load Tested Guardrail Post Connections, Professional Deck Builder, Vol. 4, (2). 48-50,52-56

Cost Impact: The code change proposal will increase the cost of construction. Since the use of lateral anchors will increase the load capacity of the guard system, fewer posts will be required. Therefore, the cost of the lateral anchors and hardware will be offset by the reduction in the number of posts and by the reduced labor costs associated with installing fewer posts.

Public Hearing:				
	Committee:	AS	AM	D
	Assembly:	ASF	AMF	DF

RB62–07/08

R313.1 (New), Appendix P, Chapter 43

Proponents: Sandra Stanek, Fire Code Consultants LLC, representing herself; John C. Dean, National Association of State Fire Marshals (NASFM)

1. Add new text as follows:

SECTION R313
~~SMOKE ALARMS~~ FIRE SPRINKLER SYSTEMS

R313.1 General. An approved automatic fire sprinkler system shall be installed in new one-and two-family dwellings and townhouses in accordance with NFPA 13D.

(Renumber subsequent sections)

2. Delete appendix without substitution:

~~APPENDIX P~~
~~FIRE SPRINKLER SYSTEM~~

~~*The provisions contained in this appendix are not mandatory unless specifically referenced in the adopting ordinance.*~~

~~**AP101 Fire sprinklers.** An approved automatic fire sprinkler system shall be installed in new one- and two-family dwellings and townhouses in accordance with Section 903.3.1 of the *International Building Code*.~~

3. Add standard to Chapter 43 as follows:

NFPA

13D-07 Installation of Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes

Reason (Stanek): All new houses should have fire sprinklers. The majority of the members attending the Rochester ROC meeting in May 07 were in favor of residential sprinklers in all new one & two family dwellings. I believe the will of the majority of ICC members as shown in Rochester should be upheld.

There are many reasons why NOW is the time to change the IRC and establish residential sprinklers as part of the minimum safety package set forth in the national model code for residential construction. Substantial justification was offered last cycle, and additional substantiation is offered in this proposal, primarily focusing on the issues raised in opposition.

1. System freeze-ups in cold climates: Opponents of residential sprinklers assert that system freeze-ups will cause problems in cold climates. However, a sprinkler system poses no greater risk of freezing than domestic plumbing if the system is properly designed and installed. Freeze-ups result from design or installation errors that can occur with any plumbing system, and it is incorrect to suggest that sprinkler systems in cold climates are predisposed to freezing. In fact, on the contrary, there are many jurisdictions with severely freezing climates that have adopted residential sprinkler ordinances, which would surely have been repealed if freezing problems were widespread. This simply hasn't happened. There are many options available to sprinkler homes in freezing climates to combat the risks of frozen piping. These include, among others:

- Using sidewall sprinklers supplied by pipes running in walls, soffits, closets and crawl spaces to keep sprinkler piping out of unheated attics, or
- Properly installing piping beneath the insulation in attics to protect the piping from the unheated attic space. This technique has been used in climates as cold as Wrangle, Alaska to successfully sprinkler single family homes.

The Residential Fire Safety Institute documents that hundreds of jurisdictions in at least 25 states have adopted residential sprinkler legislation, including mountainous states and Northern states ranging from New York to Alaska. In addition, sprinkler systems are required in all residential occupancies governed by the IBC, which include group homes and townhouses exceeding 3-stories in height. The bottom line is that residential sprinkler systems have been installed in homes located in freezing climates for many years, and if freeze concerns are being addressed in these cases, as they must be, then homes sprinklered in accordance with the IRC can and will be handled in the same manner.

2. Cost impact of inflated water tap fees: Opponents of residential sprinklers argue that sprinklers costs will skyrocket in jurisdictions where local water purveyors inflate the cost of larger water taps. Obviously, this is not a building code issue, and local fees should not serve as an impediment to national policy established by the IRC. Nevertheless, an experienced designer can avoid the use of a larger meter, and associated fee increases, by applying alternative design approaches that are already permitted by NFPA 13D. Such alternatives include:

- Using reduced sprinkler spacing in rooms protected by more than one sprinkler. UL listed sprinklers are already on the market for reduced spacing that only require 9 gpm per sprinkler. Given that NFPA 13D requires that a maximum of two sprinklers be calculated for dwelling systems, this yields a total demand of 18 gpm, which can be supplied by many municipal systems using a standard 5/8-inch meter. With this design approach, extended coverage sprinklers can still be used in rooms requiring only a single sprinkler. Although this design approach may not be the best choice for every case, it is particularly suited to smaller homes at the entry/affordable housing level.

- If the tap fees for larger supplies are substantially out of line, there is always an option available to install a small tank/pump system supplied by a standard size water tap. Obviously, this option comes with its own associated cost, but it does provide an upper limit to the potential impact of high tap fees.

The options listed above are available today, and they meet NFPA 13D. Obviously, the most effective approach to fighting unfairly high tap fees is to encourage that the fees be reduced when increased meter sizes are being used to support the installation of a fire sprinkler system. Mandating sprinklers will put builders and code officials on the same side of this issue, trying to get affordable sprinklers, rather than arguing over whether sprinklers should be provided. The home building industry could be using its powerful political contacts to reduce the costs of tap fees rather than resisting the efforts to install fire sprinklers.

For such an effort to be successful, water purveyors will need to understand that increasing meter/tap sizes to supply residential sprinklers does not increase the demand on a public water system. On the contrary, residential sprinklers actually reduce demand because sprinklers only flow water when a fire occurs, and the amount of water used by a residential fire sprinkler system is only a fraction of what firefighters use to extinguish fires in unsprinklered properties. This argument has already successfully resolved tap fee issues in some jurisdictions.

3. Cost of sprinklers and impact on affordable housing. Before specifically addressing the cost of sprinklers, there is a basic question that has to be asked when it comes to the price of housing in America, "What drives the price of a new home?" In many markets, the answer to this question is not "construction costs." Instead, prices are established based on an analysis of what the market will bear. In these markets, sales prices will continue to rise as long as there are buyers who are willing to pay the asking price, and in these markets, it would be disingenuous, at best, to suggest that the cost of fire sprinklers would price buyers out of the market.

In other segments of the home building industry, new home pricing does follow the "cost plus" model, and in these cases, the added cost of a sprinkler system is an important consideration. Such costs will be a function of many variables, including but not limited to, the availability of a public water supply, the size of the home, the level of competition in the local market, the design approach, the climate and enhancements that may be desired by the owner, such as custom colored cover plates for sprinklers.

One source of cost data associated with the widespread installation of residential sprinklers is available from Scottsdale, Arizona. Scottsdale, which became one of the first major U.S. jurisdictions to require residential sprinklers roughly 20 years ago, serves as an excellent demonstration case to show the effects of a community's decision to require residential sprinklers on system cost, life safety, property protection and the local fire-protection infrastructure. With respect to cost, residential sprinkler systems in Scottsdale were recently quoted as costing $0.55 to $0.75 per square foot, and there are now well over 40,000 sprinklered homes in the city. No one is suggesting that every other jurisdiction where residential sprinklers are required will match Scottsdale's cost structure, but Scottsdale's experience clearly demonstrates that a competitive marketplace greatly reduces sprinkler costs.

Technology, creative design approaches and labor charges also impact these costs. Multipurpose systems, which are already permitted by NFPA 13D, have been shown to be particularly well suited to certain types of homes because they add minimal cost to the plumbing installation. Recent surveys of sprinkler costs for affordable homes in the 1,000 to 1,200 square foot range showed that the added cost of materials related to sprinkler protection was in the $0.25 to 0.30 per square foot range, and the sprinkler installation required less than 8 hours of additional labor. While no cost increase is inconsequential when dealing with affordable housing, the significant fire safety benefits gained by installing sprinklers for such a small cost (in the $4/month range on a 30-year mortgage, not including any insurance or tax credit) certainly appears to be money well invested.

With respect to the cost of sprinklers in larger homes, the actual impact of sprinkler costs on the owner's monthly payment isn't much different. Figuring the cost of a hypothetical $3,000 sprinkler system in a $300,000 home with a 6.5% mortgage, a 5% credit on a $2,000/year insurance bill, and a combined Federal/State income tax rate of 33%; the net cost of fire sprinklers, after mortgage related tax deductions, would be $4.37 per month. This represents a 0.23% increase in the monthly payment and roughly equates to the cost of a premium beverage at Starbucks. The total cost on an annual basis would be $52.44, which would easily be offset by insurance reductions.

With all of the foregoing information in mind, it seems fair to say that the true impact on the housing market associated with requiring residential sprinklers will be far less than what opponents of residential sprinklers would like code officials to believe. It has been demonstrated many times in the many jurisdictions throughout the country where residential sprinklers are required that housing markets are not affected by fire sprinklers. These local experiences show us that, once the IRC requires residential sprinklers, home building will continue as it always has. Home prices will fluctuate based on the law of supply and demand; home builders will adjust their products to meet consumer preferences and trends; and home buyers will continue to buy homes.

For a full cost/benefit analysis of the impact of sprinklers on society, see the article, "Cost/Benefit to Society for Having Sprinklers in One and Two Family Dwellings – A Pessimistic Analysis", written by Kenneth E. Isman, P.E. for *SQ Magazine* in the Fall 2005 issue. It should be noted that the article is not designed to show what the fire sprinkler industry thinks will happen if all one and two family dwellings are sprinklered. Instead, the article was written to show that sprinklers still make sense, from a cost/benefit perspective, even if all of the pessimistic assumptions of the homebuilders are correct such as the assumption that fires only occur in older homes. If a more realistic approach is taken, then the benefits for fire sprinklers far outweigh the costs.

4. Does the public want residential sprinklers? Opponents of residential sprinklers have suggested that the general public, which isn't well represented at code hearings, would oppose residential sprinklers, but a recent national poll conducted by Harris Interactive indicates that this claim misrepresents public opinion. The survey of over 1,000 adults revealed that:

- 45% of homeowners said that a sprinklered home is more desirable than an unsprinklered home,
- 69% of homeowners said that having a fire sprinkler system increases the value of a home, and
- 38% of homeowners said that they would be more likely to purchase a home with fire sprinklers than without. The reason that this number isn't higher appears largely tied to an unfounded fear of water damage. 48% of homeowners cited water damage as the reason they would not want to install a sprinkler system. Clearly, this indicates a need for public education on the operation and reliability of sprinkler systems as being a major component in enhancing public support and demand for sprinklers.

The results of this survey support the assertion that the general public has become aware of and has warmed up to the concept of residential sprinklers. Certainly, this is due, at least in part, to the fact that many homeowners live in multifamily occupancies before they own a one- or two-family dwelling. Now that the IBC requires all new multi-family dwellings to be sprinklered, it is fair to say that the home-buying public will continue to become more familiar with residential sprinklers and that public support for residential fire sprinkler systems will continue to grow.

5. Correlation between a home's age and fire risk…aren't homes built to the IRC already safe enough? Opponents of residential sprinklers would like to convince us that residential fire deaths are a function of a home's age and that new homes, built in accordance with the IRC, are safe. Many people buy these arguments because, on the surface, they seem to make sense. However, further analysis paints a different picture.

First, most residential fires deaths result from fires caused directly or indirectly by people. Compliance with the IRC doesn't prevent these types of fires or many other common fire causes, and once a fire starts, compliance with the IRC will not slow its spread. The speed by which a fire spreads in a home is instead a function of contents and room geometry.

Second, a simplistic correlation of residential fire deaths with the age of homes ignores several variables that tend to vary based on the age of a home. These include the socioeconomic status of the occupants, the density of occupants, the age of the occupants, and the presence or omission of smoke detectors (discussed separately below), among others. Fire safety experts know that these factors are far more likely to be contributory factors in fire deaths than the age of a structure. In addition, the fact that more fire deaths occur in "older" homes than newer homes may also be related to the fact that the median age of homes in the U.S., according to a recent HUD study, is 32 years. By sheer numbers, a lot of people live in older homes.

6. Since only a small percentage of fire department responses are for actual structure fires, does the fire service really need residential sprinklers? With respect to residential fire losses, the statistics submitted with last cycle's proposal clearly demonstrated the scope and magnitude of the residential fire problem in the United States. Although the percentage of emergency responses to residential structure fires is a small fraction of overall fire department responses, a shocking 45 percent of firefighter deaths that occur on the fire ground occur at residential occupancies, almost always 1- and 2-family dwellings. Dwelling fires have three characteristics that present disproportionate risks as compared to fires in other occupancies:

- First, they are typically well developed, post-flashover fires by the time the fire department arrives.
- Second, they often occur at night, and
- Third, they often involve a real or perceived need to perform search and rescue operations.

In short, dwelling fires represent a small percentage of our emergency responses but account for a very large percentage of firefighters who are killed in the line of duty.

It is also important to point out that the ability of the fire service to protect our communities by responding to residential fires has declined significantly in recent years, and the situation isn't getting better. The public has a relatively simple expectation with respect to the fire department when a fire happens…they call 911, and the fire department responds to rescue trapped occupants and put out the fire. Unfortunately, that expectation isn't being effectively met in many parts of the country because of dwindling resources.

Nationally, volunteer firefighters, who comprise 73% of the American fire service and protect the vast majority of the geographic area of the United States, are becoming harder and harder to retain. In New York alone, the ranks of volunteer firefighters have declined from 110,000 in the early 1990s to approximately 85,000 today. Considering that all-volunteer fire departments protect 95% of New York communities with a population of less than 10,000, what will happen when there are no longer enough firefighters to respond to 911 calls? This situation is national. It is not unique to New York.

Long after many home builders leave a community, the homes that they leave behind and the people who live in them continue to place demands on the fire service. While the fire service will always strive to meet those demands, it is unrealistic to expect that our volunteers will always be able to do so. Therefore, the fire services' message is simple…if the public is going to be protected from home fires; it's time that we build that protection into new construction.

7. Aren't smoke alarms enough? Homebuilders often suggest that smoke alarms are good enough to protect the public and that residential sprinklers aren't justified. Everyone can agree that smoke alarms save lives and that they are largely responsible for a reduction in the fire death rates that occurred over the past 30 years. Nevertheless, smoke alarms on their own do nothing to stop the spread of fire, protect property or protect firefighters.

Two other issues related to reliance on smoke alarms are of concern. First, as smoke alarms age, their reliability declines. This concern prompted smoke alarm manufacturers and testing laboratories to begin stamping an expiration date on each unit indicating a 10-year replacement cycle. How many alarms will actually be replaced at 10-year intervals, and what will happen to the reliability of alarms that are not replaced? Although an estimated 96% of U.S. homes with telephones now have at least one smoke alarm, in ¼ of reported fires in smoke alarm equipped homes, the devices didn't work.

The second issue related to the effectiveness of smoke alarms in further reducing fire death rates has to do with their performance and waking effectiveness. In a study that was just completed in 2006, only 58% of a test group of children ages 6-12 awakened when a standard smoke alarm sounded, and only 38% of the test group successfully evacuated. The median time to awaken was 3 minutes, and the median time to escape was the maximum allowed 5 minutes.

Another study revealed that a surprising 34% of fire deaths in one- and two-family dwellings during the 2000-2004 period occurred in homes with a working smoke detector. Perhaps this statistic correlates with the fact that fire death rates for the young and the elderly, those who are least likely to be capable of self-preservation even if they are awakened by a smoke detector, are roughly double those for individuals in the central age group. Smoke detectors are good, but they can only go so far in reducing the nation's fire death and injury rates. We need residential sprinklers.

8. What about homes without a public water supply? Opponents of residential sprinklers have suggested that it is impractical and too expensive to require sprinklers in homes that will use a well as the water supply. However, design options are available that make wells a viable water supply for both sprinklers and domestic service. Wells essentially fall into two categories, deep and shallow. With a shallow well, the well will likely be designed to provide a direct feed to the home, with no intervening tank. With these types of systems, pumps can be selected at reasonable costs that are capable of supplying both the domestic and sprinkler demands. Constant pressure, variable speed pumps are an excellent choice for this type of application.

One question that is frequently raised with respect to direct feed well systems involves the "recharge" rate, or the rate at which water can keep up with the required flow. Wells may not be capable of keeping up with the demand associated with a sprinkler system, which will typically be 20 gallons per minute or more. Many automatically assume that a tank and a secondary pump are necessary in these cases, greatly increasing the cost of the sprinkler system, but a lesser known yet simple approach called "developing the well" is a much better solution.

Developing a well essentially creates an underground cistern that replaces the need for a tank. The approach involves digging the well substantially below the water table and allowing the hole to fill with water, retaining the needed capacity underground. By using an appropriate pump with a developed well, an interior tank and pump arrangement can be avoided, and the water supply costs can be limited.

For deeper wells, there are two options. First, there are constant pressure, variable speed pumps suited for these applications. For installations utilizing this approach, a "developed well" as described above can also be used to accommodate needed water retention to satisfy the sprinkler demand.

The second alternative involves a tank and pump, which can be installed between the well pump and the plumbing system. This approach is the common arrangement utilized for deep wells supplying domestic service. To supply sprinklers simply requires that the size of the domestic supply tank be increased to something in the range of 200-300 gallons, and the secondary pump needs to have an increased flow rating. Both of these enhancements can be made at modest cost.

Some have suggested that the IRC should not require homes on wells to have fire sprinklers, yet homes in rural areas, usually corresponding to homes served by wells, are the homes that are least likely to survive a fire because of long or inadequate responses by the fire service. The solution is instead educating contractors on cost-efficient design options for well systems.

9. Impact of residential sprinklers on public and private water systems: It was suggested by one builder last cycle that the operation of residential sprinklers connected to a small water system resulted in the jurisdiction having to drain and decontaminate the entire water system. Subsequent identification and review of the cited event revealed that the concern regarding contamination of the water supply, which was a private system, was linked to the use of fire hydrants during suppression activities, not the sprinkler system. This clearly makes more sense, and for the record, the fire actually started outside of this building, spread to the interior, and sprinklers still helped to stop the fire's progress.

To suggest that the water demand caused by operation of a one- or two-family dwelling or townhouse sprinkler system will lead to contamination of an entire community water system is absurd and demonstrates a complete lack of understanding regarding residential sprinkler systems. The same logic would suggest that a single broken residential pipe, which would flow more water than operating sprinklers, would have the same result. Any water system that is this feeble has much bigger concerns than residential sprinklers.

The truth is that residential sprinklers actually result in a significantly decreased demand on water systems because residential sprinklers use far less water than firefighters to extinguish a fire. Scottsdale, Arizona's experience provides data to support this claim. Scottsdale found that the average estimated sprinkler flow per residential fire incident was 341 gallons, as compared to an estimated manual suppression flow for unsprinklered residential fire incidents of 2,935 gallons.

10. Wait for more cost-effective approaches to residential sprinkler protection before adopting a requirement in the IRC. Opponents of residential sprinklers suggest that we should hold off on requiring such systems in dwellings until improvements in technology make the systems more cost effective. The truth is that many recent improvements in sprinkler technology have largely improved cost effectiveness already. The real problem isn't a lack of cost effective design and installation options.

Instead, the problem appears to stem from a lack of communication within the supply, design and installation communities regarding these efficient design options and the fact that momentum often drives us to continue doing things the way we've done them in the past. To drive the industry toward more innovative solutions, more competition is needed, and changing the IRC to require residential sprinklers will create the demand that will increase competition and motivate cost efficient designs.

Market demand will also drive the creation of design tools that will simplify the exercises of locating sprinklers and sizing pipe. These tools, which will present design requirements in prescriptive, cookbook formats, have already been developed, and are being used in communities like Prince Georges County, Maryland, with a great deal of success for well over ten years. It is expected that they can easily become national in scope as more communities adopt the IRC.

11. Required maintenance: Opponents of residential sprinklers have stated that residential sprinkler systems need regular maintenance and questioned who would perform this service. Someone suggested that local fire departments will have to perform or verify maintenance, potentially raising concerns regarding right of entry.

The fact is that residential sprinkler systems are essentially maintenance free. The owner just needs to be taught what NOT to do. Don't close the valve, don't paint the sprinklers and don't hang clothes from sprinklers. Multipurpose systems are essentially tested every time the domestic water is used. For systems with water flow alarms (not required by NFPA 13D, but installed on some systems) the alarm can easily be tested by the homeowner by turning a valve to create some flow and seeing if the alarm sounds. The test is hardly rocket science and is no more complicated than testing a burglar alarm or replacing a furnace filter, operations that homeowners perform regularly. None of this maintenance would need to be performed or witnessed by the fire department.

12. Trained labor/inspectors: Opponents of residential sprinklers have suggested that, if the IRC were to require residential sprinklers, there would be a shortage of trained labor and trained inspectors to install and inspect these systems. This subject is not a legitimate concern. The fire sprinkler industry has always responded to the increased demand created by code requirements. In the seven years between 1992 and 1999, the fire sprinkler industry doubled in size (going from approximately 20 million sprinklers installed each year to 40 million sprinklers installed). During this time, the industry kept pace with demand, adding additional people to the labor force. There is no doubt that the sprinkler industry can continue to respond to the increase in demand. Once the IRC has been revised, it will take several years for jurisdictions to begin to adopt and enforce the 2009 edition. Some jurisdictions will not choose to adopt the sprinkler requirements, so the impact on the industry will be gradual. There is no question that the demand will be met by the industry as the IRC is changed, adopted and implemented at the local level.

Preliminary discussions have already taken place with the ICC and other certification bodies regarding the possibility of having specific certification programs for installers of residential sprinkler systems and local inspectors that would review and approve the installations. Training programs are underway to take people with a general knowledge of pipe fitting and teach them the additional important requirements for residential fire sprinkler systems, so that all of the installations meet NFPA 13D.

13. Leakage and mold damage: Opponents of residential sprinklers have expressed fear that sprinklers would leak and cause mold damage, which could make a home uninsurable. In response, it should be pointed out that residential sprinkler systems are no different than residential plumbing. If quality products are used and the system is properly installed, it won't leak.

With respect to sprinkler systems, sprinkler piping and fittings, and sprinklers themselves, are subject to rigorous testing to ensure quality. Unquestionably, sprinklers are far higher quality and more thoroughly tested than domestic piping and fixtures. Sprinkler tests required for listing include, among other requirements, a 700 psi hydrostatic strength test, a 500 psi leakage resistance test, a 100,000 cycle water hammer resistance test, a 35-125°F temperature cycling test, and a freeze performance test to -20°F for 24 hours. Also, sprinkler piping and components are rated for a pressure of 175 psi, while plumbing water supply systems are rated for only 80 psi.

14. Appendix P, good enough for now? Opponents of residential sprinklers have suggested that the IRC Appendix P is fairly new and that we should wait to see what happens with it. Unfortunately, this dodges the issues at hand.

When a local jurisdiction goes to adopt Appendix P, the first statement that the local homebuilders make during the hearings is, "Appendix P isn't necessary or important. After all, if sprinklers were really necessary, they would have put them in the body of the code rather than the Appendix." So, the homebuilders end up playing both sides of the fence. At the IRC hearings, they point to Appendix P and use that as justification to keep the requirements for sprinklers out of the code. Then, at the local hearings, they point to the fact that the requirements are in the Appendix as a reason not to mandate sprinklers.

Another reason that we need sprinklers in the body of the standard rather than the Appendix is that the benefits to society become significantly greater when all homes are sprinklered. With the rule in the Appendix, there will be some jurisdictions that don't pass the requirement, leaving these communities unprotected and the public will not be able to reap the benefits (in fact, they may never even know what they are missing). But with the requirements in the body of the IRC, people may debate removing them when they adopt the IRC, but at least they will have some sense of what they are losing.

A third reason that we need the requirements for sprinklers in the body of the IRC rather than the Appendix is that the fire service and the fire sprinkler industry can't bring experts to the debate in every local jurisdiction. There are tens of thousands of jurisdictions where this debate might occur and the homebuilders are going to have their local representatives loaded for these hearings. The fire service and the fire sprinkler industry just don't have the money or the personnel to compete with the homebuilders on a dollar-for-dollar basis. The debate as to the right level of fire protection for a home should be at the national level, with all of the national experts. The right decision (to put sprinklers in homes) should be done at the national level in the body of the code. Then, if people want to modify the code at the local level and take sprinklers out, they do so at their own peril and without the recommendations of the national experts.

Putting the sprinkler requirement into the body of the IRC certainly won't end the local debate, but it will at least put the burden on the home building industry to justify making an amendment to take sprinklers out. Other codes including the Uniform Fire Code, the NFPA Building Code and the Life Safety Code have already set a moral precedent by adding mandatory dwelling sprinkler requirements in their 2006 editions. The IBC and IFC have also done their parts by now requiring all residential occupancies within their respective scopes to be protected by fire sprinklers. Now it is time for the IRC to catch up.

Conclusion: Unlike many issues that we face at code hearings, THIS change strikes directly at the heart of America's fire problem. Opponents of residential sprinklers have a record of fighting just about every initial effort to improve dwelling safety. The same groups initially fought against smoke detectors, ground fault interrupters and mandatory sprinklers in multi-family residential occupancies. On each of these topics, code officials heard the same predictions of gloom and doom, but once the codes moved forward to require these features, the home building industry proceeded without so much as a detectible bump in the road. As years passed, prices for all of these features declined, some dramatically, and technology advanced to create better, yet less expensive products.

Reason (Dean): The life safety hazards in one- and two-family occupancies are clear: Between the years of 2000 and 2004 there was an average of 375,200 reported home structure fires resulting in 2,970 civilian deaths, 14,390 civilian injuries and $5.6 billion dollars in direct property damage per year[i] These losses and deaths far exceed any of the other occupancy types. 75% of reported home structure fires and 87% of total fire deaths occurred in the one- and two-family dwelling environment[ii]

The ICC documents provide much more onerous code requirements for occupancy types other than the one- and two-family dwelling. These other occupancy types have significantly less fire death and loss history, yet they are provided with greater protection. Based on the current code requirements, the protection levels in the IRC do not match the life safety hazards in the one and two-family dwelling environment.
In the year 2006, 39% of all fireground firefighter deaths occurred in dwellings and apartments[iii] At the 2006 Code Development Hearing in Orlando, the Committee disapproved the original proposal put forward and at the May 2007 Rochester Final Action Hearing, the membership heard many of the same arguments. The following paragraphs identify and respond to the concerns raised at both hearings. With these issues addressed, NASFM encourages the support of all code officials in supporting this code change.

1. Does the public want residential sprinklers? Opponents of residential sprinklers suggested in Orlando that the general public, which isn't well represented at code hearings, would oppose residential sprinklers, but a recent national poll conducted by Harris Interactive indicates that this claim misrepresents public opinion. The survey of over 1,000 adults revealed that:

- 45% of homeowners said that a sprinklered home is more desirable than an unsprinklered home, • 69% of homeowners said that having a fire sprinkler system increases the value of a home, and
- 38% of homeowners said that they would be more likely to purchase a home with fire sprinklers than without. The reason that this number isn't higher appears largely tied to an unfounded fear of water damage. 48% of homeowners cited water damage as the reason they would not want to install a sprinkler system. Clearly, this indicates a need for public education on the operation and reliability of sprinkler systems as being a major component in enhancing public support and demand for sprinklers.

The results of this survey support the assertion that the general public has become aware of and has warmed up to the concept of residential sprinklers. Certainly, this is due, at least in part, to the fact that many homeowners live in multifamily occupancies before they own a one- or two-family dwelling. Now that the IBC requires all new multi-family dwellings to be sprinklered, it is fair to say that the home-buying public will continue to become more familiar with residential sprinklers and that public support for residential fire sprinkler systems will continue to grow.

2. Correlation between a home's age and fire risk…aren't homes built to the IRC already safe enough?: Opponents of residential sprinklers would like to convince us that residential fire deaths are a function of a home's age and that new homes, built in accordance with the IRC, are safe. Many people buy these arguments because, on the surface, they seem to make sense. However, further analysis paints a different picture. First, most residential fires deaths result from fires caused directly or indirectly by people. Compliance with the IRC doesn't prevent these types of fires or many other common fire causes, and once a fire starts, compliance with the IRC will not slow its spread. The speed by which a fire spreads in a home is instead a function of contents and room geometry.
Second, a simplistic correlation of residential fire deaths with the age of homes ignores several variables that tend to vary based on the age of a home. These include the socioeconomic status of the occupants, the density of occupants, the age of occupants, and the presence or omission of smoke detectors (discussed separately below), among others. Fire safety experts know that these factors are far more likely to be contributory factors in fire deaths than the age of a structure. In addition, the fact that more fire deaths occur in "older" homes than newer homes may also be related to the fact that the median age of homes in the U.S., according to a recent HUD study, is 32 years. By sheer numbers, a lot of people live in older homes. In summary, we do not debate that a home built in accordance with the IRC is safe, but that changes when people move in.

3. Since only a small percentage of fire department responses are for actual structure fires, does the fire service really need residential sprinklers? With respect to residential fire losses, the statistics submitted clearly demonstrate the scope and magnitude of the residential fire problem in the United States. Although the percentage of emergency responses to residential structure fires is a small fraction of overall fire department responses, a shocking 45 percent of firefighter deaths that occur on the fire ground occur at residential occupancies, almost always 1- and 2-family dwellings. Dwelling fires have three characteristics that present disproportionate risks as compared to fires in other

occupancies. First, they are typically well developed, post-flashover fires by the time the fire department arrives. Second, they often occur at night, and third, they often involve a real or perceived need to perform search and rescue operations. In short, dwelling fires represent a small percentage of our emergency responses but account for a very large percentage of firefighters who are killed in the line of duty.

It is also important to point out that the ability of the fire service to protect our communities by responding to residential fires has declined significantly in recent years, and the situation isn't getting better. The public has a relatively simple expectation with respect to the fire department when a fire happens…they call 911, and the fire department responds to rescue trapped occupants and put out the fire. Unfortunately, that expectation isn't being effectively met in many parts of the country because of dwindling resources.

Nationally, volunteer firefighters, who comprise 73% of the American fire service and protect the vast majority of the geographic area of the United States, are becoming harder and harder to retain. In New York alone, the ranks of volunteer firefighters have declined from 110,000 in the early 1990s to approximately 85,000 today. Considering that all volunteer fire departments protect 95% of New York communities with a population of less than 10,000, what will happen when there are no longer enough firefighters to respond to 911 calls? This situation is national and is not unique to New York. Long after many home builders leave a community, the homes that they leave behind and the people who live in them continue to place demands on the fire service. While the fire service will always strive to meet those demands, it is unrealistic to expect that our volunteers will always be able to do so. Therefore, the fire services' message is simple…if the public is going to be protected from home fires, it's time that we build that protection into new construction.

4. Aren't smoke alarms enough? Homebuilders who testified at the Orlando hearing suggested that smoke alarms are good enough to protect the public and that residential sprinklers aren't justified. Everyone can agree that smoke alarms save lives and that they are largely responsible for the dramatic reduction in fire death rates that has occurred in the U.S. over the past 30 years. Nevertheless, smoke alarms are only life-safety devices. On their own, they do nothing to stop the spread of fire, protect property or protect firefighters.

Two other issues related to reliance on smoke alarms are of concern. First, as smoke alarms age, their reliability declines. This concern prompted smoke alarm manufacturers and testing laboratories to begin stamping an expiration date on each unit indicating a 10-year replacement cycle. The questions before us are how many alarms will actually be replaced at 10-year intervals, and what will happen to the reliability of alarms that are not replaced? Although an estimated 96% of U.S. homes with telephones now have at least one smoke alarm, in ¼ of reported fires in smoke alarm equipped homes, the devices didn't work.

In contrast, residential sprinkler systems have a life expectancy of 50-years, and they require essentially no maintenance, particularly for multipurpose systems. With these systems, if the domestic water is turned on, sprinklers are on as well. With the combination of sprinklers and smoke alarms, homeowners will have the best of both technologies. The second issue related to the effectiveness of smoke alarms in further reducing fire death rates has to do with their performance and waking effectiveness. In a study that was just completed in 2006, only 58% of a test group of children ages 612 awakened when a standard smoke alarm sounded, and only 38% of the test group successfully evacuated. The median time to awaken was 3 minutes, and the median time to escape was the maximum allowed 5 minutes. Another study revealed that a surprising **34% of fire deaths in one- and two-family dwellings during the 2000-2004 period occurred in homes with a working smoke detector**. Perhaps this statistic correlates with the fact that fire death rates for the young and the elderly, those who are least likely to be capable of selfpreservation even if they are awakened by a smoke detector, are roughly double those for individuals in the central age group. Smoke detectors are good, but they can only go so far in reducing the nation's fire death and injury rates. We need residential sprinklers.

5. **What about homes without a public water supply?** Opponents of residential sprinklers have suggested that it is impractical and too expensive to require sprinklers in homes that will use a well as the water supply. However, design options are available that make wells a viable water supply for both sprinklers and domestic service. Wells essentially fall into two categories, deep and shallow. With a shallow well, the well will likely be designed to provide a direct feed to the home, with no intervening tank. With these types of systems, pumps can be selected at reasonable costs that are capable of supplying both the domestic and sprinkler demands. Constant pressure, variable speed pumps are an excellent choice for this type of application.

One question that is frequently raised with respect to direct feed well systems involves the "recharge" rate, or the rate at which water can keep up with the required flow. Wells may not be capable of keeping up with the demand associated with a sprinkler system, which will typically be 20 gallons per minute or more. Many automatically assume that a tank and a secondary pump are necessary in these cases, greatly increasing the cost of the sprinkler system, but a lesser known yet simple approach called "developing the well" is a much better solution. Developing a well essentially creates an underground cistern that replaces the need for a tank. The approach involves digging the well substantially below the water table and allowing the hole to fill with water, retaining the needed capacity underground. By using an appropriate pump with a developed well, an interior tank and pump arrangement can be avoided, and the water supply costs can be limited.

For deeper wells, there are two options. First, there is constant pressure, variable speed pumps suited for these applications. For installations utilizing this approach, a "developed well" as described above can also be used to accommodate needed water retention to satisfy the sprinkler demand. The second alternative involves a tank and pump, which can be installed between the well pump and the plumbing system. This approach is the common arrangement utilized for deep wells supplying domestic service. To supply sprinklers simply requires that the size of the domestic supply tank be increased to something in the range of 200-300 gallons, and the secondary pump needs to have an increased flow rating. Both of these enhancements can be made at modest cost. Some have suggested that the IRC should not require homes on wells to have fire sprinklers, yet homes in rural areas, usually corresponding to homes served by wells, are the homes that are least likely to survive a fire because of long or inadequate responses by the fire service. The solution is instead educating contractors on cost-efficient design options for well systems.

6. Impact of residential sprinklers on public and private water systems: It was suggested by one builder during testimony at the Orlando hearing that operation of residential sprinklers connected to a small water system in a Michigan jurisdiction resulted in the jurisdiction having to drain and decontaminate the entire water system. Subsequent identification and review of the cited event revealed that the concern regarding contamination of the water supply, which was a private system, was linked to the use of fire hydrants during suppression activities, not the sprinkler system. This clearly makes more sense, and for the record, the fire actually started outside of this building, spread to the interior, and sprinklers still helped to stop the fire's progress.

To suggest that the water demand caused by operation of a one- or two-family dwelling or townhouse sprinkler system will lead to contamination of an entire community water system is absurd and demonstrates a complete lack of understanding regarding residential sprinkler systems. The same logic would suggest that a single broken residential pipe, which would flow more water than operating sprinklers, would have the same result. Any water system that is this feeble has much bigger concerns than residential sprinklers.

The truth is that residential sprinklers actually result in a significantly decreased demand on water systems because residential sprinklers use far less water than firefighters to extinguish a fire. Scottsdale, Arizona's experience provides data to support this claim. Scottsdale found that the average estimated sprinkler flow per residential fire incident was 341 gallons, as compared to an estimated manual suppression flow for unsprinklered residential fire incidents of 2,935 gallons.

7. Wait for more cost-effective approaches to residential sprinkler protection before adopting a requirement in the IRC. Opponents of residential sprinklers suggest that we should hold off on requiring such systems in dwellings until improvements in technology make the systems more cost effective. The truth is that many recent improvements in sprinkler technology have largely improved cost effectiveness already. The real problem isn't a lack of cost effective design and installation options. Instead, the problem appears to stem from a lack of communication within the supply, design and installation communities regarding these efficient design options and the fact that momentum often drives us to continue doing things the way we've done them in the past.

To drive the industry toward more innovative solutions, more competition is needed, and changing the IRC to require residential sprinklers will create the demand that will increase competition and motivate cost efficient designs.

Some have suggested that we should wait for NFPA 13D or the IRC to permit the use of a single operating sprinkler as a design basis, as opposed to the currently required two sprinklers, before requiring sprinklers in the IRC. Some have also suggested that we should revisit whether sprinklers are really needed everywhere NFPA 13D requires them before requiring residential sprinklers in the IRC. The best way to encourage research and discussion on both of these ideas is to pass the IRC requirement now. Market demand will drive the research and interest in residential sprinklers will grow.

Market demand will also drive the creation of design tools that will simplify the exercises of locating sprinklers and sizing pipe. These tools, which will present design requirements in prescriptive, cookbook formats, are already being developed, and it is expected that they will be published prior to publication of the 2009 IRC.

8. **Required maintenance:** Opponents of residential sprinklers stated in Orlando that residential sprinkler systems need regular maintenance and questioned who would perform this service. Someone suggested that local fire departments will have to perform or verify maintenance, potentially raising concerns regarding right of entry.

The fact is that residential sprinkler systems are essentially maintenance free. Multipurpose systems have no maintenance requirements at all, and stand-alone systems only require an occasional test of the water flow alarm, if provided (not required by NFPA 13D or the IRC when the sprinkler pipe is copper, CPVC, or PEX) and the backflow preventer, if provided (again, not required by NFPA 13D). None of this maintenance would be performed or witnessed by the fire department. The alarm test can be conducted by the owner, in the same way the owner may periodically test a burglar alarm, and a plumber is required to test a backflow preventer. This test, which is a public health issue, is not associated with functionality or reliability of the sprinkler system, and therefore, it is not a fire safety concern.

9. Trained labor/inspectors: Opponents of residential sprinklers suggested in Orlando that, if the IRC were to require residential sprinklers, there would be a shortage of trained labor and trained inspectors to install and inspect these systems. While that is true today, there is no doubt that industry and code officials will respond once the IRC has been revised, and there will be several years to ramp up before the 2009 IRC begins to have an impact. This is exactly what has happened in the many local jurisdictions that have passed sprinkler ordinances.

Preliminary discussions have already taken place with ICC regarding the possibility of having ICC oversee a certification program for residential sprinkler installers and inspectors. Other organizations have also expressed interest in handling installer training and certification. It is expected that, in some jurisdictions, plumbers will become trained and certified to install residential sprinklers and sprinklers will be installed as part of the plumbing system. Likewise, it is expected that, in some jurisdictions, plumbing inspectors will be trained and certified to inspect these systems. This model is not unlike the approach taken with smoke alarms. They are located and installed by electricians and they are inspected by the electrical or building inspector.

10. Leakage and mold damage: In Orlando, opponents of residential sprinklers expressed fear that sprinklers would leak and cause mold damage, which could make a home uninsurable. In response, it should be pointed out that residential sprinklers systems are no different than residential plumbing. If quality products are used and the system is properly installed, it won't leak. If substandard products are used or workmanship is faulty, leaks will occur.

With respect to sprinkler systems, sprinkler piping and fittings, and sprinklers themselves, are subject to rigorous testing to ensure quality. Unquestionably, sprinklers are far higher quality and more thoroughly tested than domestic piping and fixtures. Sprinkler tests required for listing include, among others, 700 psi hydrostatic strength, 500 psi leakage resistance, 100,000 cycles water hammer resistance, 35-125°F temperature cycling, and freeze performance to 20°F below for 24 hours. Also, sprinkler piping and components are rated for a pressure of 175 psi, while plumbing water supply systems are rated for only 80 psi.

11. Appendix P, good enough for now? Opponents of residential sprinklers suggested in Orlando that, with the IRC having just accepted Appendix P, maybe it would be best to leave the sprinkler requirements in the appendix for a while to see what happens with it. This approach will certainly be appealing to some because it delays the sprinkler issue and gives home builders a leg up in fighting sprinklers at the local level.

However, isn't it time that we give local code officials the leg up? Code officials who have been through the local adoption process will certainly understand that it's much easier to justify taking something controversial out of the code than to add something new during an adoption review. With respect to residential sprinklers, code officials know all too well that arguing them into the code at the local level is a very uphill climb given local politics and the strength of local home builder associations.

Putting the sprinkler requirement into the body of the IRC certainly won't end the local debate, but it will at least put the burden on the home building industry to justify making an amendment to take sprinklers out. Local code officials would then have a respectable chance of keeping the sprinkler requirement. Other codes including the Uniform Fire Code, the NFPA Building Code and the Life Safety Code have already set a moral precedent by adding mandatory dwelling sprinkler requirements in their 2006 editions. The IBC and IFC have also done their parts by now requiring all residential occupancies within their respective scopes to be protected by fire sprinklers. Now it is time for the IRC to do the same.

i Ahrens, 2007, p. 2
ii Ibid.
iii Fahy & Leblanc, 2007, p. 24

Cost Impact (Stanek): The code change proposal will have the effect of a minor increase in the cost of construction in the short term that will be recouped in the long run due to other savings that more than offset the costs. See the Cost/Benefit analysis submitted with this proposal.

Cost Impact (Dean): The code change proposal will increase the cost of construction.

Public Hearing:	Committee:	AS	AM	D
	Assembly:	ASF	AMF	DF

RB63–07/08
R313 (New), Appendix P, Chapter 43 (New)

Proponent: Ray Moore, PE, CPD, Vice President, Legislative, American Society of Plumbing Engineers

1. Add new section as follows:

SECTION R313
SPRINKLER PROTECTION

R313.1 Sprinklers. All dwelling units shall be protected with an automatic residential fire sprinkler system.

Exception: Sprinkler protection shall not be required for additions or alterations of existing buildings that do not have an automatic residential fire sprinkler system installed.

R312.2 Design and installation. Automatic residential fire sprinkler systems shall be designed and installed in accordance with NFPA 13D.

2. Delete Appendix P without substitution:

~~**APPENDIX P**~~
~~**FIRE SPRINKLER SYSTEM**~~

~~*The provisions contained in this appendix are not mandatory unless specifically referenced in the adopting ordinance.*~~

~~**AP101 Fire sprinklers.** An approved automatic fire sprinkler system shall be installed in new one- and two family dwellings and townhouses in accordance with Section 903.3.1 of the *International Building Code*.~~

3. Add standard to Chapter 43 as follows:

NFPA

13D-07 Installation of Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes

Reason: The American Society of Plumbing Engineers (ASPE) believes that all residential dwelling units must be protected with an automatic residential fire sprinkler system. There is no more effective means of preventing loss of life.

While various design changes over the last 30 years, including the mandating of smoke detectors, has reduced the loss of life in fires of one and two family dwellings and townhouses, there is still too high a loss of life in new dwellings. On a National level, that loss of life results in an annual catastrophe. If all of the fire deaths in one and two family dwellings and townhouses happened in a single occurrence each year, there would be a national uproar to do something about it. ASPE believes it is time to address this catastrophe.

ASPE knows that the engineering community has solved the problem that has resulted in this national catastrophe. That is the installation of residential sprinkler systems. The engineering community has been effective in designing better and more effective sprinklers. The system design has also been engineered to allow for lower cost installations. The engineering community has also recognized the integration of sprinklers into the water distribution system. This water distribution system is already present in a home, hence, it is easy and inexpensive to add sprinklers to any new dwelling unit.

There is no denying that the installation of fire sprinkler systems will increase the cost of construction. However, that cost is minimal when considering the life saving aspects of the building. One can ask whether a life is worth $2000 to $3000 for a sprinkler system in a new home. However, there are sprinkler systems that also cost less than this to install in a new home.

To put this evaluation into perspective, a recent change to residential gas fired water heaters made it so that the water heaters will not ignite a vat of gasoline that is sitting immediately adjacent to the water heater. This was done to prevent loss of life from gasoline explosions and fires that were ignited by water heaters. Consumers must now pay between $80 and $100 more for a water heater to have this protection. If you evaluate the annual cost for these new water heaters and equate it to the lives that they will save each year, it equates to $50,000,000 per life saved to the consumer. That is the additional cost paid nationwide to save these lives.

If you perform the same analysis on a residential sprinkler system, it equates to $670,000 per life saved with the sprinkler system. The consumers are getting a greater deal on a national level with the installation of sprinklers. What this really shows is how many more lives can be saved with residential sprinklers.

While there are many homes without sprinklers, there has to be a time to start mandating sprinklers. Now is an appropriate time. Think back to the time when codes mandated plumbing in all new homes. This significantly increased the cost of construction, but with a tremendous health benefit. When electricity was mandated, again there was a significant increase in the cost of construction. Later, smaller items were mandated, like a washing machine connection, smoke detectors, ground fault protection, closer electrical outlets, larger egress windows, additional light switches, light in the attic, central heating, pressure balancing shower valves, thermostatic mixing valves for bathtubs, and additional backflow protection. All of these additions were for the betterment of Society. They helped protect public health, safety, and welfare. Similarly, residential sprinklers are also for the betterment of society. They will also provide life safety protection.

ASPE recognizes that there are certain hardships that must be addressed. That is why an exception was added to not require sprinkler protection in additions and alterations of existing homes.

It should also be noted that the change references NFPA 13D which is the recognized standard for the design and installation of sprinklers in one and two family dwellings and townhouses.

As ASPE submits this change, we are asking other engineering societies to join us in co-sponsoring this code change. We anticipate the support of other groups by the time of the first code change hearings.

Cost Impact: The code change proposal will increase the cost of construction.

Public Hearing:	Committee:	AS	AM	D
	Assembly:	ASF	AMF	DF

RB64–07/08

R313 (New), Appendix P, Chapter 43 (New)

Proponent: Ronny J. Coleman, Retired California State Fire Marshal, representing IRC Fire Sprinkler Coalition

1. Add new section as follows:

SECTION R313
FIRE SPRINKLER SYSTEMS

R313.1 General. Effective January 1, 2011, an approved automatic fire sprinkler system shall be installed in new one- and two-family dwellings and townhouses in accordance with NFPA 13D.

(Renumber subsequent sections)

2. Delete IRC Appendix P without substitution:

~~**APPENDIX P**~~
~~**FIRE SPRINKLER SYSTEM**~~

~~*The provisions contained in this appendix are not mandatory unless specifically referenced in the adopting ordinance.*~~

~~**AP101 Fire sprinklers.** An approved automatic fire sprinkler system shall be installed in new one- and two-family dwellings and townhouses in accordance with Section 903.3.1 of the *International Building Code*.~~

3. Add standard to Chapter 43 as follows:

NFPA

13D-07 Installation of Sprinkler Systems in One- and Two-family Dwellings and Manufactured Homes

Reason: This proposal is submitted as part of a package of three proposals that were developed in cooperation with the International Association of Fire Chiefs with input from code officials, home builders, fire chiefs and other interested parties. During last year's code development cycle, many ICC members stated that the preferred way to advance fire sprinklers into new home construction is through a comprehensive approach that involves:

1. A schedule for implementation,
2. Reasonable and appropriate design and construction incentives, and
3. A simple, prescriptive methodology for designing systems.

In response, representatives of the IRC Fire Sprinkler Coalition (IRCFSC) and the International Association of Fire Chiefs have developed and submitted three proposals for this code cycle, one addressing each topic.

This proposal addresses the first issue, "a schedule for implementation." It requires new homes constructed after January 1, 2011 to have fire sprinklers. The delayed implementation date provides a time buffer that will allow for development of infrastructure, such as trained installers and inspectors, prior to the residential sprinkler requirement becoming effective. While the approach of delaying a code requirement may be unfamiliar to some, it is entirely appropriate, and it is already used by the IRC in Chapter 38, as follows:

> ***E3802.12 Arc-fault protection of bedroom outlets.*** *All branch circuits that supply 120-volt, single-phase, 15- and 20-ampere outlets installed in bedrooms shall be protected by a combination type or branch/feeder type arc-fault circuit interrupter installed to provide protection of the entire branch circuit.* ***Effective January 1, 2008, such arc-fault circuit interrupter devices shall be combination type.*** *(emphasis added).*

It is common knowledge that fires in one- and two-family dwellings are the root of America's fire problem, and a substantial majority of ICC members who voted at last year's final action hearing, 56%, agreed that residential sprinklers are the right solution. To truly address America's fire problem, ICC members know that we must, at some point, begin to mainstream fire sprinklers into new home construction, and this proposal provides a rational way to make the transition by fixing a future date for the requirement to become effective.

During last year's debate, the IRCFSC provided detailed responses that addressed all of the concerns cited in testimony as a basis for opposing residential sprinklers. These concerns, which included the use of wells to supply sprinklers, freezing, leakage and cost, among others, were addressed in our public comment to proposal RB114-06/07 and in testimony offered at the final action hearing in Rochester. They were also addressed in a Web cast aired by the IRCFSC in May 2007, copies of which are now available on a free DVD that can be ordered at www.IRCFireSprinkler.org.

As a result of this outreach effort, opposition to sprinklers based on myths and misinformation has largely dissipated, and the debate has largely become focused on two issues; First, whether the requirement for fire sprinklers in dwellings should be determined at a local level, and second, whether the residential fire problem is limited to older homes. The remainder of this reason statement focuses on these two issues.

1. Should the requirement for fire sprinklers in dwellings be a local issue? Several speakers in Rochester who spoke in opposition to RB114 conveyed an opinion that requirements for fire sprinklers in dwellings should be decided at the local level. The question is why? By including Appendix P, the IRC has already acknowledged fire sprinklers as a basic safety feature that should be included in new homes. There is no premise for the IRC to promote residential fire safety on community-by-community basis. The IRC, as a model code, should promote safety and regulatory consistency among all jurisdictions, as opposed to creating a local "shopping list" of safety requirements.

No other ICC code treats sprinkler requirements or residential fire safety as a local choice to be made at the time of code adoption. The IBC establishes a baseline that ALL residential occupancies must be protected by fire sprinklers, including one- and two-family dwellings and townhouses. Some argue that it's appropriate for IBC to be more restrictive than the IRC because use of the IBC is only mandatory for dwellings exceeding three stories in height, but that argument disregards one very important fact; most residential fire deaths occur in one- and two-story homes. To have an impact on fire deaths in one- and two-story homes, we need a fire sprinkler requirement in the IRC.

A newly published study by the National Institute of Standards and Technology (NIST) entitled "Benefit-Cost Analysis of Residential Fire Sprinkler Systems," reports that, out of almost 2,000 fire incidents in homes equipped with fire sprinklers during the 4-year period 2002 to 2005, there were no fire-related fatalities. This statistic clearly demonstrates the potential for sprinklers to save thousands of lives that would otherwise be lost in residential fires. With the knowledge that residential fire sprinklers are a proven, life-saving technology, it is clear that the IRC should establish a model that sprinklers are a minimum safety feature that should be included in all new homes.

2. Is the residential fire problem limited to older homes?

According to a recent HUD study, the median age of homes in the U.S. is 32 years. With this in mind, it makes perfect sense that more fires and fire deaths occur in "older" homes, simply because there are many more of them. However, the residential fire problem is certainly not limited to older homes, and it is has not been correlated with home age.

To evaluate the relationship between the age of a home and fire risk, it is necessary break the concept of fire risk into its two components, the probability of a fire event occurring and the associated consequence once the event occurs. The probability of a fire event occurring equates to the risk of fire ignition. With respect to the age of a home, only those ignition sources that are permanently affixed to a home, such as central heating systems or electrical distribution systems, might be directly correlated to home age, but to date, there are no known studies demonstrating increased fire risk as these systems age. Such a study would be difficult to perform because heating and electrical systems are often replaced when a home is remodeled, breaking any correlation that might otherwise exist between the age of a home and the age of fixed systems installed therein. Nevertheless, because most fire deaths are associated with ignition scenarios related to human behavior, which are independent of home age, it is clear that home age has little to do with the probability of a fire event.

With respect to consequences associated with a fire event, assuming that an ignition has occurred, it is again difficult to establish any correlation with home age, except to the extent that the probability of safe evacuation is increased based on the possible presence of working smoke alarms and/or escape windows. On the contrary, some design and construction methods commonly used in new homes actually reduce fire safety. These include the use of lightweight trusses (now used in more than 60% of new homes according to the Wood Truss Council of America), which are known to become unstable and collapse more quickly in fire situations than conventional construction; and open floor plans, which reduce compartmentation and allow a fire to quickly spread throughout a home.

The truth is that fire growth in a home is largely dependent on contents, not the structure itself, and contents are independent of home age. Although smoke alarms and escape windows associated with newer homes are beneficial in some fire incidents, statistics show that the value of these features is declining over time, as fire deaths in homes that have working smoke alarms are becoming increasingly common. The most recent data (for the period 2000 to 2004), shows that 34% of fire deaths occurred in homes that had WORKING smoke alarms. This is up from 24% in the previous period, and as smoke alarms age, we can only assume that their reliability will continue to decline unless they are periodically replaced, which seems to be wishful thinking when one considers that we have a problem even getting people to change batteries in smoke alarms on a regular basis.

In summary, a simple risk analysis demonstrates that home age is largely independent of either the risk of ignition or the consequences of a fire, if ignition occurs. Therefore, it is clear that home age has little to do with the residential fire problem or the need for residential sprinklers.

Conclusion:

The outpouring of support for residential sprinklers has been building for many years, and today, all U.S. model building codes require fire sprinklers in residential occupancies, including one- and two-family dwellings, with the exception of the IRC. It is only logical that the IRC should finally acknowledge the value of residential sprinklers in preventing deaths, injuries and property loss by making sprinklers a standard feature in new home construction.

Although some in the IRC arena have argued that "big government" shouldn't intrude into American homes by requiring fire sprinklers, those of us who have been around for a while will recall that this same argument was made 30-years ago when smoke alarms were first required in dwellings. Today, it's hard to imagine any reasonable individual arguing that the IRC requirement for smoke alarms constitutes a "government intrusion" into the American home, largely because smoke alarms are viewed as cost-effective safety devices. Sprinklers should be viewed the same way.

Given the proposed incentive package and prescriptive design option for multipurpose fire sprinkler systems being advanced this year in a proposal by the International Association of Fire Chiefs, it is entirely feasible that it will be cheaper to build some homes with fire sprinklers than without. For those cases where there is a net cost to sprinklers, NIST's newly published "Benefit-Cost Analysis of Residential Fire Sprinkler Systems" report concludes that multipurpose residential fire sprinkler systems are still a good investment, yielding a positive present value of net benefits (PVNB) for every home type studied, including ranch-style homes, colonial-style homes and townhouses.

This proposal provides a reasonable and justified approach for advancing fire sprinklers into the body of the IRC, and the time has come to for the IRC to include fire sprinklers as part of the model for residential construction.

ABOUT THE IRC FIRE SPRINKLER COALITION: The IRC Fire Sprinkler Coalition is an organization that represents national, state and regional groups of code officials and other associations focused on public safety. The Coalition has been active in presenting training programs to code officials and others aimed at conveying facts and debunking myths and misinformation about residential sprinklers. At the time of submittal of this proposal, groups who pledged to support the IRC Fire Sprinkler Coalition's mission of mainstreaming fire sprinklers into new home construction included:

NATIONAL AND REGIONAL COALITION MEMBERS

* International Association of Fire Chiefs – Fire and Life Safety Section
* Center for Campus Fire Safety
* ICC Joint Fire Service Review Committee
* Institution of Fire Engineers, US Branch
* International Fire Marshals Association
* National Association of State Fire Marshals
* New England Association of Fire Marshals

* New England Division of the International Association of Fire Chiefs
* Safe Buildings Coordinating Committee
* Society of Fire Protection Engineers
* Southeastern Association of Fire Chiefs
* Uniform Fire Code Association
* Western Fire Chiefs Association

STATE AND LOCAL COALITION MEMBERS

Alaska
* Alaska Fire Chiefs Association

Arizona
* Arizona Fire Chiefs Association
* Arizona Fire Marshals Association
* Arizona: Society of Fire Protection Engineers, Arizona Chapter
* Arizona: Yuma County, AZ Fire Officer's Association

California
* California: California Fire Chiefs Association
* California: Northern California Fire Prevention Officers Section
* California: Orange County Fire Chiefs Association
* California: Southern California Fire Prevention Officers Section

Colorado
* Colorado: Fire Marshals Association of Colorado

Connecticut
* Connecticut: Capitol Region Fire Marshals Association of Connecticut

Delaware
* Delaware: Fire Marshals Association of Delaware Valley

Florida
* Florida Fire Marshals and Inspectors Association
* Florida Fire Chiefs Association
* Florida: Northeast Florida Fire Prevention Association

Idaho
* Idaho Fire Chiefs Association
* Idaho Fire Prevention Officers Association

Illinois
* Illinois Fire Inspectors Association
* Illinois Fire Chiefs Association
* Illinois: Lake County Fire Chiefs Association

Indiana:
* Indiana: Fire Inspectors Association Of Indiana

Iowa
* Iowa: Hawkeye State Fire Safety Association, Iowa
* Iowa Fire Marshal's Association

Louisiana
* Louisiana Association of Fire Prevention Chiefs

Maryland
* Maryland Building Officials Association
* Maryland State Firemen's Association

Maine
* Maine Fire Chiefs Association

Massachusetts
* Massachusetts: Fire Chiefs Association of Massachusetts

Michigan
* Michigan Association of Fire Chiefs
* Michigan Fire Inspectors Society
* Michigan: Macomb County Fire Chiefs Association

Missouri
* Missouri: Tri-Lakes Fire Chiefs Association

Minnesota
* Minnesota: Fire Marshals Association of Minnesota

Nebraska
* Nebraska Municipal Fire Chiefs Association

Nevada
* Nevada: Fire Prevention Association of Nevada

New Jersey
* New Jersey Fire Prevention and Protection Association
* New Jersey: Northern Ocean Fire Chiefs Association
* New Jersey: Uniform Fire Prevention/Protection Officials Assn. of Ocean County

New Mexico
* New Mexico Fire Marshals Association

New York
* New York: Association of Fire Districts of the State of New York
* New York: Career Fire Chiefs' Association of New York State
* New York: Fire Marshals Association of Suffolk County
* New York: Firemen's Association of the State of New York
* New York: Monroe County, NY Fire Marshals & Inspectors Association
* New York State Association of Fire Chiefs
* New York State Building Officials Conference
* New York State Code Coalition to Protect and Preserve our Communities:
* New York State Fire Marshals and Inspectors Association
* New York: Suffolk County Fire Chiefs Association

North Carolina
* North Carolina State Firemen's Association

Ohio
* Ohio Fire Officials Association

Oregon
* Oregon Fire Code Committee
* Oregon Fire Marshals Association

Pennsylvania
* Pennsylvania Fire and Emergency Services Institute

Rhode Island
* Rhode Island Association of Fire Marshals

Tennessee
* Tennessee Fire Safety Inspectors Association

Texas
* Texas Fire Marshals Association
* Texas: Fire Prevention Association of North Texas

Virginia
* Virginia: Central Virginia Fire and Arson Association
* Virginia Fire Chiefs Association
* Virginia Fire Prevention Association

Washington
* Washington Fire Chiefs Association
* Washington State Assn of Fire Marshals

Cost Impact: This code change will increase the cost of construction.

Analysis: This proposal includes an "effective date" which is typically not included in the I-Codes. Typically, the provisions in the code become effective when the code is adopted.

Public Hearing:	Committee:	AS	AM	D
	Assembly:	ASF	AMF	DF

RB65–07/08
R325 (New), Chapter 43 (New)

Proponents: Jim Jorgensen/Greg Reed, City of Lenexa, KS

1. Add new section as follows:

SECTION R325
AUTOMATIC SPRINKLER SYSTEM

R325.1 Fire protection systems. An automatic residential fire sprinkler system shall be installed in new townhouses in accordance with NFPA 13D.

2. Add standard to Chapter 43 as follows:

NFPA

13D-07 Installation of Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes

Reason: Townhouses present a unique fire protection and property protection issues for fore departments and owners of connected townhouses. With separate ownerships townhouses are uniquely affected by fires in adjacent units even if the fire does not breach the two hour walls separating the units. After a severe fire the structure is open to the elements and subject to damage from water intrusion and other effects. These detrimental effects contribute to ongoing damage of adjacent townhouses since the process for repair may take an extended period of time. Legal issues may further complicate the repair process. Adding sprinklers will minimize the extent of damage so that repairs are easier to complete and the time of exposure of adjacent units to adverse affects is minimized.

Significant documentation was provided RB114-06/07 to show that non-sprinkled dwellings are a major contributing factor to the amount of property damage and loss of life from fires. Sprinkling is now required for all multi-family dwellings and townhouses should be treated in a similar manner.

Cost Impact: The code change proposal will increase the cost of construction.

Public Hearing:	Committee:	AS	AM	D
	Assembly:	ASF	AMF	DF

RB66–07/08
R101.2, R301.1.3.1 (New), R313 (New), R317.2, R317.2.4, R310.1, AP102 (New), Chapter 43 (New)

Proponent: Rick Morris, AvalonBay Communities, Inc.

1. Revise as follows:

R101.2 (Supp) Scope. The provisions of the *International Residential Code for One- and Two-family Dwellings* shall apply to the construction, alteration, movement, enlargement, replacement, repair, equipment, use and occupancy, location, removal and demolition of detached one- and two-family dwellings and townhouses not more than three stories above-grade in height with a separate means of egress and their accessory structures.

The provisions of this Code shall also apply to the construction, alteration, enlargement and replacement of townhouses not more than 4 stories above grade plane that are equipped throughout with an automatic sprinkler system installed in accordance with NFPA 13D.

Exception: Live/work units complying with the requirements of Section 419 of the *International Building Code* shall be permitted to be built as one- and two-family dwellings or townhouses. Fire suppression required by Section 419.5 of the *International Building Code* when constructed under the *International Residential Code for One- and Two-family Dwellings* shall conform to Section 903.3.1.3 of the *International Building Code*.

2. Add new text as follows:

R301.1.3 Engineered design. When a building of otherwise conventional construction contains structural elements exceeding the limits of Section R301 or otherwise not conforming to this code, these elements shall be designed in accordance with accepted engineering practice. The extent of such design need only demonstrate compliance of nonconventional elements with other applicable provisions and shall be compatible with the performance of the conventional framed system. Engineered design in accordance with the *International Building Code* is permitted for all buildings and structures, and parts thereof, included in the scope of this code.

R301.1.3.1 Townhouses four stories above grade plane. For structural design of townhouses four stories above grade plane, the structural provisions of the *International Building Code* for Group R-3 shall apply

3. Rename section and add new R313.1 as follows:

R313
FIRE PROTECTION SYSTEMS AND SMOKE ALARMS

R313.1 Fire protection systems. An approved automatic fire sprinkler system shall be installed in new townhouses in accordance with NFPA 13D, except as follows:

1. Where townhouses have separation walls designed based on R317.2, Exception 2, sprinklers shall be provided to protect exterior combustible balconies, decks, porches and ground floor patios located under such combustible projections. Exterior sprinklers and supply piping shall be protected from freezing where freeze protection is required by P2603.6. Where sidewall sprinklers are installed beneath exposed wood joists, sprinklers shall be permitted to be installed with deflectors located 1 inch (25 mm) to 6 inches (152 mm) below the joists, not to exceed a maximum distance of 14 inches (356 mm) below the deck.
2. Where townhouses with private garages have separation walls designed based on R317.2, Exception 2, fire sprinkler protection shall be provided in the garage. Sprinklers in garages shall be connected to a system that complies with NFPA 13D. Garage sprinklers shall be residential sprinklers or quick-response sprinklers, designed to provide a density of 0.05 gpm/ft^2. Garage doors shall not be considered as obstructions with respect to sprinkler placement.

(Renumber subsequent sections)

4. Revise as follows:

R317.2 Townhouses. Each townhouse shall be considered a separate building and shall be separated by fire-resistance-rated wall assemblies meeting the requirements of Section R302 for exterior walls.

Exceptions:

1. A common 2-hour fire-resistance-rated wall is permitted for townhouses if such walls do not contain plumbing or mechanical equipment, ducts or vents in the cavity of the common wall. Electrical installations shall be installed in accordance with Chapters 33 through 42. Penetrations of electrical outlet boxes shall be in accordance with Section R317.3.
2. A common 1-hour fire-resistance rated wall is permitted for townhouses equipped throughout with an automatic sprinkler system installed in accordance with R313.1. The wall shall be rated for fire exposure from both sides and shall extend to and be tight against exterior walls and the underside of the roof sheathing. Where roof surfaces adjacent to the wall are at different elevations, the rated wall shall continue to the upper roof sheathing.

5. Revise as follows:

R317.2.4 Structural independence. Each individual townhouse shall be structurally independent.

Exceptions:

1. Foundations supporting exterior walls or common walls.
2. Structural roof and wall sheathing from each unit may fasten to the common wall framing.
3. Nonstructural wall coverings.
4. Flashing at termination of roof covering over common wall.
5. Townhouses separated by a common ~~2 hour~~ fire-resistance-rated wall as provided in Section R317.2.

6. Revise as follows:

R310.1 (Supp) Emergency escape and rescue required. Basements and every sleeping room shall have at least one operable emergency escape and rescue opening. Such opening shall open directly into a public street, public alley, yard or court. Where basements contain one or more sleeping rooms, emergency egress and rescue openings shall be required in each sleeping room. Where emergency escape and rescue openings are provided they shall have a sill height of not more than 44 inches (1118 mm) above the floor. Where a door opening having a threshold below the adjacent ground elevation serves as an emergency escape and rescue opening and is provided with a bulkhead enclosure, the bulkhead enclosure shall comply with Section R310.3. The net clear opening dimensions required by this section shall be obtained by the normal operation of the emergency escape and rescue opening from the inside. Emergency escape and rescue openings with a finished sill height below the adjacent ground elevation shall be provided with a window well in accordance with Section R310.2. Emergency escape and rescue openings shall open directly into a public way, or to a yard or court that opens to a public way.

Exceptions:

1. Basements used only to house mechanical equipment and not exceeding total floor area of 200 square feet (18.58 m_2).
2. In dwelling units equipped throughout with an automatic sprinkler system installed in accordance with NFPA 13D.

7. Add new text as follows:

AP102 Fire flow. The fire-flow requirements for townhouses specified by IFC Appendix B, where adopted, shall be permitted to be reduced by 75% for buildings equipped throughout with an automatic sprinkler system installed in accordance with NFPA 13D.

8. Add standard to Chapter 43 as follows:

NFPA

13D Installation of Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes

Reason: This proposal would add a requirement for residential sprinkler systems to be installed in all new townhouses constructed under the *International Residential Code*, and it includes a package of sprinkler incentives that will help offset the added cost of sprinklers, as well as improve design flexibility. If a reasonable package of incentives can be offered by the code, it simply makes sense for multifamily developers to provide these systems to protect new townhouses.

It is well known that sprinklers are the best tool for providing firesafety in residential occupancies, and the concept of the code providing incentives to encourage the use of these systems in residential occupancies is already in use in the IBC. In fact, the IBC's incentive package provided a basis for major multifamily builders to not oppose the IBC requirement for all residential occupancies to be sprinklered when that issue was considered several years ago.

By accepting this code change, sprinkler protection for townhouses would become reasonably affordable to the builders who build townhouses and to the homeowners who buy them. As a result, we could take a significant step forward in improving life safety and reducing property losses in residential occupancies for decades to come.

The following is an explanation of each new proposed section relating to this sprinkler alternative for dwellings:

1. *Revise Section R101.2:* Typical townhouse construction is no more than 4 stories above grade plane. Presently when a developer goes from 3 to 4 stories above grade, the project is then required to be designed under the IBC. Covering townhouses up to 4 stories above grade plane in the IRC provides a significant incentive for developers. The impact on 4-story buildings would be significant enough to warrant installing sprinklers in 2- and 3-story buildings, which will gain far less benefit from this change, when one considers the overall package. The overall gain of having all townhouses equipped with fire sprinklers makes the allowance of 4-story townhouses under the IRC a worthwhile investment in safety.

2. *Add new Subsection R301.1.3.1 to the "Engineered design" requirement*. This new subsection will address the structural design requirements for townhouses built under the IRC that are 4 stories above grade. The existing structural requirements in the IRC are based on a maximum 3 stories above grade, and by referencing the IBC, proper design is assured.
3. *Rename Section R313 and add new Section R313.1:* This provides a charging requirement for providing residential sprinklers in accordance with NFPA 13D for townhouses. The two exceptions deal with issues not addressed by NFPA 13D, one is outside combustible decks and the other is private garages. The combustible deck sprinkler requirement is consistent with a similar provision to IBC Section 903.3.1.2.1, "Balconies and decks". Most likely a dry sidewall sprinkler supplied by a wet pipe sprinkler system would be used to comply with this exception. The garage sprinkler criteria are based on NFPA 13R Section 6.8.3.3. Dry pendent sprinklers supplied by a wet pipe sprinkler system would most likely be used to protect garages.

4. & 5. *Add new Exception#2 to R 317.2 and revise Exception #5 to R317.2.4:* This is a similar one hour exception that was in BOCA Code Section 310.5 Exception #2 for multiple single-family dwellings. That section of Code read: "In multiple single-family dwellings that are equipped throughout with an approved automatic sprinkler system installed in accordance with Section 906.2.3 (NFPA 13D), the fire-resistance rating between each dwelling unit shall not be less than 1 hour and shall be constructed as a fire partition."

6. *Add new Exception to Section R310.1:* The IRC already allows elimination of escape windows in Groups R-1, R-2, R-4 and I-1 occupancies (IBC Section 1026, Exception 1) based on the installation of fire sprinklers. NFPA Life Safety Code, also contains an NFPA 13D related exception to the escape window requirement for one- and two-family dwellings in Section 24.2.2.1.2(2).
7. *Revise Appendix P101:* The reduction in fire flow is similar to allowances granted by the IFC.

Cost Impact: The code change proposal may increase or decrease the cost of construction, depending on the value of sprinkler incentives versus the cost of adding sprinklers to a particular building..

Public Hearing:	Committee:	AS	AM	D
	Assembly:	ASF	AMF	DF

RB67–07/08

R302.1, Table R302.1, Table R302.1(2) (New), R317.2, R317.2.4, R317.2.5 (New), R309.7 (New), R313.2, R310.1, AP102 (New), Chapter 43 (New)

Proponent: Tom Lariviere, Fire Department, Madison, MS, representing Fire & Life Safety Section of the International Association of Fire Chiefs (IAFC)

1. Revise as follows:

R302.1 (Supp) Exterior walls. Construction, projections, openings and penetrations of exterior walls of dwellings and accessory buildings shall comply with Table R302.1<u>(1); or for dwellings equipped throughout with an automatic sprinkler system installed in accordance with NFPA 13D and Table R302.1(2)</u>.

Exceptions:

1. Walls, projections, openings, or penetrations in walls perpendicular to the line used to determine the fire separation distance.
2. Walls of dwellings and accessory structures located on the same lot.
3. Detached tool sheds and storage sheds, playhouses and similar structures exempted from permits are not required to provide wall protection based on location on the lot. Projections beyond the exterior wall shall not extend over the lot line.
4. Detached garages accessory to a dwelling located within 2 feet (610 mm) of a lot line are permitted to have roof eave projections not exceeding 4 inches (102 mm).
5. Foundation vents installed in compliance with this code are permitted.

TABLE R302.1(1) (Supp)
EXTERIOR WALLS

EXTERIOR WALL ELEMENT		MINIMUM FIRE-RESISTANCE RATING	MINIMUM FIRE SEPARATION DISTANCE
Walls	(Fire-resistance rated)	1 hour with exposure from both sides	0 feet
	(Not fire-resistance rated)	0 hours	5 feet
Projections	(Fire-resistance rated)	1 hour on the underside	2 feet
	(Not fire-resistance rated)	0	5 feet
Openings	Not allowed	N/A	< 3 feet
	25 % Maximum of Wall Area	0 hours	3 feet
	Unlimited	0 hours	5 feet
Penetrations	All	Comply with Section R317.3	< 5 feet
		None required	5 feet

N/A = Not Applicable

TABLE R302.1(2)
EXTERIOR WALLS – DWELLINGS WITH FIRE SPRINKLERS

EXTERIOR WALL ELEMENT		MINIMUM FIRE-RESISTANCE RATING	MINIMUM FIRE SEPARATION DISTANCE
Walls	(Fire-resistance rated)	1 hour with exposure to the fire from the outside	0 feet
	(Not fire-resistance rated)	0 hours	3 feet[1]
Projections	Fire-resistance rated	1 hour on the underside	2 feet[1]
	(Not fire-resistance rated)	0	3 feet
Openings	Not allowed	N/A	< 3 feet
	Unlimited	0	3 feet[1]
Penetrations	All	Comply with Section R317.3	< 3 feet
		None required	3 feet[1]

[1] For residential subdivisions where all dwellings are equipped throughout with an automatic sprinkler systems installed in accordance with NFPA 13D, as amended by R309.7, the fire separation distance for non-rated exterior walls and rated projections shall be permitted to be reduced to zero feet, and unlimited unprotected openings and penetrations shall be permitted, where the adjoining lot provides an open setback yard that is 6 feet or more in width on the opposite side of the property line.

2. Revise as follows:

R317.2 Townhouses. Each townhouse shall be considered a separate building and shall be separated by fire-resistance-rated wall assemblies meeting the requirements of Section R302 for exterior walls.

Exceptions:

1. A common 2-hour fire-resistance-rated wall is permitted for townhouses if such walls do not contain plumbing or mechanical equipment, ducts or vents in the cavity of the common wall. Electrical installations shall be installed in accordance with Chapters 33 through 42. Penetrations of electrical outlet boxes shall be in accordance with Section R317.3.
2. A common 1-hour fire-resistance rated wall is permitted for townhouses equipped throughout with an automatic sprinkler system installed in accordance with NFPA 13D, as amended by R309.7 and R317.2.5, up to an aggregate floor area of 28,000 square feet per building. The wall shall be rated for fire exposure from both sides and shall extend to and be tight against exterior walls and the underside of the roof sheathing. Where roof surfaces adjacent to the wall are at different elevations, the rated wall shall continue to the upper roof sheathing.

R317.2.4 Structural independence. Each individual townhouse shall be structurally independent.

Exceptions:

1. Foundations supporting exterior walls or common walls.
2. Structural roof and wall sheathing from each unit may fasten to the common wall framing.
3. Nonstructural wall coverings.
4. Flashing at termination of roof covering over common wall.
5. Townhouses separated by a common ~~2 hour~~ fire-resistance-rated wall as provided in Section R317.2.

3. Add new text as follows:

R317.2.5 Fire sprinklers for balconies, decks, porches and ground floor patios. Where townhouses have separation walls designed based on R317.2, Exception 2, sprinklers shall be provided to protect exterior combustible balconies, decks, porches and ground floor patios located under such combustible projections. Exterior sprinklers and supply piping shall be protected from freezing where freeze protection is required by P2603.6. Where sidewall sprinklers are installed beneath exposed wood joists, sprinklers shall be permitted to be installed with deflectors located 1 inch (25 mm) to 6 inches (152 mm) below the joists, not to exceed a maximum distance of 14 inches (356 mm) below the deck.

4. Add new text as follows:

R309.7 Fire Sprinklers. Private garages shall be protected by fire sprinklers, where:

1. The garage is in a townhouse having separation walls designed based on R317.2, Exception 2.
2. A garage wall has been designed based on Table R302.1(2), Footnote 1.

Sprinklers in garages shall be connected to a system that complies with NFPA 13D. Garage sprinklers shall be residential sprinklers or quick-response sprinklers, designed to provide a density of 0.05 gpm/ft^2. Garage doors shall not be considered obstructions with respect to sprinkler placement.

5. Revise as follows:

R313.2 Location. Smoke alarms shall be installed in the following locations:

1. In each sleeping room.
2. Outside each separate sleeping area in the immediate vicinity of the bedrooms.

   Exception: In dwelling units equipped throughout with an automatic sprinkler system installed in accordance with NFPA 13D,

3. In a common area on each additional story of the dwelling, including basements but not including crawl spaces and uninhabitable attics. In dwellings or dwelling units with split levels and without an intervening door between the adjacent levels, a smoke alarm installed on the upper level shall suffice for the adjacent lower level provided that the lower level is less than one full story below the upper level.

When more than one smoke alarm is required to be installed within an individual dwelling unit the alarm devices shall be interconnected in such a manner that the actuation of one alarm will activate all of the alarms in the individual unit.

6. Revise as follows:

R310.1 (Supp) Emergency escape and rescue required. Basements and every sleeping room shall have at least one operable emergency escape and rescue opening. Such opening shall open directly into a public street, public alley, yard or court. Where basements contain one or more sleeping rooms, emergency egress and rescue openings shall be required in each sleeping room. Where emergency escape and rescue openings are provided they shall have a sill height of not more than 44 inches (1118 mm) above the floor. Where a door opening having a threshold below

the adjacent ground elevation serves as an emergency escape and rescue opening and is provided with a bulkhead enclosure, the bulkhead enclosure shall comply with Section R310.3. The net clear opening dimensions required by this section shall be obtained by the normal operation of the emergency escape and rescue opening from the inside. Emergency escape and rescue openings with a finished sill height below the adjacent ground elevation shall be provided with a window well in accordance with Section R310.2. Emergency escape and rescue openings shall open directly into a public way, or to a yard or court that opens to a public way.

Exceptions:

1. Basements used only to house mechanical equipment and not exceeding total floor area of 200 square feet (18.58 m_2).
2. In dwelling units equipped throughout with an automatic sprinkler system installed in accordance with NFPA 13D.

7. Add new text as follows:

AP102 Fire flow. As provided in IFC Appendix B, where adopted, the fire-flow requirements for one and two family dwellings and townhouses shall be permitted to be reduced by 50% for buildings equipped throughout with an automatic sprinkler system installed in accordance with NFPA 13D.

8. Add standard to Chapter 43 as follows:

NFPA

13D Installation of Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes

Reason: Fire sprinklers are universally recognized as the most effective means of reducing America's fire losses and preventing firefighter deaths and injuries associated with firefighting operations. Both of these objectives are fundamental to the mission of the International Association of Fire Chiefs (IAFC). Through this proposal, the IAFC hopes to encourage more widespread use of residential sprinklers by establishing a package of sprinkler incentives in the IRC that will appeal to homebuilders and consumers.

The use of incentives to encourage the installation of fire sprinkler systems is traceable in model building codes for at least 80 years, and today, these incentives are woven into the text of nearly every ICC code. Likewise, in communities throughout the United States where residential sprinklers are required, incentives play a critical roll in developing and maintaining community support for sprinklers. Nevertheless, sprinkler incentives remain few and far between in the IRC, offering little to offset the cost of installing sprinklers or to enhance their value through building design options. Many stakeholders in the residential construction industry have made it clear that this must change before we'll see residential sprinklers in the mainstream of new home construction, and as an organization dedicated to public safety, IAFC chose to undertake the challenge of assembling a reasonable IRC incentive package to motivate the use of sprinklers. To identify incentives that would be seen by the homebuilding industry as having value, input was sought and received from the National Association of Homebuilders, and although NAHB was unable to consider endorsing this proposal prior to the code change submittal deadline, their input is reflected in the proposed text.

Overall, IAFC believes that the package of incentives contained in this proposal will significantly enhance the safety of buildings constructed in accordance with the IRC, and ultimately, we expect to see more homes protected by fire sprinklers once these revisions are published in the IRC. Although individual items in this package may be viewed by some as too liberal, while others will say that they are not liberal enough, IAFC believes that each of the suggested changes is reasonable and justifiable for a sprinklered dwelling.

The following discussion provides justifications for each of the 7 parts of this proposal.

1. ***Modify existing Section R302.1 and add a new Table R302.1(2)****:* This change provides a significant financial and design incentive for residential sprinklers. From a financial perspective, the proposal permits cost reductions related to exterior wall construction and, in the case of a planned community, could result in more developable lots. From a design advantage perspective, the proposal permits homes to have larger footprints without triggering fire-rated exterior walls and permits more flexible use of windows on walls facing property lines.

   From a firesafety perspective, the proposed requirements generally put the code back where it was in 2000 and 2003, so there is essentially no concession compared to how homes have been built under the IRC since the code was first published in 2000. In 2006, the IRC's fire separation distances for non-rated exterior walls were increased from 3 feet to 5 feet for the purpose of coordinating the IRC's residential separation distances with those in the IBC (Code Change G128-03/04). History shows that residential sprinklers reliably limit fire spread to the room of origin, and with such protection, allowing the code to revert to a 3-foot separation distance provides a reasonable compensation for sprinklers. Certainly, the probability of a favorable outcome in the event of a fire is much better for a sprinklered building with a 3-foot separation versus a nonsprinklered building with a 5-foot separation, so encouraging sprinklers is a preferred approach.
2. ***Revise the exceptions to R317.2 and R317.2.4****:* Because residential sprinklers will slow fire growth and often completely extinguish a fire, the fire challenge to townhouse separation walls is expected to be significantly delayed, reduced or eliminated. Precedent for this incentive exists in Section 310.5 Exception 2 of the BOCA code, which read: "In multiple single-family dwellings that are equipped throughout with an approved automatic sprinkler system installed in accordance with Section 906.2.3 (NFPA 13D), the fire resistance rating between each dwelling unit shall not be less than 1 hour and shall be constructed as a fire partition." Clearly, the overall level of safety and best chance for a favorable outcome in the event of a fire is through the use of fire sprinklers with a 1-hour wall versus no sprinklers and a 2-hour wall.
3. ***Add a new Section R317.2.5****:* This revision provides a limitation on the incentive described in Part 2 above. Because NFPA 13D systems are being recognized to a limited degree for property protection, as well as life safety, it was considered appropriate to ask for sprinklers to protect combustible exterior projections sometimes associated with outdoor fires, typically associated with a barbecue grill on a deck. Similar requirements are established by the IBC in Section 903.3.1.2.1 for NFPA 13R systems. Often, this type of protection is provided by dry sidewall sprinklers connected to a wet pipe sprinkler system.
4. ***Add a new Section R309.7****:* This revision provides a limitation on the incentive described in Part 2 above. Because NFPA 13D systems are being recognized to a limited degree for property protection, as well as life safety, it was considered appropriate to ask for sprinklers to protect sprinklers to protect garages. Design criteria suggested for sprinklers was derived from NFPA 13R Section 6.8.3.3, which addresses sprinkler protection for garages in buildings protected by NFPA 13R sprinkler systems. Often, this type of protection is provided by dry pendent sprinklers connected to a wet pipe sprinkler system.

5. ***Revise Section R313.2***: The value of smoke alarms with respect to life safety is well recognized. Nevertheless, code requirements associated with how many smoke alarms must be installed in a dwelling and where they must be located were developed without respect to the presence of fire sprinklers. It is widely known that the addition of fire sprinklers to a dwelling will provide a significant improvement to life safety and property protection versus having smoke alarms alone, so eliminating a minimal number of smoke alarms as part of a package to gain sprinklers is a reasonable approach.

   Contrary to what one might expect as a result of reducing the number of smoke alarms, the proposed revision could actually improve the performance of smoke alarms because it will require that a minimum of one smoke alarm be located in the common area on each floor. Currently, the code only requires smoke alarms outside of sleeping areas, often satisfied by installing a smoke alarm in the hallway outside of bedroom doors. The number of alarms will only be reduced in cases where there is more than one sleeping area on a floor.

   Given that fires often start in kitchens and living rooms, installing a smoke alarm in a more central area, as required by this proposal, may well result in more effective detection of fires in these areas. Plus, with the code still requiring smoke alarms in each bedroom, connected to common area smoke alarms, waking effectiveness and protection of bedroom areas will not be impacted by this proposal.
6. ***Add a new Exception to Section R310.1****:* This part of the proposal will, on its own, provide enough incentive to get a home sprinklered in some cases. Homebuilders and homeowners often want greater flexibility to use a variety of window types and configurations to provide required light and ventilation (it should be noted an exception to the emergency escape window requirement is unlikely to result in rooms without windows or doors because rooms will still require light and ventilation to comply with R303.1 and it seems unlikely that homeowners would choose to forgo natural light in bedrooms). For example, by allowing side-hinged windows, smaller windows or strategically positioned windows that wouldn't meet the current escape window requirements, there are potential gains in energy efficiency and wind resistance versus traditional hung windows with friction seals used to meet escape provisions.

   To those who might regard egress windows as a safety feature that should not be equated to sprinkler protection, consider that the IBC already allows elimination of escape windows in Groups R-1, R-2, R-4 and I-1 occupancies (IBC Section 1026, Exception 1) based on the installation of fire sprinklers. It simply makes no sense that sprinkler protection should be considered as providing adequate safety without escape windows in fraternities, apartments, hotels, adult care, child care and assisted living facilities, among others, but not in one- and two-family dwellings. In fact, even the NFPA Life Safety Code, a document with a pure life safety focus, provides an exception to the escape window requirement for one- and two-family dwellings [2006 NFPA 101, Section 24.2.2.1.2(2)] based on the installation of fire sprinklers in accordance with NFPA 13D. Recognizing the high level of safety that will be provided in homes that have both smoke alarms and sprinklers, providing adequate time for occupants to escape a fire using the normal means of egress, and with so much code precedent and a high incentive value, it makes sense to extend the sprinkler allowance for escape windows to include one- and two-family dwellings and townhouses.
7. ***Add a new Section AP102****:* The reduction in fire flow simply calls attention to an allowance already permitted by the IFC.

Cost Impact: The code change proposal will decrease the cost of construction.

Public Hearing:	Committee:	AS	AM	D
	Assembly:	ASF	AMF	DF

RB68–07/08

R313.1 (New), Chapter 43 (New)

Proponent: Sean DeCrane, Fire Department, Cleveland, OH, representing International Association of Fire Fighters, Local 93

1. Add new text as follows:

R313.1 Fire protection systems. One and two family dwellings that incorporate lightweight truss or engineered lightweight material such as wooden I-beams, cold form steel or trusses in the floor or ceiling areas shall have the floors/ceilings assemblies protected by a thirty (30) minute fire-rated barrier.

Exception: Where the building is protected with a sprinkler system designed to NFPA 13D.

2. Add standard to Chapter 43 as follows:

NFPA

13D-07 Installation of Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes

(Renumber subsequent sections)

Reason: On August 13, 2006 a Wisconsin fire fighter was killed, and a second fire fighter injured, when the floor they were operating on collapsed sending them into the basement. One fire fighter fell directly into the room of origin and was killed, the second fire fighter landed on the opposite side of a block wall and survived by shielding herself and making an escape through a rear window. They checked the floor to ensure it was safe and solid, just prior to collapse they heard a loud crack.

The floor they were operating on was unprotected lightweight construction that collapsed without warning. In the ensuing investigation, the National Institute for Occupational Safety and Health released report F2006-26. One of the recommendations is to "modify current building codes to require that lightweight trusses be protected with a fire barrier". This should not only pertain to truss construction. There are additional forms of construction that can be determined to be lightweight, cold form steel, bar joists, wooden engineered I-beam, etc., the recent trend in residential construction is to use products that are financially beneficial. It is the belief of many of us in the fire service that as the industry engineers products to a more finite point we are losing our safety factors.

In April, 2005, NIOSH released their report "Preventing Injuries and Deaths of Fire Fighters due to Truss System Failures". In their release they recommended the placement of a labeling system on buildings to indicate the type of construction. While this recommendation will probably not be acceptable to residents of a one or two family home, we can mandate that they increase the protection of the construction type to provide increased safety to the residents and the responding fire fighters.

1. National Institute for Occupational Safety and Health Report F206-26. July, 2007.
2. National Institute for Occupational Safety and Health Alert, "Preventing Injuries and Deaths of Fire Fighters due to Truss System Failures".

Cost Impact: This code change proposal will increase the cost of construction.

Public Hearing:	Committee:	AS	AM	D
	Assembly:	ASF	AMF	DF

RB69-07/08

AP102 (New), AP103 (New), AP104 (New), AP105 (New), AP106 (New), AP107 (New), AP107.1 (New), AP107.2 (New), AP107.3 (New), AP107.3.1 (New)

Proponent: Steven Orlowski, National Association of Home Builders

Add new text to Appendix P as follows:

APPENDIX P
FIRE SPRINKLER SYSTEM

The provisions contained in this appendix are not mandatory unless specifically referenced in the adopting ordinance.

SECTION AP102
ALLOWANCES FOR FIRE SPRINKLERS

AP102.1Exterior walls of sprinklered dwellings. Construction, projections, openings and penetrations of exterior walls of dwellings that are equipped throughout with an automatic sprinkler system in accordance with Section AP101, shall not be required to comply with Table R302.1.

AP102.2 Emergency escape and rescue in sprinklered dwellings. Emergency escape and rescue openings in accordance with Section R310 shall not be required in dwellings that are equipped throughout with an automatic sprinkler system in accordance with Section AP101.

AP102.3 Smoke Alarms in sprinklered dwellings. Smoke alarms shall be located in accordance with Section R313 of the *International Residential Code.*

Exception: Smoke alarms shall not be required in sleeping rooms in dwellings that are equipped throughout with an automatic sprinkler system in accordance with Section AP101.

AP102.4 Arc-fault protection of bedroom outlets in sprinklered dwellings. Electrical arc-fault protection in accordance with Section E3802.12 shall not be required in dwellings that are equipped throughout with an automatic sprinkler system in accordance with Section AP101.

SECTION AP103
FEES

AP103.1 General. Where water supply and distribution system fees are assessed and based on the size of the system, fees shall be based on the minimum size meter and water distribution needed to meet the water supply fixture unit values.

SECTION AP104
FIRE SERVICE FEATURES

AP104.1 General. Where a fire sprinkler system is installed in accordance with Section AP101, service features shall be in compliance with Sections AP104.2 through AP104.4.1.

AP104.2 Fire-flow. Fire-flow requirements shall conform to the *International Fire Code* Appendix B105.1, or a reduction in the required fire-flow of 50 percent is allowed, as approved, when all one- and two-family dwelling and townhouses are equipped with an automatic sprinkler system installed in accordance with this appendix.

AP104.3 Fire hydrant spacing. In one- and two-family dwelling and townhouse developments where all dwellings are equipped throughout with an approved automatic sprinkler system in accordance with this appendix, the spacing of the fire hydrants shall be permitted to be up to 1000'.

AP104.4 Fire apparatus access roads. Fire apparatus access roads shall conform to the *International Fire Code Appendix D107.1,* or where the one- and two-family dwellings and townhouses on a single public or private fire apparatus access road are equipped throughout with an automatic sprinkler system in accordance with this appendix, access from two directions shall not be required.

AP104.4.1 Dimensions. Fire apparatus access roads shall be permitted to have a clear unobstructed width of less than 20 feet, as approved, when all dwellings on a single public or private fire apparatus access road are equipped throughout with an approved automatic sprinkler system in accordance with this section.

Reason: The exceptions included in this proposal are reasonable allowances for consideration by the IRC Committee and the ICC Membership, should sprinklers be installed in accordance with the proposed prescriptive sprinkler system provisions or NFPA 13D and do not result in a reduction to occupant safety. Several of these exceptions are similar in methodology to other trade exceptions offered in structures that are equipped with an automatic sprinkler system. Some of the proposed exceptions are referenced in other codes that may not have been adopted by the jurisdiction, therefore it is important that they be included in the IRC Appendix P as possible trade exceptions. Below is a list and supporting information for each proposed trade exception;

AP102.1 This proposal exception would allow for the reduction in the fire separation distance between dwellings, require that the 1 hour rating of the exterior wall to be limited to the outside exposed wall. This proposal would also allow one- and two-family dwelling, equipped with an automatic sprinkler system, to be built without a rated exterior wall and unlimited openings up to the property, provided there is setback of a minimum 6 feet. When a dwelling unit is equipped with an automatic sprinkler system most fires can be controlled by one or two sprinklers, thereby reducing the concern about heat exposure from one dwelling to another.

AP102.2 Emergency escape and rescue openings are required by the code to allow a secondary exit should the primary escape route is blocked. As stated above, the automatic sprinkler system is designed to provide an increased level of safety for the occupant by controlling or suppressing the fire. Similar exceptions are already provided in the International Building Code and Life Safety Code to other R occupancies when the structure is equipped with an approved automatic sprinkler system.

AP102.3 The purpose of the smoke alarm system is to provide the occupant enough time to escape the dwelling upon notification of a fire. Dwellings that are equipped with an automatic sprinkler system should be permitted to reduce the number of smoke alarms required in the dwelling, since they increase the amount of time the occupant has to vacate the dwelling by controlling and sometimes extinguishing the fire.

AP102.4 The IRC Commentary explains that Arc-Fault receptacles are required to reduce the number of fires that are associated with electrical arcs. Based on information provided in reports published by the National Fire Protection Association prior to the code requiring arc-fault protection, the number of fires who's origin was based on an electrical distribution and lighting failure or malfunction accounted for 3% of all residential structure fires and caused the least number of fire fatalities.

AP103 When the sizing of the water meter and distribution line must be increased to accommodate an automatic sprinkler system, the fees assessed by the water purveyor should be based solely on the size meter and distribution lines that would be required to meet the domestic potable demand. Unless the sprinkler is activated, there is no increase in the amount of water consumed by the dwelling. Consumers should not be charged higher rates or fees, just because the sprinkler system design required the distribution system to be increased.

AP104.2 The purpose of this proposal is to follow a precedence that has been established in the *International Residential Code* when referencing another code. The *International Fire Code* allows the Authority Having Jurisdiction to reduce the required fire flow rate by 50 percent when the dwelling is provided with an approved sprinkler system.

AP104.3 Would allow greater distances between fire hydrants in residential developments where all dwellings are equipped with an automatic sprinkler system in accordance with Appendix P. Both the *Uniform fire Code* and the *Urban- Wildland Interface Code* allow for increase to the fire hydrant spacing when all dwelling units in a development are equipped with an automatic sprinkler system. The spacing increase to 1,000 feet would still meet the UFC requirement for response to vehicular accidents and the WUIC requirement for maximum distance to a water source.

AP104.4.1 This proposed exception would allow for the increase the number of dwelling units allowed before requiring a secondary fire apparatus access road and would allow for the reduction of the access road to less than 20 feet when all the dwellings are equipped with an approved automatic sprinkler system. The *International Fire Code* allows for a single fire apparatus access road for developments that are equipped with an automatic sprinkler system and some jurisdictions have allowed for narrower roads as an exception when dwellings are sprinklered.

Cost Impact: The code change proposal will increase the cost of construction.

Public Hearing:	Committee:	AS	AM	D
	Assembly:	ASF	AMF	DF

RB70–07/08

AP111 (New), AP112 (New), AP113 (New)

Proponent: Steven Orlowski, National Association of Home Builders

Add new text to Appendix P as follows:

SECTION AP 111
ALLOWANCES FOR FIRE SPRINKLERS

AP111.1 Exterior walls of sprinklered dwellings. Construction, projections, openings and penetrations of exterior walls of dwellings that are equipped throughout with an automatic sprinkler system in accordance with, Sections AP101 through AP 110 shall not be required to comply with Table R302.1.

AP111.2 Emergency escape and rescue in sprinklered dwellings. Emergency escape and rescue openings in accordance with Section R310 shall not be required in dwellings that are equipped throughout with, Sections AP101 through AP 110.

AP111.3 Smoke alarms in sprinklered dwellings. Smoke alarms shall be located in accordance with Section R313 of the *International Residential Code*.

Exception: Smoke alarms shall not be required in sleeping rooms in dwellings that are equipped throughout with an automatic sprinkler system in accordance with, Sections AP101 through AP 110.

AP111.4 Arc-fault protection of bedroom outlets in sprinklered dwellings. Electrical arc-fault protection in accordance with Section E3802.12 shall not be required in dwellings that are equipped throughout with an automatic sprinkler system in accordance with, Sections AP101 through AP 110.

SECTION AP112
FEES

AP112.1 General. Where water supply and distribution system fees are assessed and based on the size of the system, fees shall be based on the minimum size meter and water distribution needed to meet the water supply fixture unit values.

SECTION AP113
FIRE SERVICE FEATURES

AP113.1 General. Where a fire sprinkler system is installed in accordance with Sections AP101 through AP110, fire service features shall be in compliance with Sections AP113.2 through AP113.4.1.

AP113.2 Fire-flow. Fire-flow requirements shall conform to the *International Fire Code* Appendix B105.1, or a reduction in the required fire-flow of 50 percent is allowed, as approved, when all one- and two-family dwelling and townhouses are equipped with an automatic sprinkler system installed in accordance with this appendix.

AP113.3 Fire hydrant spacing. In one- and two-family dwelling and townhouse developments where all dwellings are equipped throughout with an approved automatic sprinkler system in accordance with this appendix, the spacing of the fire hydrants shall be permitted to be up to 1000'.

AP113.4 Fire apparatus access roads. Fire apparatus access roads shall conform to the *International Fire Code* Appendix D107.1, or where the one- and two-family dwellings and townhouses on a single public or private fire apparatus access road are equipped throughout with an automatic sprinkler system in accordance with this appendix, access from two directions shall not be required.

AP113.4.1 Dimensions. Fire apparatus access roads shall be permitted to have a clear unobstructed width of less than 20 feet, as approved, when all dwellings on a single public or private fire apparatus access road are equipped throughout with an approved automatic sprinkler system in accordance with this section.

NOTE: THE ALLOWANCES GIVEN IN THE PROPOSED NEW TEXT ABOVE ARE BASED UPON THE USE OF THE FIRE SPRINKLER SYSTEM THAT IS PART OF ANOTHER CODE CHANGE PROPOSAL WHICH WILL BE ON THE AGENDA OF THE IRC MECHANICAL AND PLUMBING COMMITTEE. THE DETAILS OF THAT FIRE SPRINKLER SYSTEM ARE SHOWN BELOW FOR INFORMATION. THESE DETAILS ARE NOT THE SUBJECT OF THIS CODE CHANGE PROPOSAL AND ARE THEREFORE NOT ABLE TO BE MODIFIED BY ACTIONS TAKEN IN THIS CODE CHANGE PROPOSAL.

FIRE SPRINKLER SYSTEMS

SECTION AP 101
GENERAL

AP101.1 Scope. The provisions of this appendix shall control the design and installation of automatic fire sprinkler system in new one- and two-family dwellings and townhouses.

Exception: Residential fire sprinklers installed in accordance with NFPA 13D shall be permitted.

SECTION AP 102
REQUIREMENTS FOR SPRINKLERS

AP102.1 Sprinklers. Sprinklers shall be listed residential sprinklers. Residential sprinklers shall be installed in accordance with the manufacturer's installation instructions.

AP102.2 Temperature rating and separation from heat sources. Sprinklers shall have a temperature rating of 135-170°F and shall be separated from heat sources as required by the manufacturer's instructions.

Exception: Sprinklers shall have a temperature rating of 175-225°F where installed in the following areas:

1. Directly under skylights where exposed to direct sunlight.
2. In attics or concealed spaces located directly beneath a roof.

AP102.3 Intermediate temperature sprinklers. Sprinklers located within the distance to a heat source as specified in Table AP102.3 shall have a temperature rating of 175-225°F.

TABLE AP102.3
DISTANCE FROM HEAT SOURCE

HEAT SOURCE	LOCATION OF SPRINKLER WITHIN DISTANCE TO HEAT SOURCE (INCH)
Fireplace, Side of Open or Recessed Fireplace	36
Fireplace, Front of Recessed Fireplace	84
Coal and Wood Burning Stove	42
Kitchen Range Top	18
Oven	18
Vent Connector or Chimney Connector	18
Heating Duct Not Insulated	18
Hot Water Pipe Not Insulated	12
Side of Ceiling or Wall Warm Air Register	24
Front of Wall Mounted Warm Air Register	36
Water Heater, Furnace, or Boiler	6
Luminaire, Up to 250 Watts	6
Luminaire, 251 Watts Up to 499 Watts	12

AP103
SPRINKLER COVERAGE

AP103.1 General. The area of coverage of the residential sprinklers shall be based on the manufacturer's installation instruction. The minimum area of coverage shall be 12 feet by 12 feet for each sprinkler. The maximum area of coverage shall be 20 feet by 20 feet.

AP104
SPRINKLER HYDRAULIC DEMAND

AP104.1 General The hydraulic demand, flow rate and minimum pressure, for each sprinkler shall be based on the area of coverage as specified in the manufacturer's installation instructions.

AP104.2 Hydraulic requirements. Where more than one sprinkler is located in a room, the hydraulic demand for the multiple sprinklers shall be based on two sprinklers discharging. A room shall be considered a space surrounded by walls, windows, doors, or lintels that are 8 inches or more in height.

AP105
SPRINKLERS REQUIRED

AP105.1 General. Sprinklers shall be provided to protect all areas of the dwelling unit except those areas specified in Section AP105.2.

AP105.2 Sprinklers not required. Sprinklers shall not be required in the following areas:

1. Attics and unfinished basements
2. Crawl spaces and closets
3. Bathrooms and toilet rooms
4. Garages and car ports
5. Accessory buildings not having sleeping rooms
6. Balconies, Breezeways, and decks

AP106
SPRINKLER PIPING

AP106.1 General. The sprinkler piping shall conform to the requirements for cold water distribution piping. Sprinkler piping shall connect to and be a part of the cold water distribution piping system.

AP106.1.1 Pipe protection. CPVC pipe, PEX tubing, PEX-Al-PEX tubing, and PE-AL-PE tubing shall be protected from exposure to the living space by a layer of 3/8 inch thick gypsum wallboard, 1/4 inch thick plywood, or other material having a 15 minute fire rating. Protection of the pipe shall not be required in areas not required to be protected with sprinklers as specified in Section AP105.2.

Exception. Protection shall not be required where exposure is permitted by the third party certification.

AP106.2 Water filtration or treatment systems. An automatic bypass valve shall be installed on all connections of the water distribution system to water filters, water softener or other water treatment systems that are located between the water service and any sprinkler.

Exception. Where hydraulic calculations verify that an automatic bypass valve is not required.

AP106.3 Shutoff valve limitation. A shutoff valve shall be prohibited from being installed in the water piping system such that the valve only isolates the water supply to a sprinkler or sprinklers.

AP107
PRIVATE WELLS

AP107.1 General. Sprinkler systems supplied by private well shall conform to the requirements of Section AP107.2 through AP107.2.1.

AP107.2 Well pump rating. The pump for a private well shall be rated for a minimum flow required for the entire sprinkler system. The minimum pressure setting of the pump shall be used for sizing the water piping system.

AP107.2.1 Capacity. For a well system, any combination of well capacity and tank storage shall provide a flow of water at the maximum sprinkler flow rate for a period of 7 minutes for dwelling units 2000 square feet or less in area and 10 minutes for dwelling units in excess of 2000 square feet.

AP108
SYSTEM DESIGN FLOW

AP108.1 Determining system design flow. The flow for sizing the sprinkler piping system shall be based on the flow rating of each sprinkler in accordance with Section AP108.3 and the calculation in accordance with Section AP108.3.

AP108.2 Determining required flow rate for each sprinkler. The minimum required flow for each sprinkler shall be determined using the sprinkler manufacturer's published data for the specific sprinkler model based on all of the following:

1. The area of coverage
2. The ceiling configuration
3. The temperature rating
4. Any additional conditions specified by the sprinkler manufacturer.

AP108.3 System design flow rate. The design flow rate for the system shall be based on the following:

1. The design flow rate for a room having only one sprinkler shall be the flow rate required for that sprinkler, as determined by Section AP108.1.
2. The design flow rate for a room having two or more sprinklers a shall be determined by identifying the sprinkler in that room with the highest required flow rate, based on Section AP108.1, and multiplying that flow rate by 2.
3. Where the sprinkler manufacturer specifies different criteria for ceiling configurations that are not smooth, flat and horizontal, the required flow rate for that room shall comply with the sprinkler manufacturer's instructions.
4. The design flow rate for the sprinkler system shall be the flow required by the room with the largest flow rate, based on Items 1, 2 and 3.
5. For the purpose of this section, it shall be permissible to reduce the design flow rate for a room by subdividing the space into two or more rooms, where each room is evaluated separately with respect to the required design flow rate. Each room shall be bounded by walls and a ceiling. Openings in walls shall have a lintel not less than 8 inches in depth and each lintel shall form a solid barrier between the ceiling and the top of the opening.

AP109
PIPE SIZING

AP109.1 General The piping to sprinklers shall be sized for the flow required by Section AP108.3. The flow required to supply the plumbing fixtures shall not be required to be added to the sprinkler design flow.

AP109.2 Method of sizing pipe. Piping supplying sprinklers shall be sized using the prescriptive method in Sections AP109.3 or by hydraulic calculation in accordance with NFPA 13D. The minimum pipe size from the water supply source to any sprinkler shall be 3/4 inch nominal. Threaded adapter fittings at the point where sprinklers are attached to the piping shall be a minimum of ½ inch nominal.

AP109.3 Prescriptive pipe sizing method. Pipe shall be sized by determining the available pressure to offset friction loss in piping and identifying a piping material, diameter and length using the equation in Section AP109.3.1 and the procedure in Section AP109.3.2.

AP109.3.1 Available pressure equation. The pressure available to offset friction loss in the interior piping system (P_t) shall be determined in accordance with the Equation AP-1.

$$P_t = P_{sup} - PL_{svc} - PL_m - PL_d - PL_e - P_{sp} \qquad \textbf{(Equation AP-1)}$$

Where:

P_t	=	Pressure used in applying Tables AP109.2.1(4) through AP190.2.1(9).
P_{sup}	=	Pressure available from the water supply source.
PL_{svc}	=	Pressure loss in the water-service pipe.
PL_m	=	Pressure loss in the water meter.
PL_d	=	Pressure loss from devices other than the water meter.
PL_e	=	Pressure loss associated with changes in elevation.
P_{sp}	=	Maximum pressure required by a sprinkler

AP109.3.2 Calculation procedure. Determination of the required size for water distribution piping shall be in accordance with the following procedure:

Step 1 - Determine P_{sup}
Obtain the supply pressure that will be available from the water main from the water purveyor, or for an individual source, the available supply pressure. The pressure shall be the residual pressure available at the flow rate used when applying Table AP109.2.1 (1).

Step 2 – Determine PL_{svc}
Use Table AP109.2.1 (1) to determine the pressure loss in the water service pipe based on the selected size of the water service.

Step 3 – Determine PL_m
Use Table AP109.2.1 (2) to determine the pressure loss from the water meter. based on the selected water meter size.

Step 4 – Determine PL_d
Determine the pressure loss from devices, other than the water meter, installed in the piping system supplying sprinklers, such as pressure-reducing valves, backflow preventers, water softeners or water filters. Device pressure losses shall be based on the device manufacturer's specifications. The flow rate used to determine pressure loss shall

be the rate from Section AP108.3, except that 5 gpm shall be added where the device is installed in a water-service pipe that supplies more than one dwelling. As alternative to deducting pressure loss for a device, an automatic bypass valve shall be installed to divert flow around the device when a sprinkler activates.

Step 5 – Determine PL_e
Use Table AP109.2.1 (3) to determine the pressure loss associated with changes in elevation. The elevation used in applying the table shall be the difference between the elevation where the water source pressure was measured and the elevation of the highest sprinkler.

Step 6 – Determine P_{sp}
Determine the maximum pressure required by any individual sprinkler based on the flow rate from Section AP108.1. The required pressure is provided in the sprinkler manufacturer's published data for the specific sprinkler model based on the selected flow rate.

Step 7 – Calculate P_t
Using Equation AP-1, calculate the pressure available to offset friction loss in water-distribution piping between the service valve and the sprinklers.

Step 8 – Determine the maximum allowable pipe length
Use Tables AP109.2.1 (4) through AP109.2.1 (9) to select a material and size for water distribution piping. The piping material and size shall be acceptable if the developed length of pipe between the service valve the most remote sprinkler does not exceed the maximum allowable length specified by the applicable table. Interpolation of P_t between the tabular values shall be permitted.

The maximum allowable length of piping in Tables AP109.2.1 (4) through AP109.2.1 (9) incorporates an adjustment for pipe fittings, and no additional consideration of friction losses associated with pipe fittings shall be required.

AP110
SIGNS

AP110.1 Valve Sign. A sign shall be installed at the main shutoff valve to the water distribution system stating "Warning, the water system for this home supplies fire sprinklers that require certain flows and pressures to fight a fire. Devices that restrict the flow or decrease the pressure or automatically shut off the water to the fire sprinkler system, such as water softeners, filtration systems, and automatic shutoff valves, shall not be added to this system without a review of the fire sprinkler system by a fire protection specialist. Do not remove this sign."

TABLE AP109.2.1(1)
WATER SERVICE PRESSURE LOSS (PL_{SVC})[a, b]
(Underlining of table omitted for clarity)

Flow Rate[c]	3/4" Water Service Pressure Loss (psi)				1" Water Service Pressure Loss (psi)				1-1/4" Water Service Pressure Loss (psi)			
(gpm)	40' or less	41' to 75'	76' to 100'	101' to 150'	40' or less	41' to 75'	76' to 100'	101' to 150'	40' or less	41' to 75'	76' to 100'	101' to 150'
8	5.1	8.7	11.8	17.4	1.5	2.5	3.4	5.1	0.6	1.0	1.3	1.9
10	7.7	13.1	17.8	26.3	2.3	3.8	5.2	7.7	0.8	1.4	2.0	2.9
12	10.8	18.4	24.9	NP	3.2	5.4	7.3	10.7	1.2	2.0	2.7	4.0
14	14.4	24.5	NP	NP	4.2	7.1	9.6	14.3	1.6	2.7	3.6	5.4
16	18.4	NP	NP	NP	5.4	9.1	12.4	18.3	2.0	3.4	4.7	6.9
18	22.9	NP	NP	NP	6.7	11.4	15.4	22.7	2.5	4.3	5.8	8.6
20	27.8	NP	NP	NP	8.1	13.8	18.7	27.6	3.1	5.2	7.0	10.4
22	NP	NP	NP	NP	9.7	16.5	22.3	NP	3.7	6.2	8.4	12.4
24	NP	NP	NP	NP	11.4	19.3	26.2	NP	4.3	7.3	9.9	14.6
26	NP	NP	NP	NP	13.2	22.4	NP	NP	5.0	8.5	11.4	16.9
28	NP	NP	NP	NP	15.1	25.7	NP	NP	5.7	9.7	13.1	19.4
30	NP	NP	NP	NP	17.2	NP	NP	NP	6.5	11.0	14.9	22.0
32	NP	NP	NP	NP	19.4	NP	NP	NP	7.3	12.4	16.8	24.8
34	NP	NP	NP	NP	21.7	NP	NP	NP	8.2	13.9	18.8	NP
36	NP	NP	NP	NP	24.1	NP	NP	NP	9.1	15.4	20.9	NP

NP - Not permitted. Pressure loss exceeds reasonable limits

a. Values are applicable for underground piping materials listed in Table P2904.4 and are based on an SDR of 11 and a Hazen Williams C Factor of 150.
b. Values include the following length allowances for fittings: 25% length increase for actual lengths up to 100 feet and 15% length increase for actual lengths over 100 feet.
c. Flow rate from Section AP108.3. Add 5 gpm to the flow rate required by Section AP108.3 where the water-service pipe supplies more than one dwelling.

TABLE AP109.2.1 (2)
MINIMUM WATER METER PRESSURE LOSS (PL_m)[a]

FLOW RATE (GPM)[B]	5/8" METER PRESSURE LOSS (PSI)	3/4" METER PRESSURE LOSS (PSI)
8	2	1
10	3	1
12	4	1
14	5	2
16	7	3
18	9	4
20	11	4
22	NP	5
24	NP	5
26	NP	6
28	NP	6
30	NP	7
32	NP	7
34	NP	8
36	NP	8

NP - Not permitted unless the actual water meter pressure loss is known.
a. Table AP109.2.1(2) establishes conservative values for water meter pressure loss for installations where the water meter loss is unknown. Where the actual water meter pressure loss is known, P_m shall be the actual loss.
b. Flow rate from Section AP108.3. Add 5 gpm to the flow rate required by Section AP108.3 where the water-service pipe supplies more than one dwelling.

TABLE AP109.2.1 (3)
ELEVATION LOSS (PL_e)

ELEVATION (FEET)	PRESSURE LOSS (PSI)
5	2.2
10	4.4
15	6.5
20	8.7
25	10.9
30	13
35	15.2
40	17.4

TABLE AP109.2.1 (4)
ALLOWABLE PIPE LENGTH FOR ¾ INCH TYPE M COPPER WATER TUBING

Sprinkler Flow Rate[a] (gpm)	Water Distribution Size (inch)	Available Pressure - P_t (psi)									
		15	20	25	30	35	40	45	50	55	60
		Allowable Length of Pipe from Service Valve to Farthest Sprinkler-(feet)									
8	3/4	217	289	361	434	506	578	650	723	795	867
9	3/4	174	232	291	349	407	465	523	581	639	697
10	3/4	143	191	239	287	335	383	430	478	526	574
11	3/4	120	160	200	241	281	321	361	401	441	481
12	3/4	102	137	171	205	239	273	307	341	375	410
13	3/4	88	118	147	177	206	235	265	294	324	353
14	3/4	77	103	128	154	180	205	231	257	282	308
15	3/4	68	90	113	136	158	181	203	226	248	271
16	3/4	60	80	100	120	140	160	180	200	220	241
17	3/4	54	72	90	108	125	143	161	179	197	215
18	3/4	48	64	81	97	113	129	145	161	177	193
19	3/4	44	58	73	88	102	117	131	146	160	175
20	3/4	40	53	66	80	93	106	119	133	146	159
21	3/4	36	48	61	73	85	97	109	121	133	145
22	3/4	33	44	56	67	78	89	100	111	122	133
23	3/4	31	41	51	61	72	82	92	102	113	123
24	3/4	28	38	47	57	66	76	85	95	104	114
25	3/4	26	35	44	53	61	70	79	88	97	105
26	3/4	24	33	41	49	57	65	73	82	90	98
27	3/4	23	30	38	46	53	61	69	76	84	91
28	3/4	21	28	36	43	50	57	64	71	78	85
29	3/4	20	27	33	40	47	53	60	67	73	80
30	3/4	19	25	31	38	44	50	56	63	69	75
31	3/4	18	24	29	35	41	47	53	59	65	71
32	3/4	17	22	28	33	39	44	50	56	61	67
33	3/4	16	21	26	32	37	42	47	53	58	63
34	3/4	NP	20	25	30	35	40	45	50	55	60
35	3/4	NP	19	24	28	33	38	42	47	52	57
36	3/4	NP	18	22	27	31	36	40	45	49	54
37	3/4	NP	17	21	26	30	34	38	43	47	51
38	3/4	NP	16	20	24	28	32	36	40	45	49
39	3/4	NP	15	19	23	27	31	35	39	42	46
40	3/4	NP	NP	18	22	26	29	33	37	40	44

NP - Not permitted.

a. Flow rate from Section AP108.3.

TABLE AP109.2.1 (5)
ALLOWABLE PIPE LENGTH FOR 1 INCH TYPE M COPPER WATER TUBING

Sprinkler Flow Rate[a] (gpm)	Water Distribution Size (inch)	Available Pressure - P_t (psi)									
		15	20	25	30	35	40	45	50	55	60
		Allowable Length of Pipe from Service Valve to Farthest Sprinkler (feet)									
8	1	806	1075	1343	1612	1881	2149	2418	2687	2955	3224
9	1	648	864	1080	1296	1512	1728	1945	2161	2377	2593
10	1	533	711	889	1067	1245	1422	1600	1778	1956	2134
11	1	447	596	745	894	1043	1192	1341	1491	1640	1789
12	1	381	508	634	761	888	1015	1142	1269	1396	1523
13	1	328	438	547	657	766	875	985	1094	1204	1313
14	1	286	382	477	572	668	763	859	954	1049	1145
15	1	252	336	420	504	588	672	756	840	924	1008
16	1	224	298	373	447	522	596	671	745	820	894
17	1	200	266	333	400	466	533	600	666	733	799
18	1	180	240	300	360	420	479	539	599	659	719
19	1	163	217	271	325	380	434	488	542	597	651
20	1	148	197	247	296	345	395	444	493	543	592
21	1	135	180	225	270	315	360	406	451	496	541
22	1	124	165	207	248	289	331	372	413	455	496
23	1	114	152	190	228	267	305	343	381	419	457
24	1	106	141	176	211	246	282	317	352	387	422
25	1	98	131	163	196	228	261	294	326	359	392
26	1	91	121	152	182	212	243	273	304	334	364
27	1	85	113	142	170	198	226	255	283	311	340
28	1	79	106	132	159	185	212	238	265	291	318
29	1	74	99	124	149	174	198	223	248	273	298
30	1	70	93	116	140	163	186	210	233	256	280
31	1	66	88	110	132	153	175	197	219	241	263
32	1	62	83	103	124	145	165	186	207	227	248
33	1	59	78	98	117	137	156	176	195	215	234
34	1	55	74	92	111	129	148	166	185	203	222
35	1	53	70	88	105	123	140	158	175	193	210
36	1	50	66	83	100	116	133	150	166	183	199
37	1	47	63	79	95	111	126	142	158	174	190
38	1	45	60	75	90	105	120	135	150	165	181
39	1	43	57	72	86	100	115	129	143	158	172
40	1	41	55	68	82	96	109	123	137	150	164

a. Flow rate from Section AP108.3.

TABLE AP109.2.1 (6)
ALLOWABLE PIPE LENGTH FOR ¾ INCH CPVC PIPE

Sprinkler Flow Rate[a] (gpm)	Water Distribution Size (inch)	Available Pressure - P_t (psi)									
		15	20	25	30	35	40	45	50	55	60
		Allowable Length of Pipe from Service Valve to Farthest Sprinkler-(feet)									
8	3/4	348	465	581	697	813	929	1045	1161	1278	1394
9	3/4	280	374	467	560	654	747	841	934	1027	1121
10	3/4	231	307	384	461	538	615	692	769	845	922
11	3/4	193	258	322	387	451	515	580	644	709	773
12	3/4	165	219	274	329	384	439	494	549	603	658
13	3/4	142	189	237	284	331	378	426	473	520	568
14	3/4	124	165	206	247	289	330	371	412	454	495
15	3/4	109	145	182	218	254	290	327	363	399	436
16	3/4	97	129	161	193	226	258	290	322	354	387
17	3/4	86	115	144	173	202	230	259	288	317	346
18	3/4	78	104	130	155	181	207	233	259	285	311
19	3/4	70	94	117	141	164	188	211	234	258	281
20	3/4	64	85	107	128	149	171	192	213	235	256
21	3/4	58	78	97	117	136	156	175	195	214	234
22	3/4	54	71	89	107	125	143	161	179	197	214
23	3/4	49	66	82	99	115	132	148	165	181	198
24	3/4	46	61	76	91	107	122	137	152	167	183
25	3/4	42	56	71	85	99	113	127	141	155	169
26	3/4	39	52	66	79	92	105	118	131	144	157
27	3/4	37	49	61	73	86	98	110	122	135	147
28	3/4	34	46	57	69	80	92	103	114	126	137
29	3/4	32	43	54	64	75	86	96	107	118	129
30	3/4	30	40	50	60	70	81	91	101	111	121
31	3/4	28	38	47	57	66	76	85	95	104	114
32	3/4	27	36	45	54	63	71	80	89	98	107
33	3/4	25	34	42	51	59	68	76	84	93	101
34	3/4	24	32	40	48	56	64	72	80	88	96
35	3/4	23	30	38	45	53	61	68	76	83	91
36	3/4	22	29	36	43	50	57	65	72	79	86
37	3/4	20	27	34	41	48	55	61	68	75	82
38	3/4	20	26	33	39	46	52	59	65	72	78
39	3/4	19	25	31	37	43	50	56	62	68	74
40	3/4	18	24	30	35	41	47	53	59	65	71

a. Flow rate from Section AP108.3.

TABLE AP109.2.1 (7)
ALLOWABLE PIPE LENGTH FOR 1 INCH CPVC PIPE

Sprinkler Flow Rate[a] (gpm)	Water Distribution Size (inch)	Available Pressure - P_t (psi)									
		15	20	25	30	35	40	45	50	55	60
		Allowable Length of Pipe from Service Valve to Farthest Sprinkler (feet)									
8	1	1049	1398	1748	2098	2447	2797	3146	3496	3845	4195
9	1	843	1125	1406	1687	1968	2249	2530	2811	3093	3374
10	1	694	925	1157	1388	1619	1851	2082	2314	2545	2776
11	1	582	776	970	1164	1358	1552	1746	1940	2133	2327
12	1	495	660	826	991	1156	1321	1486	1651	1816	1981
13	1	427	570	712	854	997	1139	1281	1424	1566	1709
14	1	372	497	621	745	869	993	1117	1241	1366	1490
15	1	328	437	546	656	765	874	983	1093	1202	1311
16	1	291	388	485	582	679	776	873	970	1067	1164
17	1	260	347	433	520	607	693	780	867	954	1040
18	1	234	312	390	468	546	624	702	780	858	936
19	1	212	282	353	423	494	565	635	706	776	847
20	1	193	257	321	385	449	513	578	642	706	770
21	1	176	235	293	352	410	469	528	586	645	704
22	1	161	215	269	323	377	430	484	538	592	646
23	1	149	198	248	297	347	396	446	496	545	595
24	1	137	183	229	275	321	366	412	458	504	550
25	1	127	170	212	255	297	340	382	425	467	510
26	1	118	158	197	237	276	316	355	395	434	474
27	1	111	147	184	221	258	295	332	368	405	442
28	1	103	138	172	207	241	275	310	344	379	413
29	1	97	129	161	194	226	258	290	323	355	387
30	1	91	121	152	182	212	242	273	303	333	364
31	1	86	114	143	171	200	228	257	285	314	342
32	1	81	108	134	161	188	215	242	269	296	323
33	1	76	102	127	152	178	203	229	254	280	305
34	1	72	96	120	144	168	192	216	240	265	289
35	1	68	91	114	137	160	182	205	228	251	273
36	1	65	87	108	130	151	173	195	216	238	260
37	1	62	82	103	123	144	165	185	206	226	247
38	1	59	78	98	117	137	157	176	196	215	235
39	1	56	75	93	112	131	149	168	187	205	224
40	1	53	71	89	107	125	142	160	178	196	214

a. Flow rate from Section AP108.3.

TABLE AP109.2.1 (8)
ALLOWABLE PIPE LENGTH FOR ¾ INCH PEX TUBING

Sprinkler Flow Rate[a] (gpm)	Water Distribution Size (inch)	Available Pressure - P_t (psi)									
		15	20	25	30	35	40	45	50	55	60
		Allowable Length of Pipe from Service Valve to Farthest Sprinkler-(feet)									
8	3/4	93	123	154	185	216	247	278	309	339	370
9	3/4	74	99	124	149	174	199	223	248	273	298
10	3/4	61	82	102	123	143	163	184	204	225	245
11	3/4	51	68	86	103	120	137	154	171	188	205
12	3/4	44	58	73	87	102	117	131	146	160	175
13	3/4	38	50	63	75	88	101	113	126	138	151
14	3/4	33	44	55	66	77	88	99	110	121	132
15	3/4	29	39	48	58	68	77	87	96	106	116
16	3/4	26	34	43	51	60	68	77	86	94	103
17	3/4	23	31	38	46	54	61	69	77	84	92
18	3/4	21	28	34	41	48	55	62	69	76	83
19	3/4	19	25	31	37	44	50	56	62	69	75
20	3/4	17	23	28	34	40	45	51	57	62	68
21	3/4	16	21	26	31	36	41	47	52	57	62
22	3/4	NP	19	24	28	33	38	43	47	52	57
23	3/4	NP	17	22	26	31	35	39	44	48	52
24	3/4	NP	16	20	24	28	32	36	40	44	49
25	3/4	NP	NP	19	22	26	30	34	37	41	45
26	3/4	NP	NP	17	21	24	28	31	35	38	42
27	3/4	NP	NP	16	20	23	26	29	33	36	39
28	3/4	NP	NP	15	18	21	24	27	30	33	36
29	3/4	NP	NP	NP	17	20	23	26	28	31	34
30	3/4	NP	NP	NP	16	19	21	24	27	29	32
31	3/4	NP	NP	NP	15	18	20	23	25	28	30
32	3/4	NP	NP	NP	NP	17	19	21	24	26	28
33	3/4	NP	NP	NP	NP	16	18	20	22	25	27
34	3/4	NP	NP	NP	NP	NP	17	19	21	23	25
35	3/4	NP	NP	NP	NP	NP	16	18	20	22	24
36	3/4	NP	NP	NP	NP	NP	15	17	19	21	23
37	3/4	NP	NP	NP	NP	NP	NP	16	18	20	22
38	3/4	NP	NP	NP	NP	NP	NP	16	17	19	21
39	3/4	NP	NP	NP	NP	NP	NP	NP	16	18	20
40	3/4	NP	NP	NP	NP	NP	NP	NP	16	17	19

NP - Not permitted.

a. Flow rate from Section AP108.3.

TABLE AP109.2.1 (9)
ALLOWABLE PIPE LENGTH FOR 1 INCH PEX TUBING

Sprinkler Flow Rate[a] (gpm)	Water Distribution Size (inch)	Available Pressure - P_t (psi)									
		15	20	25	30	35	40	45	50	55	60
		Allowable Length of Pipe from Service Valve to Farthest Sprinkler-(feet)									
8	1	314	418	523	628	732	837	941	1046	1151	1255
9	1	252	336	421	505	589	673	757	841	925	1009
10	1	208	277	346	415	485	554	623	692	761	831
11	1	174	232	290	348	406	464	522	580	638	696
12	1	148	198	247	296	346	395	445	494	543	593
13	1	128	170	213	256	298	341	383	426	469	511
14	1	111	149	186	223	260	297	334	371	409	446
15	1	98	131	163	196	229	262	294	327	360	392
16	1	87	116	145	174	203	232	261	290	319	348
17	1	78	104	130	156	182	208	233	259	285	311
18	1	70	93	117	140	163	187	210	233	257	280
19	1	63	84	106	127	148	169	190	211	232	253
20	1	58	77	96	115	134	154	173	192	211	230
21	1	53	70	88	105	123	140	158	175	193	211
22	1	48	64	80	97	113	129	145	161	177	193
23	1	44	59	74	89	104	119	133	148	163	178
24	1	41	55	69	82	96	110	123	137	151	164
25	1	38	51	64	76	89	102	114	127	140	152
26	1	35	47	59	71	83	95	106	118	130	142
27	1	33	44	55	66	77	88	99	110	121	132
28	1	31	41	52	62	72	82	93	103	113	124
29	1	29	39	48	58	68	77	87	97	106	116
30	1	27	36	45	54	63	73	82	91	100	109
31	1	26	34	43	51	60	68	77	85	94	102
32	1	24	32	40	48	56	64	72	80	89	97
33	1	23	30	38	46	53	61	68	76	84	91
34	1	22	29	36	43	50	58	65	72	79	86
35	1	20	27	34	41	48	55	61	68	75	82
36	1	19	26	32	39	45	52	58	65	71	78
37	1	18	25	31	37	43	49	55	62	68	74
38	1	18	23	29	35	41	47	53	59	64	70
39	1	17	22	28	33	39	45	50	56	61	67
40	1	16	21	27	32	37	43	48	53	59	64

a. Flow rate from Section AP108.3.

Reason: The exceptions included in this proposal are reasonable allowances for consideration by the IRC Committee and the ICC Membership, should sprinklers be installed in accordance with the proposed prescriptive sprinkler system provisions or NFPA 13D and do not result in a reduction to occupant safety. Several of these exceptions are similar in methodology to other trade exceptions offered in structures that are equipped with an automatic sprinkler system. Some of the proposed exceptions are referenced in other codes that may not have been adopted by the jurisdiction, therefore it is important that they be included in the IRC Appendix P as possible trade exceptions. Below is a list and supporting information for each proposed trade exception;

AP111.1 This proposal exception would allow for the reduction in the fire separation distance between dwellings, require that the 1 hour rating of the exterior wall to be limited to the outside exposed wall. This proposal would also allow one- and two-family dwelling, equipped with an automatic sprinkler system, to be built without a rated exterior wall and unlimited openings up to the property, provided there is setback of a minimum 6 feet. When a dwelling unit is equipped with an automatic sprinkler system most fires can be controlled by one or two sprinklers, thereby reducing the concern about heat exposure from one dwelling to another.

AP111.2 Emergency escape and rescue openings are required by the code to allow a secondary exit should the primary escape route is blocked. As stated above, the automatic sprinkler system is designed to provide an increased level of safety for the occupant by controlling or suppressing the fire. Similar exceptions are already provided in the International Building Code and Life Safety Code to other R occupancies when the structure is equipped with an approved automatic sprinkler system.

AP111.3 The purpose of the smoke alarm system is to provide the occupant enough time to escape the dwelling upon notification of a fire. Dwellings that are equipped with an automatic sprinkler system should be permitted to reduce the number of smoke alarms required in the dwelling, since they increase the amount of time the occupant has to vacate the dwelling by controlling and sometimes extinguishing the fire.

AP111.4 The IRC Commentary explains that Arc-Fault receptacles are required to reduce the number of fires that are associated with electrical arcs. Based on information provided in reports published by the National Fire Protection Association prior to the code requiring arc-fault protection, the number of fires who's origin was based on an electrical distribution and lighting failure or malfunction accounted for 3% of all residential structure fires and caused the least number of fire fatalities.

AP112 When the sizing of the water meter and distribution line must be increased to accommodate an automatic sprinkler system, the fees assessed by the water purveyor should be based solely on the size meter and distribution lines that would be required to meet the domestic potable demand. Unless the sprinkler is activated, there is no increase in the amount of water consumed by the dwelling. Consumers should not be charged higher rates or fees, just because the sprinkler system design required the distribution system to be increased.

AP113.2 The purpose of this proposal is to follow a precedence that has been established in the *International Residential Code* when referencing another code. The *International Fire Code* allow the Authority Having Jurisdiction to reduce the required fire flow rate by 50 percent when the dwelling is provided with an approved sprinkler system.

AP113.3 Would allow greater distances between fire hydrants in residential developments where all dwellings are equipped with an automatic sprinkler system in accordance with Appendix P. Both the *Uniform fire Code* and the *Urban- Wildland Interface Code* allow for increase to the fire hydrant spacing when all dwelling units in a development are equipped with an automatic sprinkler system. The spacing increase to 1,000 feet would still meet the UFC requirement for response to vehicular accidents and the WUIC requirement for maximum distance to a water source.

AP113.4 This proposed exception would allow for the increase the number of dwelling units allowed before requiring a secondary fire apparatus access road and would allow for the reduction of the access road to less than 20 feet when all the dwellings are equipped with an approved automatic sprinkler system. The *International Fire Code* allows for a single fire apparatus access road for developments that are equipped with an automatic sprinkler system and some jurisdictions have allowed for narrower roads as an exception when dwellings are sprinklered.

Cost Impact: The code change proposal will increase the cost of construction.

Public Hearing:	Committee:	AS	AM	D
	Assembly:	ASF	AMF	DF

RB71–07/08

R313, R313.1.1 (New), R313.1.2 (New), R313.1.3 (New), Chapter 43 (New)

Proponent: Roger R. Evans, Park City Municipal Corporation, representing Utah Chapter of ICC

1. Revise section title as follows:

SECTION R313
~~SMOKE~~ ALARMS

2. Add new text as follows:

R313.1.1 Carbon monoxide alarms. In new construction, dwelling units within which fuel-fired appliances are installed shall be provided with an approved carbon monoxide alarm installed outside of each separate sleeping area in the immediate vicinity of the bedroom(s).

R313.1.2 Where required-existing dwellings. In existing dwellings, where interior alterations, repairs, fuel-fired appliance replacements of additions requiring a permit occur, or where one or more sleeping rooms are added or created, carbon monoxide alarms shall be provided in accordance with Section 313.1.1.

R313.1.3 Alarm requirements. The required carbon monoxide alarms shall be clearly audible in all bedrooms over background noise levels with all intervening doors closed. Carbon monoxide alarms shall be listed as complying with UL 2034 and shall be installed in accordance with this code and the manufacturer's installation instructions.

(Renumber subsequent sections)

3. Add standard to Chapter 43 as follows:

UL

2034-96 Standard for Single and Multiple Station Carbon Monoxide Alarms

Reason: According to the Journal of the American Medical Association (JAMA), carbon monoxide is the leading cause of accidental poisoning deaths in America. Over 1,500 people die annually due to accidental carbon monoxide exposure and an additional 10,000 seek medical attention. www.homesafe.com

Cost Impact: The code change proposal will increase the cost of construction from between $50.00 to $300.00 per dwelling unit.

Analysis: The standard proposed for inclusion in the code, UL 2034, complies with ICC criteria for referenced standards given in Section 3.6 of Council Policy #CP 28.

Public Hearing:	Committee:	AS	AM	D
	Assembly:	ASF	AMF	DF

RP3–07/08
P2904 (New), Chapter 43 (New)

Proponent: Tom Lariviere, Fire Department, Madison, MS, representing Fire & Life Safety Section of the International Association of Fire Chiefs (IAFC)

1. Add new section as follows:

SECTION P2904
MULTIPURPOSE FIRE SPRINKLER SYSTEMS

P2904.1 General. A multipurpose fire sprinkler system shall provide domestic water to both fire sprinklers and plumbing fixtures and shall be in accordance with NFPA 13D or Section P2904. Section P2904 shall be considered equivalent to NFPA 13D.

P2904.1.1 Required sprinkler locations. Sprinklers shall be installed to protect all areas of a dwelling unit.

Exceptions:

1. Attics, crawl spaces, and normally unoccupied concealed spaces that do not contain fuel-fired appliances do not require sprinklers. In attics, crawl spaces, and normally unoccupied concealed spaces that contain fuel-fired equipment, a sprinkler shall be provided above the equipment; however, sprinklers shall not be required in the remainder of the space.
2. Clothes closets, linen closets and pantries not exceeding 24 square feet in area, with the smallest dimension not greater than 3 feet and having wall and ceiling surfaces of gypsum board.
3. Bathrooms not greater than 55 square feet in area.
4. Garages; carports; exterior porches; unheated entry areas, such as mud rooms, that are adjacent to an exterior door; and similar areas.

P2904.2 Sprinklers. Sprinklers shall be listed residential sprinklers and shall be installed in accordance with the sprinkler manufacturer's installation instructions.

P2904.2.1 Temperature rating and separation from heat sources. Except as provided for in Section P2904.2.2, sprinklers shall have a temperature rating of not less than 135°F and not more than 170°F. Sprinklers shall be separated from heat sources as required by the sprinkler manufacturer's installation instructions.

P2904.2.2 Intermediate temperature sprinklers. Sprinklers shall have an intermediate temperature rating not less than 175°F and not more than 225°F where installed in the following locations:

1. Directly under skylights, where the sprinkler is exposed to direct sunlight.
2. In attics.
3. In concealed spaces located directly beneath a roof.
4. Within the distance to a heat source as specified in Table P2904.2.2

TABLE P2904.2.2
LOCATIONS WHERE INTERMEDIATE TEMPERATURE SPRINKLERS ARE REQUIRED

HEAT SOURCE	RANGE OF DISTANCE FROM HEAT SOURCE WITHIN WHICH INTERMEDIATE TEMPERATURE SPRINKLERS ARE REQUIRED [a,b] (inches)
Fireplace, Side of Open or Recessed Fireplace	12 to 36
Fireplace, Front of Recessed Fireplace	36 to 60
Coal and Wood Burning Stove	12 to 42
Kitchen Range Top	9 to 18
Oven	9 to 18
Vent Connector or Chimney Connector	9 to 18
~~Heating Duct, Not Insulated~~	~~9 to 18~~

2. Pipe protection shall not be required where exposed piping is permitted by the pipe listing.

P2904.3.2 Shutoff valves prohibited. With the exception of shutoff valves for the entire water distribution system, valves shall not be installed in any location where the valve would isolate piping serving one or more sprinklers.

P2904.3.3 Single dwelling limit. Piping beyond the service valve located at the beginning of the water distribution system shall not serve more than one dwelling.

P2904.4 Determining system design flow. The flow for sizing the sprinkler piping system shall be based on the flow rating of each sprinkler in accordance with Section P2904.4.1 and the calculation in accordance with Section P2904.4.2.

P2904.4.1 Determining required flow rate for each sprinkler. The minimum required flow for each sprinkler shall be determined using the sprinkler manufacturer's published data for the specific sprinkler model based on all of the following:

1. The area of coverage
2. The ceiling configuration
3. The temperature rating
4. Any additional conditions specified by the sprinkler manufacturer.

P2904.4.2 System design flow rate. The design flow rate for the system shall be based on the following:

1. The design flow rate for a room having only one sprinkler shall be the flow rate required for that sprinkler, as determined by Section P2904.4.1.
2. The design flow rate for a room having two or more sprinklers a shall be determined by identifying the sprinkler in that room with the highest required flow rate, based on Section P2904.4.1, and multiplying that flow rate by 2.
3. Where the sprinkler manufacturer specifies different criteria for ceiling configurations that are not smooth, flat and horizontal, the required flow rate for that room shall comply with the sprinkler manufacturer's instructions.
4. The design flow rate for the sprinkler system shall be the flow required by the room with the largest flow rate, based on Items 1, 2 and 3.
5. For the purpose of this section, it shall be permissible to reduce the design flow rate for a room by subdividing the space into two or more rooms, where each room is evaluated separately with respect to the required design flow rate. Each room shall be bounded by walls and a ceiling. Openings in walls shall have a lintel not less than 8 inches in depth and each lintel shall form a solid barrier between the ceiling and the top of the opening.

P2904.5 Water supply. The water supply shall provide not less than the required design flow rate for sprinklers in accordance with Section P2904.4.2 at a pressure not less than that used to comply with Section P2904.6.

P2904.5.1 Water supply from individual sources. Where a dwelling unit water supply is from a tank system, a private well system, or a combination of these, the available water supply shall be based on the minimum pressure control setting for the pump.

P2904.5.2. Required capacity. The water supply shall have the capacity to provide the required design flow rate for sprinklers for a period of time as follows:

1. 7 minutes for dwelling units less than 2,000 square feet in area
2. 10 minutes for dwelling units equal to or greater than 2,000 square feet in area.

Where a well system, a water supply tank system, or a combination thereof, is used, any combination of well capacity and tank storage shall be permitted to meet the capacity requirement.

P2904.6 Pipe sizing. The piping to sprinklers shall be sized for the flow required by Section P2904.4.2. The flow required to supply the plumbing fixtures shall not be required to be added to the sprinkler design flow.

P2904.6.1 Method of sizing pipe. Piping supplying sprinklers shall be sized using the prescriptive method in Sections P2904.6.2 or by hydraulic calculation in accordance with NFPA 13D. The minimum pipe size from the water supply source to any sprinkler shall be 3/4 inch nominal. Threaded adapter fittings at the point where sprinklers are attached to the piping shall be a minimum of ½ inch nominal.

P2904.6.2 Prescriptive pipe sizing method. Pipe shall be sized by determining the available pressure to offset friction loss in piping and identifying a piping material, diameter and length using the equation in Section P2904.6.2.1 and the procedure in Section P2904.6.2.2.

P2904.6.2.1 Available pressure equation. The pressure available to offset friction loss in the interior piping system (P_t) shall be determined in accordance with the Equation 29-1.

$$P_t = P_{sup} - PL_{svc} - PL_m - PL_d - PL_e - P_{sp} \quad \textbf{(Equation 29-1)}$$

Where:

P_t = Pressure used in applying Tables P2904.6.2(4) through P2904.6.2(9).
P_{sup} = Pressure available from the water supply source.
PL_{svc} = Pressure loss in the water-service pipe.
PL_m = Pressure loss in the water meter.
PL_d = Pressure loss from devices other than the water meter.
PL_e = Pressure loss associated with changes in elevation.
P_{sp} = Maximum pressure required by a sprinkler

2904.6.2.2 Calculation procedure. Determination of the required size for water distribution piping shall be in accordance with the following procedure:

Step 1 - Determine P_{sup}
Obtain the supply pressure that will be available from the water main from the water purveyor, or for an individual source, the available supply pressure shall be in accordance with Section P2904.5.1. The pressure shall be the residual pressure available at the flow rate used when applying Table P2904.6.2(1).

Step 2 – Determine PL_{svc}
Use Table P2904.6.2(1) to determine the pressure loss in the water service pipe based on the selected size of the water service.

Step 3 – Determine PL_m
Use Table P2904.6.2(2) to determine the pressure loss from the water meter. based on the selected water meter size.

Step 4 – Determine PL_d
Determine the pressure loss from devices, other than the water meter, installed in the piping system supplying sprinklers, such as pressure-reducing valves, backflow preventers, water softeners or water filters. Device pressure losses shall be based on the device manufacturer's specifications. The flow rate used to determine pressure loss shall be the rate from Section P2904.4.2, except that 5 gpm shall be added where the device is installed in a water-service pipe that supplies more than one dwelling. As alternative to deducting pressure loss for a device, an automatic bypass valve shall be installed to divert flow around the device when a sprinkler activates.

Step 5 – Determine PL_e
Use Table P2904.6.2(3) to determine the pressure loss associated with changes in elevation. The elevation used in applying the table shall be the difference between the elevation where the water source pressure was measured and the elevation of the highest sprinkler.

Step 6 – Determine P_{sp}
Determine the maximum pressure required by any individual sprinkler based on the flow rate from Section P2904.4.1. The required pressure is provided in the sprinkler manufacturer's published data for the specific sprinkler model based on the selected flow rate.

Step 7 – Calculate P_t
Using Equation 29-1, calculate the pressure available to offset friction loss in water-distribution piping between the service valve and the sprinklers.

Step 8 – Determine the maximum allowable pipe length

Use Tables P2904.6.2(4) through P2904.6.2(9) to select a material and size for water distribution piping. The piping material and size shall be acceptable if the developed length of pipe between the service valve the most remote sprinkler does not exceed the maximum allowable length specified by the applicable table. Interpolation of P_t between the tabular values shall be permitted.

The maximum allowable length of piping in Tables P2904.6.2(4) through P2904.6.2(9) incorporates an adjustment for pipe fittings, and no additional consideration of friction losses associated with pipe fittings shall be required.

P2904.7 Instructions and signs. An owner's manual for the fire sprinkler system shall be provided to the owner. A sign or valve tag shall be installed at the main shutoff valve to the water distribution system stating the following: "Warning, the water system for this home supplies fire sprinklers that require certain flows and pressures to fight a fire. Devices that restrict the flow or decrease the pressure or automatically shut off the water to the fire sprinkler system, such as water softeners, filtration systems, and automatic shutoff valves, shall not be added to this system without a review of the fire sprinkler system by a fire protection specialist. Do not remove this sign."

P2904.8 Inspections. The water distribution system shall be inspected in accordance with Sections P2904.8.1 and P2904.8.2.

P2904.8.1 Pre-concealment Inspection. The following items shall be verified prior to the concealment of any sprinkler system piping:

1. Sprinklers are installed in all areas as required by Section P2904.1.1.
2. Where sprinkler water spray patterns are obstructed by construction features, luminaires or ceiling fans, additional sprinklers are installed as required by Section P2904.2.4.2.
3. Sprinklers are the correct temperature rating and are installed at or beyond the required separation distances from heat sources as required by Sections P2904.2.1 and P2904.2.2.
4. The pipe size equals or exceeds the size used in applying Tables P2904.6.2(4) through P2904.6.2(9) or, if the piping system was hydraulically calculated in accordance with Section P2904.6.1, the size used in the hydraulic calculation.
5. The pipe length does not exceed the length permitted by Tables P2904.6.2(4) through P2904.6.2(9) or, if the piping system was hydraulically calculated in accordance with Section P2904.6.1, pipe lengths and fittings do not exceed those used in the hydraulic calculation.
6. Non-metallic piping that conveys water to sprinklers is listed for use with fire sprinklers.
7. Piping is supported in accordance with the pipe manufacturer's and sprinkler manufacturer's installation instructions.
8. The piping system is tested in accordance with Section P2503.6

P2904.8.2 Final Inspection. The following items shall be verified upon completion of the system:

1. Sprinkler are not painted, damaged or otherwise hindered from operation.
2. Where a pump is required to provide water to the system, the pump starts automatically upon system water demand.
3. Pressure reducing valves, water softeners, water filters or other impairments to water flow that were not part of the original design have not been installed.
4. The sign or valve tag required by Section P2904.7 is installed and the owner's manual for the system is present.

TABLE P2904.6.2(1)
WATER SERVICE PRESSURE LOSS (PL_{SVC})[a, b]
(Underlining of table omitted for clarity)

Flow Rate[c]	3/4" Water Service Pressure Loss (psi)				1" Water Service Pressure Loss (psi)				1-1/4" Water Service Pressure Loss (psi)			
(gpm)	40' or less	41' to 75'	76' to 100'	101' to 150'	40' or less	41' to 75'	76' to 100'	101' to 150'	40' or less	41' to 75'	76' to 100'	101' to 150'
8	5.1	8.7	11.8	17.4	1.5	2.5	3.4	5.1	0.6	1.0	1.3	1.9
10	7.7	13.1	17.8	26.3	2.3	3.8	5.2	7.7	0.8	1.4	2.0	2.9
12	10.8	18.4	24.9	NP	3.2	5.4	7.3	10.7	1.2	2.0	2.7	4.0
14	14.4	24.5	NP	NP	4.2	7.1	9.6	14.3	1.6	2.7	3.6	5.4
16	18.4	NP	NP	NP	5.4	9.1	12.4	18.3	2.0	3.4	4.7	6.9
18	22.9	NP	NP	NP	6.7	11.4	15.4	22.7	2.5	4.3	5.8	8.6
20	27.8	NP	NP	NP	8.1	13.8	18.7	27.6	3.1	5.2	7.0	10.4
22	NP	NP	NP	NP	9.7	16.5	22.3	NP	3.7	6.2	8.4	12.4
24	NP	NP	NP	NP	11.4	19.3	26.2	NP	4.3	7.3	9.9	14.6
26	NP	NP	NP	NP	13.2	22.4	NP	NP	5.0	8.5	11.4	16.9
28	NP	NP	NP	NP	15.1	25.7	NP	NP	5.7	9.7	13.1	19.4
30	NP	NP	NP	NP	17.2	NP	NP	NP	6.5	11.0	14.9	22.0
32	NP	NP	NP	NP	19.4	NP	NP	NP	7.3	12.4	16.8	24.8
34	NP	NP	NP	NP	21.7	NP	NP	NP	8.2	13.9	18.8	NP
36	NP	NP	NP	NP	24.1	NP	NP	NP	9.1	15.4	20.9	NP

NP - Not permitted. Pressure loss exceeds reasonable limits

a. Values are applicable for underground piping materials listed in Table P2904.4 and are based on an SDR of 11 and a Hazen Williams C Factor of 150.

b. Values include the following length allowances for fittings: 25% length increase for actual lengths up to 100 feet and 15% length increase for actual lengths over 100 feet.

c. Flow rate from Section P2904.4.2. Add 5 gpm to the flow rate required by Section P2904.4.2 where the water-service pipe supplies more than one dwelling.

TABLE P2904.6.2(2)
MINIMUM WATER METER PRESSURE LOSS (PL_M)[A]

FLOW RATE (GPM)[B]	5/8" METER PRESSURE LOSS (PSI)	3/4" METER PRESSURE LOSS (PSI)
8	2	1
10	3	1
12	4	1
14	5	2
16	7	3
18	9	4
20	11	4
22	NP	5
24	NP	5
26	NP	6
28	NP	6
30	NP	7
32	NP	7
34	NP	8
36	NP	8

NP - Not permitted unless the actual water meter pressure loss is known.

a. Table 2904.6.2(2) establishes conservative values for water meter pressure loss or installations where the water meter loss is unknown. Where the actual water meter pressure loss is known, P_m shall be the actual loss.

b. Flow rate from Section P2904.4.2. Add 5 gpm to the flow rate required by Section P2904.4.2 where the water-service pipe supplies more than one dwelling.

TABLE P2904.6.2(3)
ELEVATION LOSS (PL_E)

ELEVATION (FEET)	PRESSURE LOSS (PSI)
5	2.2
10	4.4
15	6.5
20	8.7
25	10.9
30	13
35	15.2
40	17.4

TABLE P2904.6.2(4)
ALLOWABLE PIPE LENGTH FOR ¾ INCH TYPE M COPPER WATER TUBING
(Underlining of table omitted for clarity)

Sprinkler Flow Rate[a] (gpm)	Water Distribution Size (inch)	Available Pressure - P_t (psi)									
		15	20	25	30	35	40	45	50	55	60
		Allowable Length of Pipe from Service Valve to Farthest Sprinkler-(feet)									
8	3/4	217	289	361	434	506	578	650	723	795	867
9	3/4	174	232	291	349	407	465	523	581	639	697
10	3/4	143	191	239	287	335	383	430	478	526	574
11	3/4	120	160	200	241	281	321	361	401	441	481
12	3/4	102	137	171	205	239	273	307	341	375	410
13	3/4	88	118	147	177	206	235	265	294	324	353
14	3/4	77	103	128	154	180	205	231	257	282	308
15	3/4	68	90	113	136	158	181	203	226	248	271
16	3/4	60	80	100	120	140	160	180	200	220	241
17	3/4	54	72	90	108	125	143	161	179	197	215
18	3/4	48	64	81	97	113	129	145	161	177	193
19	3/4	44	58	73	88	102	117	131	146	160	175
20	3/4	40	53	66	80	93	106	119	133	146	159
21	3/4	36	48	61	73	85	97	109	121	133	145
22	3/4	33	44	56	67	78	89	100	111	122	133
23	3/4	31	41	51	61	72	82	92	102	113	123
24	3/4	28	38	47	57	66	76	85	95	104	114
25	3/4	26	35	44	53	61	70	79	88	97	105
26	3/4	24	33	41	49	57	65	73	82	90	98
27	3/4	23	30	38	46	53	61	69	76	84	91
28	3/4	21	28	36	43	50	57	64	71	78	85
29	3/4	20	27	33	40	47	53	60	67	73	80
30	3/4	19	25	31	38	44	50	56	63	69	75
31	3/4	18	24	29	35	41	47	53	59	65	71
32	3/4	17	22	28	33	39	44	50	56	61	67
33	3/4	16	21	26	32	37	42	47	53	58	63
34	3/4	NP	20	25	30	35	40	45	50	55	60
35	3/4	NP	19	24	28	33	38	42	47	52	57
36	3/4	NP	18	22	27	31	36	40	45	49	54
37	3/4	NP	17	21	26	30	34	38	43	47	51
38	3/4	NP	16	20	24	28	32	36	40	45	49
39	3/4	NP	15	19	23	27	31	35	39	42	46
40	3/4	NP	NP	18	22	26	29	33	37	40	44

NP - Not permitted

a. Flow rate from Section P2904.4.2

TABLE P2904.6.2(5)
ALLOWABLE PIPE LENGTH FOR 1 INCH TYPE M COPPER WATER TUBING
(Underlining of table omitted for clarity)

Sprinkler Flow Rate[a] (gpm)	Water Distribution Size (inch)	Available Pressure - P_t (psi)									
		15	20	25	30	35	40	45	50	55	60
		Allowable Length of Pipe from Service Valve to Farthest Sprinkler (feet)									
8	1	806	1075	1343	1612	1881	2149	2418	2687	2955	3224
9	1	648	864	1080	1296	1512	1728	1945	2161	2377	2593
10	1	533	711	889	1067	1245	1422	1600	1778	1956	2134
11	1	447	596	745	894	1043	1192	1341	1491	1640	1789
12	1	381	508	634	761	888	1015	1142	1269	1396	1523
13	1	328	438	547	657	766	875	985	1094	1204	1313
14	1	286	382	477	572	668	763	859	954	1049	1145
15	1	252	336	420	504	588	672	756	840	924	1008
16	1	224	298	373	447	522	596	671	745	820	894
17	1	200	266	333	400	466	533	600	666	733	799
18	1	180	240	300	360	420	479	539	599	659	719
19	1	163	217	271	325	380	434	488	542	597	651
20	1	148	197	247	296	345	395	444	493	543	592
21	1	135	180	225	270	315	360	406	451	496	541
22	1	124	165	207	248	289	331	372	413	455	496
23	1	114	152	190	228	267	305	343	381	419	457
24	1	106	141	176	211	246	282	317	352	387	422
25	1	98	131	163	196	228	261	294	326	359	392
26	1	91	121	152	182	212	243	273	304	334	364
27	1	85	113	142	170	198	226	255	283	311	340
28	1	79	106	132	159	185	212	238	265	291	318
29	1	74	99	124	149	174	198	223	248	273	298
30	1	70	93	116	140	163	186	210	233	256	280
31	1	66	88	110	132	153	175	197	219	241	263
32	1	62	83	103	124	145	165	186	207	227	248
33	1	59	78	98	117	137	156	176	195	215	234
34	1	55	74	92	111	129	148	166	185	203	222
35	1	53	70	88	105	123	140	158	175	193	210
36	1	50	66	83	100	116	133	150	166	183	199
37	1	47	63	79	95	111	126	142	158	174	190
38	1	45	60	75	90	105	120	135	150	165	181
39	1	43	57	72	86	100	115	129	143	158	172
40	1	41	55	68	82	96	109	123	137	150	164

a. Flow rate from Section P2904.4.2

TABLE P2904.6.2(6)
ALLOWABLE PIPE LENGTH FOR ¾ INCH CPVC PIPE
(Underling of table omitted for clarity)

Sprinkler Flow Rate[a] (gpm)	Water Distribution Size (inch)	Available Pressure - P_t (psi)									
		15	20	25	30	35	40	45	50	55	60
		Allowable Length of Pipe from Service Valve to Farthest Sprinkler-(feet)									
8	3/4	348	465	581	697	813	929	1045	1161	1278	1394
9	3/4	280	374	467	560	654	747	841	934	1027	1121
10	3/4	231	307	384	461	538	615	692	769	845	922
11	3/4	193	258	322	387	451	515	580	644	709	773
12	3/4	165	219	274	329	384	439	494	549	603	658
13	3/4	142	189	237	284	331	378	426	473	520	568
14	3/4	124	165	206	247	289	330	371	412	454	495
15	3/4	109	145	182	218	254	290	327	363	399	436
16	3/4	97	129	161	193	226	258	290	322	354	387
17	3/4	86	115	144	173	202	230	259	288	317	346
18	3/4	78	104	130	155	181	207	233	259	285	311
19	3/4	70	94	117	141	164	188	211	234	258	281
20	3/4	64	85	107	128	149	171	192	213	235	256
21	3/4	58	78	97	117	136	156	175	195	214	234
22	3/4	54	71	89	107	125	143	161	179	197	214
23	3/4	49	66	82	99	115	132	148	165	181	198
24	3/4	46	61	76	91	107	122	137	152	167	183
25	3/4	42	56	71	85	99	113	127	141	155	169
26	3/4	39	52	66	79	92	105	118	131	144	157
27	3/4	37	49	61	73	86	98	110	122	135	147
28	3/4	34	46	57	69	80	92	103	114	126	137
29	3/4	32	43	54	64	75	86	96	107	118	129
30	3/4	30	40	50	60	70	81	91	101	111	121
31	3/4	28	38	47	57	66	76	85	95	104	114
32	3/4	27	36	45	54	63	71	80	89	98	107
33	3/4	25	34	42	51	59	68	76	84	93	101
34	3/4	24	32	40	48	56	64	72	80	88	96
35	3/4	23	30	38	45	53	61	68	76	83	91
36	3/4	22	29	36	43	50	57	65	72	79	86
37	3/4	20	27	34	41	48	55	61	68	75	82
38	3/4	20	26	33	39	46	52	59	65	72	78
39	3/4	19	25	31	37	43	50	56	62	68	74
40	3/4	18	24	30	35	41	47	53	59	65	71

a. Flow rate from Section P2904.4.2

TABLE P2904.6.2(7)
ALLOWABLE PIPE LENGTH FOR 1 INCH CPVC PIPE
(Underlining of table omitted for clarity)

Sprinkler Flow Rate[a] (gpm)	Water Distribution Size (inch)	Available Pressure - P_t (psi)									
		15	20	25	30	35	40	45	50	55	60
		Allowable Length of Pipe from Service Valve to Farthest Sprinkler (feet)									
8	1	1049	1398	1748	2098	2447	2797	3146	3496	3845	4195
9	1	843	1125	1406	1687	1968	2249	2530	2811	3093	3374
10	1	694	925	1157	1388	1619	1851	2082	2314	2545	2776
11	1	582	776	970	1164	1358	1552	1746	1940	2133	2327
12	1	495	660	826	991	1156	1321	1486	1651	1816	1981
13	1	427	570	712	854	997	1139	1281	1424	1566	1709
14	1	372	497	621	745	869	993	1117	1241	1366	1490
15	1	328	437	546	656	765	874	983	1093	1202	1311
16	1	291	388	485	582	679	776	873	970	1067	1164
17	1	260	347	433	520	607	693	780	867	954	1040
18	1	234	312	390	468	546	624	702	780	858	936
19	1	212	282	353	423	494	565	635	706	776	847
20	1	193	257	321	385	449	513	578	642	706	770
21	1	176	235	293	352	410	469	528	586	645	704
22	1	161	215	269	323	377	430	484	538	592	646
23	1	149	198	248	297	347	396	446	496	545	595
24	1	137	183	229	275	321	366	412	458	504	550
25	1	127	170	212	255	297	340	382	425	467	510
26	1	118	158	197	237	276	316	355	395	434	474
27	1	111	147	184	221	258	295	332	368	405	442
28	1	103	138	172	207	241	275	310	344	379	413
29	1	97	129	161	194	226	258	290	323	355	387
30	1	91	121	152	182	212	242	273	303	333	364
31	1	86	114	143	171	200	228	257	285	314	342
32	1	81	108	134	161	188	215	242	269	296	323
33	1	76	102	127	152	178	203	229	254	280	305
34	1	72	96	120	144	168	192	216	240	265	289
35	1	68	91	114	137	160	182	205	228	251	273
36	1	65	87	108	130	151	173	195	216	238	260
37	1	62	82	103	123	144	165	185	206	226	247
38	1	59	78	98	117	137	157	176	196	215	235
39	1	56	75	93	112	131	149	168	187	205	224
40	1	53	71	89	107	125	142	160	178	196	214

a. Flow rate from Section P2904.4.2

TABLE P2904.6.2(8)
ALLOWABLE PIPE LENGTH FOR ¾ INCH PEX TUBING
(Underlining of table omitted for clarity)

Sprinkler Flow Rate[a] (gpm)	Water Distribution Size (inch)	Available Pressure - P_t (psi)									
		15	20	25	30	35	40	45	50	55	60
		Allowable Length of Pipe from Service Valve to Farthest Sprinkler-(feet)									
8	3/4	93	123	154	185	216	247	278	309	339	370
9	3/4	74	99	124	149	174	199	223	248	273	298
10	3/4	61	82	102	123	143	163	184	204	225	245
11	3/4	51	68	86	103	120	137	154	171	188	205
12	3/4	44	58	73	87	102	117	131	146	160	175
13	3/4	38	50	63	75	88	101	113	126	138	151
14	3/4	33	44	55	66	77	88	99	110	121	132
15	3/4	29	39	48	58	68	77	87	96	106	116
16	3/4	26	34	43	51	60	68	77	86	94	103
17	3/4	23	31	38	46	54	61	69	77	84	92
18	3/4	21	28	34	41	48	55	62	69	76	83
19	3/4	19	25	31	37	44	50	56	62	69	75
20	3/4	17	23	28	34	40	45	51	57	62	68
21	3/4	16	21	26	31	36	41	47	52	57	62
22	3/4	NP	19	24	28	33	38	43	47	52	57
23	3/4	NP	17	22	26	31	35	39	44	48	52
24	3/4	NP	16	20	24	28	32	36	40	44	49
25	3/4	NP	NP	19	22	26	30	34	37	41	45
26	3/4	NP	NP	17	21	24	28	31	35	38	42
27	3/4	NP	NP	16	20	23	26	29	33	36	39
28	3/4	NP	NP	15	18	21	24	27	30	33	36
29	3/4	NP	NP	NP	17	20	23	26	28	31	34
30	3/4	NP	NP	NP	16	19	21	24	27	29	32
31	3/4	NP	NP	NP	15	18	20	23	25	28	30
32	3/4	NP	NP	NP	NP	17	19	21	24	26	28
33	3/4	NP	NP	NP	NP	16	18	20	22	25	27
34	3/4	NP	NP	NP	NP	NP	17	19	21	23	25
35	3/4	NP	NP	NP	NP	NP	16	18	20	22	24
36	3/4	NP	NP	NP	NP	NP	15	17	19	21	23
37	3/4	NP	NP	NP	NP	NP	NP	16	18	20	22
38	3/4	NP	NP	NP	NP	NP	NP	16	17	19	21
39	3/4	NP	NP	NP	NP	NP	NP	NP	16	18	20
40	3/4	NP	NP	NP	NP	NP	NP	NP	16	17	19

NP - Not permitted.

a. Flow rate from Section P2904.4.2.

TABLE P2904.6.2(9)
ALLOWABLE PIPE LENGTH FOR 1 INCH PEX TUBING
(Underlining of table omitted for clarity)

Sprinkler Flow Rate[a] (gpm)	Water Distribution Size (inch)	Available Pressure - P_t (psi)									
		15	20	25	30	35	40	45	50	55	60
		Allowable Length of Pipe from Service Valve to Farthest Sprinkler-(feet)									
8	1	314	418	523	628	732	837	941	1046	1151	1255
9	1	252	336	421	505	589	673	757	841	925	1009
10	1	208	277	346	415	485	554	623	692	761	831
11	1	174	232	290	348	406	464	522	580	638	696
12	1	148	198	247	296	346	395	445	494	543	593
13	1	128	170	213	256	298	341	383	426	469	511
14	1	111	149	186	223	260	297	334	371	409	446
15	1	98	131	163	196	229	262	294	327	360	392
16	1	87	116	145	174	203	232	261	290	319	348
17	1	78	104	130	156	182	208	233	259	285	311
18	1	70	93	117	140	163	187	210	233	257	280
19	1	63	84	106	127	148	169	190	211	232	253
20	1	58	77	96	115	134	154	173	192	211	230
21	1	53	70	88	105	123	140	158	175	193	211
22	1	48	64	80	97	113	129	145	161	177	193
23	1	44	59	74	89	104	119	133	148	163	178
24	1	41	55	69	82	96	110	123	137	151	164
25	1	38	51	64	76	89	102	114	127	140	152
26	1	35	47	59	71	83	95	106	118	130	142
27	1	33	44	55	66	77	88	99	110	121	132
28	1	31	41	52	62	72	82	93	103	113	124
29	1	29	39	48	58	68	77	87	97	106	116
30	1	27	36	45	54	63	73	82	91	100	109
31	1	26	34	43	51	60	68	77	85	94	102
32	1	24	32	40	48	56	64	72	80	89	97
33	1	23	30	38	46	53	61	68	76	84	91
34	1	22	29	36	43	50	58	65	72	79	86
35	1	20	27	34	41	48	55	61	68	75	82
36	1	19	26	32	39	45	52	58	65	71	78
37	1	18	25	31	37	43	49	55	62	68	74
38	1	18	23	29	35	41	47	53	59	64	70
39	1	17	22	28	33	39	45	50	56	61	67
40	1	16	21	27	32	37	43	48	53	59	64

a. Flow rate from Section P2904.4.2.

2. Add standard to Chapter 13 as follows:

NFPA

13D-2007 Standard for the Installation of Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes

Reason: Fire sprinklers are universally recognized as the most effective means of reducing America's fire losses and preventing firefighter deaths and injuries associated with firefighting operations. Both of these objectives are fundamental to the mission of the International Association of Fire Chiefs (IAFC). Through this proposal, the IAFC hopes to encourage more widespread use of residential sprinklers by establishing a simple, straightforward design methodology for residential sprinklers that should appeal to homebuilders and code officials.

Many stakeholders in the residential construction industry have conveyed in testimony before ICC that the IRC must include a prescriptive requirements for designing residential sprinklers before they can be mainstreamed into new home construction. While it is recognized that many people would simply prefer to reference NFPA 13D, this approach would be inconsistent with the underlying principle of the IRC, which is to serve as a stand-alone document for residential construction. That principle is reflected in the way that the IRC handles requirements for structural, mechanical, electrical and plumbing systems, and it makes sense for the IRC to handle fire-protection systems in a similar fashion.

As an organization dedicated to the advancement of residential sprinklers, IAFC chose to undertake the challenge of sponsoring this code change proposal to advance this concept. Provisions contained in this proposal were developed with input from a variety of interested parties, including the National Association of Homebuilders, and although NAHB was unable to consider endorsing this proposal prior to the code change submittal deadline, their input was helpful in developing the proposed text.

The proposed Section P2904 provides a simple, prescriptive and cost-effective approach to residential fire sprinkler systems that is fully contained in the IRC. This text will allow a contractor or homebuilder to install a residential sprinkler system without referencing another code or standard.

The requirements are intended to be fully consistent with NFPA 13D, but are simplified since Section 2904 only applies to multipurpose systems. Homebuilders will still have the option of using the nationally recognized standard, NFPA 13D, which allows an engineered design option and other piping configurations. The approach of including prescriptive tables in the IRC, but still permitting an engineered design alternative based on recognized standards, is utilized elsewhere in the IRC, and it is a logical way to handle residential sprinkler requirements. For example, consider the IRC's approach to structural design. In the case of floor systems, the IRC provides prescriptive span tables as a simple basis of design, but Section R301 gives the homebuilder an option to use an engineered design based on the IBC and ASCE 7, if desired.

A fundamental assumption of P2904 is that piping will comply with all of the requirements applicable to a residential plumbing system established by IRC Chapters 25-29. For this reason, there is no need to address special subjects, for example freeze protection, in P2904 since all residential plumbing is required to be protected by freezing, and installers of potable water systems will be familiar with local requirements for freeze protection.

Another fundamental assumption of Section 2904 is that the designer and installer will make use of the manufacturers' instructions for sprinklers and sprinkler pipe and that the instructions will include all of the basic requirements necessary to design and install these components. For this approach to be effective, it will be necessary for sprinkler manufacturers to agree to provide certain criteria, such as required separations from obstructions and installation requirements for complex ceilings, in the installation instructions. Currently, this information is provided by some manufacturers, while others simply defer to NFPA 13D. Efforts to establish minimum criteria for manufacturers instructions, based on the listing requirements, are already underway, and progress will be reported at ICC's public hearing.

Efforts have also been made to reach out to NFPA to explore the possibility of utilizing NFPA 13D text more directly in Section 2904, not unlike how provisions of the National Electrical Code are directly incorporated in the IRC electrical provisions in IRC Chapter 33.

Perhaps the most notable aspect of the proposed section is the tabular approach to dealing with hydraulic design. In an effort to simplify the design of residential sprinkler systems, comprehensive pipe sizing tables have been provided, which address elevation loss and all sources of pressure loss in a system as a basis for prescribing a maximum pipe length between the water supply and the most remote sprinkler. The tables accommodate different sizes for underground and aboveground piping and different meter sizes.

Given that a substantial portion of the cost of a sprinkler system installation can be associated with interior piping materials, a well-informed designer will consider cost-effective ways to increase the available pressure to interior piping (P_t) to permit smaller, less expensive interior piping and fittings. Equation 29-1 provides a framework for this approach by showing each source of pressure loss separately to facilitate this analysis. For example:

1. **For PL_{svc}:** Increasing the size of the water service pipe, which tends to be inexpensive, will reduce pressure loss in the service and increase available pressure to offset losses in water-distribution piping. This may result in being able to use smaller diameter water-distribution piping and fittings and in a reduction to overall system cost. It should be noted that much of the loss associated with the water service is often caused by friction loss in the service pipe versus loss in the water meter, and increasing the service pipe diameter while maintaining a smaller meter can be an inexpensive way to increase P_t.
2. **For PL_m:** Increasing the size of the water meter, may or may not be cost effective versus reducing the size of water distribution piping. In cases where the water purveyor charges capital recovery fees or standby charges for larger meters, using the smallest meter size, even if it results in larger water distribution piping, may be yield the lowest overall cost. Where upsizing the meter (or if it is permitted, using a different meter brand with better loss characteristics, without changing the meter size) can be done inexpensively, it can be a good way to increase available pressure to offset losses in water-distribution piping. This may result in being able to use smaller diameter water-distribution piping and fittings and in a reduction to overall system cost.

For simplicity, water distribution system tables have been developed for the three common interior piping materials used in these systems, copper, CPVC, and PEX. Because each material has a different inside diameter, separate tables are necessary to accommodate the different friction loss associated with each type of piping. Also for simplicity, the tables only address common pipe sizes used for residential sprinkler systems, which are ¾ and 1 inch, and the tables assume that pipe sizes will not be mixed. If different pipe sizes are desired to gain a hydraulic advantage, then the system must be hydraulically calculated.

Overall, the tables reflect conservative design assumptions. These include:

1. The tables use the Hazen-Williams equation for calculating the allowable length of pipe, which correlates with NFPA 13D.
2. The C-factor used for each piping material in the Hazen-Williams calculation was 150. This correlates with C-factors assigned by NFPA 13D.
3. Conservative values were used in calculating the limits on pipe length. A fitting factor that assumes a 25 percent increase over the actual pipe length to accommodate additional friction loss associated with pipe fittings. This means that the length of piping specified by the tables has been adjusted to accommodate a reasonable number of pipe fittings that would be expected. With the fittings already calculated into the length numbers in the tables, there is no need to separately consider losses in fittings.
4. A factor of safety is provided by assuming that the sprinkler requiring the greatest pressure and the room with the highest flow demand are always located at the most remote point in the system and that the most remote point in the system is always at the highest elevation, which typically will not be the case.

In conclusion, Section P2904 represents a major advancement in the effort to make residential sprinkler systems simple and affordable, and this proposal will serve as a basis for incorporating a prescriptive approach to residential sprinkler systems in the IRC.

Cost Impact: This proposal is expected to reduce the cost of construction by reducing design costs.

Public Hearing:	Committee:	AS	AM	D
	Assembly:	ASF	AMF	DF

RP8–07/08

AP101, All New Sections: AP101.1, AP102.1, AP102.2, AP102.3, Table AP102.3, AP103.1, AP104.1, AP104.2, AP105.1, AP105.1, AP105.2, AP106.1, AP106.1.1, AP106.2, AP106.3, AP107.1, AP107.2, AP107.2.1, AP108.1, AP108.2, AP108.3, AP109.1, AP109.2 AP109.3, AP109.3.1, AP109.3.2, AP110.1, T. AP109.2.1(1), T. AP109.2.1(2), T. AP109.2.1(3), T. AP109.2.1(4), T. AP109.2.1(5), T. AP109.2.1(6), T. AP109.2.1(7), T. AP109.2.1(8), T. AP109.2.1(9)

Proponent: Steven Orlowski, National Association of Home Builders

Revise as follows:

APPENDIX P
~~SPRINKLERS~~

~~**AP101 (Supp) Fire sprinklers.** An approved automatic fire sprinkler system shall be installed in new buildings and structures one and two family dwellings and townhouses in accordance with NFPA 13D.~~

FIRE SPRINKLER SYSTEMS

SECTION AP101
GENERAL

AP101.1 Scope. The provisions of this appendix shall control the design and installation of automatic fire sprinkler system in new one- and two-family dwellings and townhouses.

Exception: Residential fire sprinklers installed in accordance with NFPA 13D shall be permitted.

SECTION AP102
REQUIREMENTS FOR SPRINKLERS

AP102.1 Sprinklers. Sprinklers shall be listed residential sprinklers. Residential sprinklers shall be installed in accordance with the manufacturer's installation instructions.

AP102.2 Temperature rating and separation from heat sources. Sprinklers shall have a temperature rating of 135-170°F and shall be separated from heat sources as required by the manufacturer's instructions.

Exception: Sprinklers shall have a temperature rating of 175-225°F where installed in the following areas:

1. Directly under skylights where exposed to direct sunlight.
2. In attics or concealed spaces located directly beneath a roof.

AP102.3 Intermediate temperature sprinklers. Sprinklers located within the distance to a heat source as specified in Table AP102.3 shall have a temperature rating of 175-225°F.

TABLE AP102.3
DISTANCE FROM HEAT SOURCE

HEAT SOURCE	LOCATION OF SPRINKLER WITHIN DISTANCE TO HEAT SOURCE (INCH)
Fireplace, Side of Open or Recessed Fireplace	36
Fireplace, Front of Recessed Fireplace	84
Coal and Wood Burning Stove	42
Kitchen Range Top	18
Oven	18
Vent Connector or Chimney Connector	18
Heating Duct Not Insulated	18
Hot Water Pipe Not Insulated	12
Side of Ceiling or Wall Warm Air Register	24
Front of Wall Mounted Warm Air Register	36
Water Heater, Furnace, or Boiler	6
Luminaire, Up to 250 Watts	6
Luminaire, 251 Watts Up to 499 Watts	12

SECTION AP103
SPRINKLER COVERAGE

AP103.1 General. The area of coverage of the residential sprinklers shall be based on the manufacturer's installation instruction. The minimum area of coverage shall be 12 feet by 12 feet for each sprinkler. The maximum area of coverage shall be 20 feet by 20 feet.

SECTION AP104
SPRINKLER HYDRAULIC DEMAND

AP104.1 General The hydraulic demand, flow rate and minimum pressure, for each sprinkler shall be based on the area of coverage as specified in the manufacturer's installation instructions.

AP104.2 Hydraulic requirements. Where more than one sprinkler is located in a room, the hydraulic demand for the multiple sprinklers shall be based on two sprinklers discharging. A room shall be considered a space surrounded by walls, windows, doors, or lintels that are 8 inches or more in height.

SECTION AP105
SPRINKLERS REQUIRED

AP105.1 General. Sprinklers shall be provided to protect all areas of the dwelling unit except those areas specified in Section AP105.2.

AP105.2 Sprinklers not required. Sprinklers shall not be required in the following areas:

1. Attics and unfinished basements
2. Crawl spaces and closets
3. Bathrooms and toilet rooms
4. Garages and car ports
5. Accessory buildings not having sleeping rooms
6. Balconies, Breezeways, and decks

SECTION AP106
SPRINKLER PIPING

AP106.1 General. The sprinkler piping shall conform to the requirements for cold water distribution piping. Sprinkler piping shall connect to and be a part of the cold water distribution piping system.

AP106.1.1 Pipe protection. CPVC pipe, PEX tubing, PEX-Al-PEX tubing, and PE-AL-PE tubing shall be protected from exposure to the living space by a layer of 3/8 inch thick gypsum wallboard, 1/4 inch thick plywood, or other material having a 15 minute fire rating. Protection of the pipe shall not be required in areas not required to be protected with sprinklers as specified in Section AP105.2.

Exception. Protection shall not be required where exposure is permitted by the third party certification.

AP106.2 Water filtration or treatment systems. An automatic bypass valve shall be installed on all connections of the water distribution system to water filters, water softener or other water treatment systems that are located between the water service and any sprinkler.

Exception. Where hydraulic calculations verify that an automatic bypass valve is not required.

AP106.3 Shutoff valve limitation. A shutoff valve shall be prohibited from being installed in the water piping system such that the valve only isolates the water supply to a sprinkler or sprinklers.

SECTION AP107
PRIVATE WELLS

AP107.1 General. Sprinkler systems supplied by private well shall conform to the requirements of Section AP107.2 through AP107.2.1.

AP107.2 Well pump rating. The pump for a private well shall be rated for a minimum flow required for the entire sprinkler system. The minimum pressure setting of the pump shall be used for sizing the water piping system.

AP107.2.1 Capacity. For a well system, any combination of well capacity and tank storage shall provide a flow of water at the maximum sprinkler flow rate for a period of 7 minutes for dwelling units 2000 square feet or less in area and 10 minutes for dwelling units in excess of 2000 square feet.

SECTION AP108
SYSTEM DESIGN FLOW

AP108.1 Determining system design flow. The flow for sizing the sprinkler piping system shall be based on the flow rating of each sprinkler in accordance with Section AP108.2 and the calculation in accordance with Section AP108.3.

AP108.2 Determining required flow rate for each sprinkler. The minimum required flow for each sprinkler shall be determined using the sprinkler manufacturer's published data for the specific sprinkler model based on all of the following:

1. The area of coverage
2. The ceiling configuration
3. The temperature rating
4. Any additional conditions specified by the sprinkler manufacturer.

AP108.3 System design flow rate. The design flow rate for the system shall be based on the following:

1. The design flow rate for a room having only one sprinkler shall be the flow rate required for that sprinkler, as determined by Section AP108.1.
2. The design flow rate for a room having two or more sprinklers a shall be determined by identifying the sprinkler in that room with the highest required flow rate, based on Section AP108.1, and multiplying that flow rate by 2.
3. Where the sprinkler manufacturer specifies different criteria for ceiling configurations that are not smooth, flat and horizontal, the required flow rate for that room shall comply with the sprinkler manufacturer's instructions.
4. The design flow rate for the sprinkler system shall be the flow required by the room with the largest flow rate, based on Items 1, 2 and 3.
5. For the purpose of this section, it shall be permissible to reduce the design flow rate for a room by subdividing the space into two or more rooms, where each room is evaluated separately with respect to the required design flow rate. Each room shall be bounded by walls and a ceiling. Openings in walls shall have a lintel not less than 8 inches in depth and each lintel shall form a solid barrier between the ceiling and the top of the opening.

SECTION AP109
PIPE SIZING

AP109.1 General The piping to sprinklers shall be sized for the flow required by Section AP108.3. The flow required to supply the plumbing fixtures shall not be required to be added to the sprinkler design flow.

AP109.2 Method of sizing pipe. Piping supplying sprinklers shall be sized using the prescriptive method in Sections AP109.3 or by hydraulic calculation in accordance with NFPA 13D. The minimum pipe size from the water supply source to any sprinkler shall be 3/4 inch nominal. Threaded adapter fittings at the point where sprinklers are attached to the piping shall be a minimum of ½ inch nominal.

AP109.3 Prescriptive pipe sizing method. Pipe shall be sized by determining the available pressure to offset friction loss in piping and identifying a piping material, diameter and length using the equation in Section AP109.3.1 and the procedure in Section AP109.3.2.

AP109.3.1 Available pressure equation. The pressure available to offset friction loss in the interior piping system (P_t) shall be determined in accordance with the Equation AP-1.

$$P_t = P_{sup} - PL_{svc} - PL_m - PL_d - PL_e - P_{sp} \qquad \textbf{(Equation AP-1)}$$

Where:

P_t = Pressure used in applying Tables AP109.2.1(4) through AP190.2.1(9).
$P_{sup.}$ = Pressure available from the water supply source.
PL_{svc} = Pressure loss in the water-service pipe.
PL_m = Pressure loss in the water meter.
$PL_{d.}$ = Pressure loss from devices other than the water meter.
PL_e = Pressure loss associated with changes in elevation.
P_{sp} = Maximum pressure required by a sprinkler

AP109.3.2 Calculation procedure. Determination of the required size for water distribution piping shall be in accordance with the following procedure:

Step 1 - Determine P_{sup}
Obtain the supply pressure that will be available from the water main from the water purveyor, or for an individual source, the available supply pressure. The pressure shall be the residual pressure available at the flow rate used when applying Table AP109.2.1 (1).

Step 2 – Determine PL_{svc}
Use Table AP109.2.1 (1) to determine the pressure loss in the water service pipe based on the selected size of the water service.

Step 3 – Determine PL_m
Use Table AP109.2.1 (2) to determine the pressure loss from the water meter. based on the selected water meter size.

Step 4 – Determine PL_d
Determine the pressure loss from devices, other than the water meter, installed in the piping system supplying sprinklers, such as pressure-reducing valves, backflow preventers, water softeners or water filters. Device pressure losses shall be based on the device manufacturer's specifications. The flow rate used to determine pressure loss shall be the rate from Section AP108.2, except that 5 gpm shall be added where the device is installed in a water-service pipe that supplies more than one dwelling. As alternative to deducting pressure loss for a device, an automatic bypass valve shall be installed to divert flow around the device when a sprinkler activates.

Step 5 – Determine PL_e
Use Table AP109.2.1 (3) to determine the pressure loss associated with changes in elevation. The elevation used in applying the table shall be the difference between the elevation where the water source pressure was measured and the elevation of the highest sprinkler.

Step 6 – Determine P_{sp}
Determine the maximum pressure required by any individual sprinkler based on the flow rate from Section AP108.1. The required pressure is provided in the sprinkler manufacturer's published data for the specific sprinkler model based on the selected flow rate.

Step 7 – Calculate P_t
Using Equation AP-1, calculate the pressure available to offset friction loss in water-distribution piping between the service valve and the sprinklers.

Step 8 – Determine the maximum allowable pipe length
Use Tables AP109.2.1 (4) through AP109.2.1 (9) to select a material and size for water distribution piping. The piping material and size shall be acceptable if the developed length of pipe between the service valve the most remote sprinkler does not exceed the maximum allowable length specified by the applicable table. Interpolation of P_t between the tabular values shall be permitted.

The maximum allowable length of piping in Tables AP109.2.1 (4) through AP109.2.1 (9) incorporates an adjustment for pipe fittings, and no additional consideration of friction losses associated with pipe fittings shall be required.

SECTION AP110
SIGNS

AP110.1 Valve Sign. A sign shall be installed at the main shutoff valve to the water distribution system stating "Warning, the water system for this home supplies fire sprinklers that require certain flows and pressures to fight a fire. Devices that restrict the flow or decrease the pressure or automatically shut off the water to the fire sprinkler system, such as water softeners, filtration systems, and automatic shutoff valves, shall not be added to this system without a review of the fire sprinkler system by a fire protection specialist. Do not remove this sign."

TABLE AP109.2.1(1)
WATER SERVICE PRESSURE LOSS (PL_{SVC})[a, b]
(Underlining of table omitted for clarity)

Flow Rate[c]	3/4" Water Service Pressure Loss (psi)				1" Water Service Pressure Loss (psi)				1-1/4" Water Service Pressure Loss (psi)			
(gpm)	40' or less	41' to 75'	76' to 100'	101' to 150'	40' or less	41' to 75'	76' to 100'	101' to 150'	40' or less	41' to 75'	76' to 100'	101' to 150'
8	5.1	8.7	11.8	17.4	1.5	2.5	3.4	5.1	0.6	1.0	1.3	1.9
10	7.7	13.1	17.8	26.3	2.3	3.8	5.2	7.7	0.8	1.4	2.0	2.9
12	10.8	18.4	24.9	NP	3.2	5.4	7.3	10.7	1.2	2.0	2.7	4.0
14	14.4	24.5	NP	NP	4.2	7.1	9.6	14.3	1.6	2.7	3.6	5.4
16	18.4	NP	NP	NP	5.4	9.1	12.4	18.3	2.0	3.4	4.7	6.9
18	22.9	NP	NP	NP	6.7	11.4	15.4	22.7	2.5	4.3	5.8	8.6
20	27.8	NP	NP	NP	8.1	13.8	18.7	27.6	3.1	5.2	7.0	10.4
22	NP	NP	NP	NP	9.7	16.5	22.3	NP	3.7	6.2	8.4	12.4
24	NP	NP	NP	NP	11.4	19.3	26.2	NP	4.3	7.3	9.9	14.6
26	NP	NP	NP	NP	13.2	22.4	NP	NP	5.0	8.5	11.4	16.9
28	NP	NP	NP	NP	15.1	25.7	NP	NP	5.7	9.7	13.1	19.4
30	NP	NP	NP	NP	17.2	NP	NP	NP	6.5	11.0	14.9	22.0
32	NP	NP	NP	NP	19.4	NP	NP	NP	7.3	12.4	16.8	24.8
34	NP	NP	NP	NP	21.7	NP	NP	NP	8.2	13.9	18.8	NP
36	NP	NP	NP	NP	24.1	NP	NP	NP	9.1	15.4	20.9	NP

NP - Not permitted. Pressure loss exceeds reasonable limits

a. Values are applicable for underground piping materials listed in Table P2904.4 and are based on an SDR of 11 and a Hazen Williams C Factor of 150.
b. Values include the following length allowances for fittings: 25% length increase for actual lengths up to 100 feet and 15% length increase for actual lengths over 100 feet.
c. Flow rate from Section AP108.2. Add 5 gpm to the flow rate required by Section AP108.2 where the water-service pipe supplies more than one dwelling.

TABLE AP109.2.1(2)
MINIMUM WATER METER PRESSURE LOSS (PL_m)[a]

Flow Rate (gpm)[b]	5/8" Meter Pressure Loss (psi)	3/4" Meter Pressure Loss (psi)
8	2	1
10	3	1
12	4	1
14	5	2
16	7	3
18	9	4
20	11	4
22	NP	5
24	NP	5
26	NP	6
28	NP	6
30	NP	7
32	NP	7
34	NP	8
36	NP	8

NP - Not permitted unless the actual water meter pressure loss is known.

a. Table AP109.2.1(2) establishes conservative values for water meter pressure loss for installations where the water meter loss is unknown. Where the actual water meter pressure loss is known, P_m shall be the actual loss.

b. Flow rate from Section AP108.2. Add 5 gpm to the flow rate required by Section AP108.2 where the water-service pipe supplies more than one dwelling.

TABLE AP109.2.1(3)
ELEVATION LOSS (PL_e)

Elevation (feet)	Pressure Loss (psi)
5	2.2
10	4.4
15	6.5
20	8.7
25	10.9
30	13
35	15.2
40	17.4

TABLE AP109.2.1 (4)
ALLOWABLE PIPE LENGTH FOR ¾ INCH TYPE M COPPER WATER TUBING

Sprinkler Flow Rate[a] (gpm)	Water Distribution Size (inch)	Available Pressure - P_t (psi)									
		15	20	25	30	35	40	45	50	55	60
		Allowable Length of Pipe from Service Valve to Farthest Sprinkler (feet)									
8	3/4	217	289	361	434	506	578	650	723	795	867
9	3/4	174	232	291	349	407	465	523	581	639	697
10	3/4	143	191	239	287	335	383	430	478	526	574
11	3/4	120	160	200	241	281	321	361	401	441	481
12	3/4	102	137	171	205	239	273	307	341	375	410
13	3/4	88	118	147	177	206	235	265	294	324	353
14	3/4	77	103	128	154	180	205	231	257	282	308
15	3/4	68	90	113	136	158	181	203	226	248	271
16	3/4	60	80	100	120	140	160	180	200	220	241
17	3/4	54	72	90	108	125	143	161	179	197	215
18	3/4	48	64	81	97	113	129	145	161	177	193
19	3/4	44	58	73	88	102	117	131	146	160	175
20	3/4	40	53	66	80	93	106	119	133	146	159
21	3/4	36	48	61	73	85	97	109	121	133	145
22	3/4	33	44	56	67	78	89	100	111	122	133
23	3/4	31	41	51	61	72	82	92	102	113	123
24	3/4	28	38	47	57	66	76	85	95	104	114
25	3/4	26	35	44	53	61	70	79	88	97	105
26	3/4	24	33	41	49	57	65	73	82	90	98
27	3/4	23	30	38	46	53	61	69	76	84	91
28	3/4	21	28	36	43	50	57	64	71	78	85
29	3/4	20	27	33	40	47	53	60	67	73	80
30	3/4	19	25	31	38	44	50	56	63	69	75
31	3/4	18	24	29	35	41	47	53	59	65	71
32	3/4	17	22	28	33	39	44	50	56	61	67
33	3/4	16	21	26	32	37	42	47	53	58	63
34	3/4	NP	20	25	30	35	40	45	50	55	60
35	3/4	NP	19	24	28	33	38	42	47	52	57
36	3/4	NP	18	22	27	31	36	40	45	49	54
37	3/4	NP	17	21	26	30	34	38	43	47	51
38	3/4	NP	16	20	24	28	32	36	40	45	49
39	3/4	NP	15	19	23	27	31	35	39	42	46
40	3/4	NP	NP	18	22	26	29	33	37	40	44

NP - Not permitted.

a. Flow rate from Section AP108.2.

TABLE AP109.2.1 (5)
ALLOWABLE PIPE LENGTH FOR 1 INCH TYPE M COPPER WATER TUBING

Sprinkler Flow Rate[a] (gpm)	Water Distribution Size (inch)	Available Pressure - P_t (psi)									
		15	20	25	30	35	40	45	50	55	60
		Allowable Length of Pipe from Service Valve to Farthest Sprinkler (feet)									
8	1	806	1075	1343	1612	1881	2149	2418	2687	2955	3224
9	1	648	864	1080	1296	1512	1728	1945	2161	2377	2593
10	1	533	711	889	1067	1245	1422	1600	1778	1956	2134
11	1	447	596	745	894	1043	1192	1341	1491	1640	1789
12	1	381	508	634	761	888	1015	1142	1269	1396	1523
13	1	328	438	547	657	766	875	985	1094	1204	1313
14	1	286	382	477	572	668	763	859	954	1049	1145
15	1	252	336	420	504	588	672	756	840	924	1008
16	1	224	298	373	447	522	596	671	745	820	894
17	1	200	266	333	400	466	533	600	666	733	799
18	1	180	240	300	360	420	479	539	599	659	719
19	1	163	217	271	325	380	434	488	542	597	651
20	1	148	197	247	296	345	395	444	493	543	592
21	1	135	180	225	270	315	360	406	451	496	541
22	1	124	165	207	248	289	331	372	413	455	496
23	1	114	152	190	228	267	305	343	381	419	457
24	1	106	141	176	211	246	282	317	352	387	422
25	1	98	131	163	196	228	261	294	326	359	392
26	1	91	121	152	182	212	243	273	304	334	364
27	1	85	113	142	170	198	226	255	283	311	340
28	1	79	106	132	159	185	212	238	265	291	318
29	1	74	99	124	149	174	198	223	248	273	298
30	1	70	93	116	140	163	186	210	233	256	280
31	1	66	88	110	132	153	175	197	219	241	263
32	1	62	83	103	124	145	165	186	207	227	248
33	1	59	78	98	117	137	156	176	195	215	234
34	1	55	74	92	111	129	148	166	185	203	222
35	1	53	70	88	105	123	140	158	175	193	210
36	1	50	66	83	100	116	133	150	166	183	199
37	1	47	63	79	95	111	126	142	158	174	190
38	1	45	60	75	90	105	120	135	150	165	181
39	1	43	57	72	86	100	115	129	143	158	172
40	1	41	55	68	82	96	109	123	137	150	164

a. Flow rate from Section AP108.2.

TABLE AP109.2.1 (6)
ALLOWABLE PIPE LENGTH FOR ¾ INCH CPVC PIPE

Sprinkler Flow Rate[a] (gpm)	Water Distribution Size (inch)	Available Pressure - P_t (psi)									
		15	20	25	30	35	40	45	50	55	60
		Allowable Length of Pipe from Service Valve to Farthest Sprinkler (feet)									
8	3/4	348	465	581	697	813	929	1045	1161	1278	1394
9	3/4	280	374	467	560	654	747	841	934	1027	1121
10	3/4	231	307	384	461	538	615	692	769	845	922
11	3/4	193	258	322	387	451	515	580	644	709	773
12	3/4	165	219	274	329	384	439	494	549	603	658
13	3/4	142	189	237	284	331	378	426	473	520	568
14	3/4	124	165	206	247	289	330	371	412	454	495
15	3/4	109	145	182	218	254	290	327	363	399	436
16	3/4	97	129	161	193	226	258	290	322	354	387
17	3/4	86	115	144	173	202	230	259	288	317	346
18	3/4	78	104	130	155	181	207	233	259	285	311
19	3/4	70	94	117	141	164	188	211	234	258	281
20	3/4	64	85	107	128	149	171	192	213	235	256
21	3/4	58	78	97	117	136	156	175	195	214	234
22	3/4	54	71	89	107	125	143	161	179	197	214
23	3/4	49	66	82	99	115	132	148	165	181	198
24	3/4	46	61	76	91	107	122	137	152	167	183
25	3/4	42	56	71	85	99	113	127	141	155	169
26	3/4	39	52	66	79	92	105	118	131	144	157
27	3/4	37	49	61	73	86	98	110	122	135	147
28	3/4	34	46	57	69	80	92	103	114	126	137
29	3/4	32	43	54	64	75	86	96	107	118	129
30	3/4	30	40	50	60	70	81	91	101	111	121
31	3/4	28	38	47	57	66	76	85	95	104	114
32	3/4	27	36	45	54	63	71	80	89	98	107
33	3/4	25	34	42	51	59	68	76	84	93	101
34	3/4	24	32	40	48	56	64	72	80	88	96
35	3/4	23	30	38	45	53	61	68	76	83	91
36	3/4	22	29	36	43	50	57	65	72	79	86
37	3/4	20	27	34	41	48	55	61	68	75	82
38	3/4	20	26	33	39	46	52	59	65	72	78
39	3/4	19	25	31	37	43	50	56	62	68	74
40	3/4	18	24	30	35	41	47	53	59	65	71

a. Flow rate from Section AP108.2.

TABLE AP109.2.1 (7)
ALLOWABLE PIPE LENGTH FOR 1 INCH CPVC PIPE

Sprinkler Flow Rate[a] (gpm)	Water Distribution Size (inch)	Available Pressure - P_t (psi)									
		15	20	25	30	35	40	45	50	55	60
		Allowable Length of Pipe from Service Valve to Farthest Sprinkler (feet)									
8	1	1049	1398	1748	2098	2447	2797	3146	3496	3845	4195
9	1	843	1125	1406	1687	1968	2249	2530	2811	3093	3374
10	1	694	925	1157	1388	1619	1851	2082	2314	2545	2776
11	1	582	776	970	1164	1358	1552	1746	1940	2133	2327
12	1	495	660	826	991	1156	1321	1486	1651	1816	1981
13	1	427	570	712	854	997	1139	1281	1424	1566	1709
14	1	372	497	621	745	869	993	1117	1241	1366	1490
15	1	328	437	546	656	765	874	983	1093	1202	1311
16	1	291	388	485	582	679	776	873	970	1067	1164
17	1	260	347	433	520	607	693	780	867	954	1040
18	1	234	312	390	468	546	624	702	780	858	936
19	1	212	282	353	423	494	565	635	706	776	847
20	1	193	257	321	385	449	513	578	642	706	770
21	1	176	235	293	352	410	469	528	586	645	704
22	1	161	215	269	323	377	430	484	538	592	646
23	1	149	198	248	297	347	396	446	496	545	595
24	1	137	183	229	275	321	366	412	458	504	550
25	1	127	170	212	255	297	340	382	425	467	510
26	1	118	158	197	237	276	316	355	395	434	474
27	1	111	147	184	221	258	295	332	368	405	442
28	1	103	138	172	207	241	275	310	344	379	413
29	1	97	129	161	194	226	258	290	323	355	387
30	1	91	121	152	182	212	242	273	303	333	364
31	1	86	114	143	171	200	228	257	285	314	342
32	1	81	108	134	161	188	215	242	269	296	323
33	1	76	102	127	152	178	203	229	254	280	305
34	1	72	96	120	144	168	192	216	240	265	289
35	1	68	91	114	137	160	182	205	228	251	273
36	1	65	87	108	130	151	173	195	216	238	260
37	1	62	82	103	123	144	165	185	206	226	247
38	1	59	78	98	117	137	157	176	196	215	235
39	1	56	75	93	112	131	149	168	187	205	224
40	1	53	71	89	107	125	142	160	178	196	214

a. Flow rate from Section AP108.2.

TABLE AP109.2.1 (8)
ALLOWABLE PIPE LENGTH FOR ¾ INCH PEX TUBING

Sprinkler Flow Rate[a] (gpm)	Water Distribution Size (inch)	Available Pressure - P_t (psi)									
		15	20	25	30	35	40	45	50	55	60
		Allowable Length of Pipe from Service Valve to Farthest Sprinkler-(feet)									
8	3/4	93	123	154	185	216	247	278	309	339	370
9	3/4	74	99	124	149	174	199	223	248	273	298
10	3/4	61	82	102	123	143	163	184	204	225	245
11	3/4	51	68	86	103	120	137	154	171	188	205
12	3/4	44	58	73	87	102	117	131	146	160	175
13	3/4	38	50	63	75	88	101	113	126	138	151
14	3/4	33	44	55	66	77	88	99	110	121	132
15	3/4	29	39	48	58	68	77	87	96	106	116
16	3/4	26	34	43	51	60	68	77	86	94	103
17	3/4	23	31	38	46	54	61	69	77	84	92
18	3/4	21	28	34	41	48	55	62	69	76	83
19	3/4	19	25	31	37	44	50	56	62	69	75
20	3/4	17	23	28	34	40	45	51	57	62	68
21	3/4	16	21	26	31	36	41	47	52	57	62
22	3/4	NP	19	24	28	33	38	43	47	52	57
23	3/4	NP	17	22	26	31	35	39	44	48	52
24	3/4	NP	16	20	24	28	32	36	40	44	49
25	3/4	NP	NP	19	22	26	30	34	37	41	45
26	3/4	NP	NP	17	21	24	28	31	35	38	42
27	3/4	NP	NP	16	20	23	26	29	33	36	39
28	3/4	NP	NP	15	18	21	24	27	30	33	36
29	3/4	NP	NP	NP	17	20	23	26	28	31	34
30	3/4	NP	NP	NP	16	19	21	24	27	29	32
31	3/4	NP	NP	NP	15	18	20	23	25	28	30
32	3/4	NP	NP	NP	NP	17	19	21	24	26	28
33	3/4	NP	NP	NP	NP	16	18	20	22	25	27
34	3/4	NP	NP	NP	NP	NP	17	19	21	23	25
35	3/4	NP	NP	NP	NP	NP	16	18	20	22	24
36	3/4	NP	NP	NP	NP	NP	15	17	19	21	23
37	3/4	NP	NP	NP	NP	NP	NP	16	18	20	22
38	3/4	NP	NP	NP	NP	NP	NP	16	17	19	21
39	3/4	NP	NP	NP	NP	NP	NP	NP	16	18	20
40	3/4	NP	NP	NP	NP	NP	NP	NP	16	17	19

NP - Not permitted.

a. Flow rate from Section AP108.2.

TABLE AP109.2.1 (9)
ALLOWABLE PIPE LENGTH FOR 1 INCH PEX TUBING

Sprinkler Flow Rate[a] (gpm)	Water Distribution Size (inch)	Available Pressure - P_t (psi)									
		15	20	25	30	35	40	45	50	55	60
		Allowable Length of Pipe from Service Valve to Farthest Sprinkler (feet)									
8	1	314	418	523	628	732	837	941	1046	1151	1255
9	1	252	336	421	505	589	673	757	841	925	1009
10	1	208	277	346	415	485	554	623	692	761	831
11	1	174	232	290	348	406	464	522	580	638	696
12	1	148	198	247	296	346	395	445	494	543	593
13	1	128	170	213	256	298	341	383	426	469	511
14	1	111	149	186	223	260	297	334	371	409	446
15	1	98	131	163	196	229	262	294	327	360	392
16	1	87	116	145	174	203	232	261	290	319	348
17	1	78	104	130	156	182	208	233	259	285	311
18	1	70	93	117	140	163	187	210	233	257	280
19	1	63	84	106	127	148	169	190	211	232	253
20	1	58	77	96	115	134	154	173	192	211	230
21	1	53	70	88	105	123	140	158	175	193	211
22	1	48	64	80	97	113	129	145	161	177	193
23	1	44	59	74	89	104	119	133	148	163	178
24	1	41	55	69	82	96	110	123	137	151	164
25	1	38	51	64	76	89	102	114	127	140	152
26	1	35	47	59	71	83	95	106	118	130	142
27	1	33	44	55	66	77	88	99	110	121	132
28	1	31	41	52	62	72	82	93	103	113	124
29	1	29	39	48	58	68	77	87	97	106	116
30	1	27	36	45	54	63	73	82	91	100	109
31	1	26	34	43	51	60	68	77	85	94	102
32	1	24	32	40	48	56	64	72	80	89	97
33	1	23	30	38	46	53	61	68	76	84	91
34	1	22	29	36	43	50	58	65	72	79	86
35	1	20	27	34	41	48	55	61	68	75	82
36	1	19	26	32	39	45	52	58	65	71	78
37	1	18	25	31	37	43	49	55	62	68	74
38	1	18	23	29	35	41	47	53	59	64	70
39	1	17	22	28	33	39	45	50	56	61	67
40	1	16	21	27	32	37	43	48	53	59	64

a. Flow rate from Section AP108.2.

Reason: The exceptions included in this proposal are reasonable allowances for consideration by the IRC Committee and the ICC Membership, should sprinklers be installed in accordance with the proposed prescriptive sprinkler system provisions or NFPA 13D and do not result in a reduction to occupant safety. Several of these exceptions are similar in methodology to other trade exceptions offered in structures that are equipped with an automatic sprinkler system. Some of the proposed exceptions are referenced in other codes that may not have been adopted by the jurisdiction, therefore it is important that they be included in the IRC Appendix P as possible trade exceptions. Below is a list and supporting information for each proposed trade exception;

AP111.1 This proposal exception would allow for the reduction in the fire separation distance between dwellings, require that the 1 hour rating of the exterior wall to be limited to the outside exposed wall. This proposal would also allow one- and two-family dwelling, equipped with an automatic sprinkler system, to be built without a rated exterior wall and unlimited openings up to the property, provided there is setback of a minimum 6 feet. When a dwelling unit is equipped with an automatic sprinkler system most fires can be controlled by one or two sprinklers, thereby reducing the concern about heat exposure from one dwelling to another.

AP111.2 The purpose of the smoke alarm system is to provide the occupant enough time to escape the dwelling upon notification of a fire. Dwellings that are equipped with an automatic sprinkler system should be permitted to reduce the number of smoke alarms required in the dwelling, since they increase the amount of time the occupant has to vacate the dwelling by controlling and sometimes extinguishing the fire.

AP111.3 Emergency escape and rescue openings are required by the code to allow a secondary exit should the primary escape route is blocked. As stated above, the automatic sprinkler system is designed to provide an increased level of safety for the occupant by controlling or suppressing the fire. Similar exceptions are already provided in the International Building Code and Life Safety Code to other R occupancies when the structure is equipped with an approved automatic sprinkler system.

AP111.4 The IRC Commentary explains that Arc-Fault receptacles are required to reduce the number of fires that are associated with electrical arcs. Based on information provided in reports published by the National Fire Protection Association prior to the code requiring arc-fault protection,

the number of fires who's origin was based on an electrical distribution and lighting failure or malfunction accounted for 3% of all residential structure fires and caused the least number of fire fatalities.

AP112 When the sizing of the water meter and distribution line must be increased to accommodate an automatic sprinkler system, the fees assessed by the water purveyor should be based solely on the size meter and distribution lines that would be required to meet the domestic potable demand. Unless the sprinkler is activated, there is no increase in the amount of water consumed by the dwelling. Consumers should not be charged higher rates or fees, just because the sprinkler system design required the distribution system to be increased.

AP113.2 The purpose of this proposal is to follow a precedence that has been established in the *International Residential Code* when referencing another code. The *International Fire Code* allow the Authority Having Jurisdiction to reduce the required fire flow rate by 50 percent when the dwelling is provided with an approved sprinkler system.

AP113.3 Would allow greater distances between fire hydrants in residential developments where all dwellings are equipped with an automatic sprinkler system in accordance with Appendix P. Both the *Uniform fire Code* and the *Urban- Wildland Interface Code* allow for increase to the fire hydrant spacing when all dwelling units in a development are equipped with an automatic sprinkler system. The spacing increase to 1,000 feet would still meet the UFC requirement for response to vehicular accidents and the WUIC requirement for maximum distance to a water source.

AP113.4 This proposed exception would allow for the increase the number of dwelling units allowed before requiring a secondary fire apparatus access road and would allow for the reduction of the access road to less than 20 feet when all the dwellings are equipped with an approved automatic sprinkler system. The *International Fire Code* allows for a single fire apparatus access road for developments that are equipped with an automatic sprinkler system and some jurisdictions have allowed for narrower roads as an exception when dwellings are sprinklered.

Cost Impact: The code change proposal will increase the cost of construction.

Public Hearing:	Committee:	AS	AM	D
	Assembly:	ASF	AMF	DF