

## Cost Effective Fire Service Friendly Fire Safety Provisions

15 November 2002

By Scott R. Creighton PE

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## Cost Effective “Fire Service Friendly” Fire Safety Provisions

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### Questions about Building Code Fire Safety Cost and Performance Effectiveness

#### Definitions:

“Substantial Hostile Fire”: A fire that has lethal smoke or heat levels.

**Abstract:** Why are building code fire safety provisions so complicated and cluttered? Long ago the building code process embraced (adopted) the protection philosophy of *delayed intervention* as “acceptable risk”. That was 50 years ago and that was reasonable then...but is no more. The underlying philosophy of fire safety provisions must change to *early intervention*.

When the protection philosophy change is made to early intervention...codes can be 90% simplified and costs for construction can decrease from \$ 10 - \$ 40/SF to \$ 6 - 10/SF. All band-aid elements can be removed.

Our building code officials have toiled admirably throughout the years. They are to be appreciated for their hard work. With little real life information available, they have stressed over how to protect the public. However, the dysfunction and inefficiencies created by the cross-purpose of code goals and foundational philosophy needs to be eradicated. Now is the time. This mismatch encumbers codes from truly serving the public’s best interest. It is intuitive that early fire growth intervention is the answer to improved performance at less cost and less risk. This is no mystery.

Continued reliance on “delayed intervention” places fire emergency responders at unnecessary risk.

If current codes were cost - performance oriented, there would be no need for *performance based design* and this grassroots movement would cease. Prescriptive cost accountability and performance measurability is necessary.

#### Introduction:

Fire is a momentum event. Current codes, the proposed “I” codes and NFPA’s 5000 code continue to treat fire under the philosophy of *successive destruction*. This philosophy *concedes* the fire origin building to be lost and is based on stopping conflagration. This outdated philosophy does not marry current technology to need. Our society has grown to be risk intolerant. Protection which has the intent of stopping fires at the nearest fire wall gives permission to still have Substantial Hostile\* fires. This fails societal expectations after the public pays \$ 10 - \$ 40/SF during construction for “fire safety provisions”.

Should a building burn to the ground after paying all those costs? “Yes” according to the above philosophy.

Would a change in philosophy to limit fire size to 1-2 rooms cost more? No. Adding one early intervention fire safety feature permits equivalent facilitation of protection allowing the deletion of a myriad of more costly latent performing fire safety features.

Truly effective fire protection is achieved in only two ways; stopping fires from occurring (fire prevention) and arresting fire growth before lethal heat and smoke levels occur (early intervention, QR fire sprinklers).

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Adjusting the philosophy to limit fire size to 1-2 rooms and non-hostile heat and smoke levels directly addresses the issue of fire momentum. Fire safety provision costs can be reduced to \$ 04 - \$ 10/SF.

How can this be? "A timely dose of water is of far more value than all other individual and collective possible fire safety features".

Perpetuation of the antiquated protection philosophy burdens society with unnecessary redundant provisions, higher costs, poorer fire safety performance and higher risks to fire emergency responders.

Our legal, risk and cost conscious society cannot afford code non performance which permits fire size in excess of fire service suppression response and capacities.

This document contains a basis concept and format for simplified cost efficient prescriptive fire safety provisions. It is a better starting point than proposed "new" codes. This concept provides time measurability and cost - benefit accountability.

### Fire Safety Discussion Points:

1. **Question:** What is the singular most effective method to protect buildings from fire induced loss?

Answer: Fire Sprinklers as detailed by NFPA 13 and 13R.

2. **Question:** What is the cost?

Answer: Typically \$ 1.00 - \$ 2.00/SF

3. **Question:** Is this an excessive cost?

Answer: When compared to the whole cost of construction or the cost of other forms of fire protective systems, the answer is "No". For instance, 1 HR construction typically costs \$ 4 -5/SF. Cost for construction ranges from \$ 40/SF (warehouses) to \$ 200/SF(hospitals) with \$ 80 - \$ 120/SF being the norm.

4. **Question:** How effective are fire sprinklers?

Answer: Fire Sprinklers typically limit a fire event direct heat damage to 1-2 rooms and limit fire duration to 1-3 minutes (closed floor plan) and 2-5 minutes (open floor plan) when using quick response sprinklers. Heat levels rarely exceed 300F-400F for a maximum of 2 minutes before temperatures are driven back down to near ambient conditions. Fire sprinklers are extremely effective and very reliable. High ceiling structures do not fit the above time frames but the high ceiling permits heat dispersion.

5. **Question:** Are there any other fire protective systems that limit direct heat damage to 1-2 rooms and 1-5 minute fire durations?

Answer: No

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6. **Question:** Is limiting direct heat loss damage to 1-2 rooms and fire duration to 1-5 minutes an acceptable risk level?

Answer: Most would say "yes".

**Statement: Fire sprinklers provide the best affordable service of property protection, occupant life safety and emergency responder life safety when they work.**

7. **Question:** What can make fire sprinklers ineffective?

Answer: From the Society of Fire Protection Engineers Tech Report 84-2;

- A. Sprinklers for the approximate 100 year period of 1870's to 1970's have a collective failure rate of about 4%.\*\*
- B. Sprinkler control valve(s) shut off or partially closed constitutes 67% of the 4% failure rate.
- C. Unaccounted for water supply degradation constitutes 12% of the 4% failure rate.
- D. Unaccounted for occupancy BTU escalation to above design levels constitutes 11% of the 4% failure rate.
- E. Substantially obstructed sprinklers constitutes 05% of the 4% failure rate.
- F. A wide array of reasons constitutes the final 05% percentage of the 4% failure rate.

\*\* Society of Fire Protection Engineers Technology Report 84-2.

8. **Question:** Are the above items (A-E) "controllable" by the fire service?

Answer: If funding is directed to fire prevention, yes, absolutely.

9. **Question:** If funding is directed towards fire prevention...would funding for fire suppression manpower and apparatus be able to be reduced?

Answer: Shifting funding towards fire prevention and less towards fire suppression is a tact several cities have enacted. In time, suppression funding is reducible. A timed "plan" needs to be enacted with high risk areas given first priority.

10. **Question:** Is fire prevention collaborative partnering for the potential causes of sprinkler failure an effective use of time and fire service dollars?

Answer: Yes, according to cities that have enacted this concept. The most recent validation is from the Austin Fire Department as was reported in the November-December 2002 *NFPA Journal*.

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11. **Question:** What are the major detriments or deterrents of shifting funding to this philosophy?

Answers;

- A. Fire Service lack of long term vision.
- B. Fire Service inability to “sell” the concept to Mayoral, City Funding Persons and/or Public.
- C. Fire Service unwillingness to buck status quo.
- D. Fire Service labor unions.
- E. Fire Service unwillingness to choose a path that has a perception of leading to reduced funding to the fire service.
- F. Fire Service disdain for the image change

12. **Question:** What happens to Occupant Life Safety (OLS) when a fire is limited to 1-2 rooms of direct heat involvement/1-5 minute fire duration and low maximum temperatures?

Answer: Loss history supports that egress tenability is not lost. Occupants not aware of fire development are able to escape.

13. **Question:** Have sprinklers always had this dramatic of effect on Occupant Life Safety?

Answer: No. Throughout the period of building code development, fire sprinklers have changed. Exiting codes began in the 1920's. At that time fire sprinklers were primitive, slower and considered only as a property protection system. The advent of the Quick Response (QR) sprinkler in the mid 1980's has validated these sprinklers life safety value. It has taken until the mid 1990's to develop a reasonable performance track record, which is impeccable.

14. **Question:** Do building occupants have to evacuate a building when QR sprinklers control a fire as designed?

Answer: The QR Sprinkler Federal Emergency Management (FEMA) demonstration trailer verified that fire is controlled before dangerous levels of smoke occur. Continued incident reports indicates occupants having to evacuate is rare. Often only those in the fire origin space or room are even aware that a fire occurred. Evacuation may be enacted as a safety precaution, but is not a necessity. Note: Washington Codes exhibit such confidence that handicapped Areas of Safe Refuge can be deleted when buildings are quick response “life safety” fire sprinklered.

15. **Question:** Assuming sprinklers work effectively as designed, what else is absolutely needed for safety?

Answers:

- A) prompt fire department notification (sprinkler flow switch)
- B) reasonable fire department access for speedy investigation and assessment of conditions (design review process).

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16. **Question:** What else is needed in the way of firewalls, rated corridors, construction materials, fire alarm systems, etc?

Answer: When sprinklers work as designed, none of the above items listed are needed, but some safety margin may be prudent for some occupancies.

17. **Question:** When is additional safety margin/redundancy prudent?

Answer: Occupancies with occupants that are asleep, physically restrained, physically, mentally or emotionally incapable of making wise self preservation/exiting decisions when sprinkler bells ring should have a form of additional protection.

18. **Question:** What redundancy works best?

Answer: Any form of provision that focuses on extending egress path tenability. Some spaces may lend best towards rated corridors, some towards smoke detection in egress paths/occupant notification, use of high ceiling heights to allow additional egress time or smoke management. All are excellent forms of redundancy. Double redundancy would call for 2 of these concepts to be implemented.

19. **Question:** For the remote case of fire sprinkler total failure, what should be done?

Answer: Stepped up fire prevention (Question # 11) limits this propensity to a statistically rare occurrence. The following safeguards are also needed;

- A) assure that sprinkler water controlling valves are electronically supervised
- B) assure that sprinkler controlling valves are locked off from the public and building occupants.

The failure rate should be considered as acceptable risk because this failure rate is lower than the failure rate delivered by current codes. The answer is nothing more should be done.

20. **Question:** This seems too simplistic, is this reasonable?

Answer: "Why has it been made so complicated?". Fire provisions starting in the early 20<sup>th</sup> century were based on the concept that the fire person/fire truck/fire hydrant/fire flow was the primary form of fire protection and that a substantial hostile fire \* would be occurring when the fire service arrives. And it was true. Since it is assumed a substantial hostile fire is probable, all manner of annoying minor provisions have been added to codes over time to chip away at continued high loss levels.

The foundational philosophy of building code fire safety requirements is that the fire origin building is sacrificed and fire spread is stopped by successive fire slowing at fire walls or at property lines by the fire service.

\* Definition of Substantially Hostile Fire: "A fire that has lethal smoke or heat levels"

Under the current code (Uniform Codes) sprinklers are second or third tier protective systems. When one reverses the foundational philosophy to make sprinklers the primary protective system, there is not a substantial hostile fire to fight. All the piecemeal loss

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reduction provisions become unnecessary.

An analogy is provided: A mechanical fan is the heart or primary element of a mechanical system. If one installs the wrong type of fan in a building, it will always have poor performance. But it is installed. All manner of fixes can be attempted; bump up the speed, alter a duct here, tweak the system there, reduce BTU loading, etc. The answer typically is a patchwork of small fixes. What is needed is to acknowledge the fundamental issue and make the one big change - put in the right fan. When this change is made, all the other "helps" are unnecessary.

In fire safety, the ineffective primary defense system of fire person/fire truck/fire hydrant/fire flow as the primary form of fire protection permits substantial hostile fires. The resultant risk levels are not acceptable. Over time code regulators have been forced to load up codes with a myriad of tweaks and fixes to overcome the fundamental deficiency.

The foundational code precept is archaic and incongruent with 21<sup>st</sup> century societal needs. The primary protective system for all buildings needs to be fire sprinklers, not fire hydrants.

All of us in the fire safety field have hundreds of pictures of burned out building hulks with working fire hydrants in the foreground or background. Is this "success"? Tell it to the building owner.

On the other hand, the number of buildings that have burned to the ground that have been sprinklered one can counted on one hand. Of those few, all could have been prevented by stepped up cooperative fire prevention efforts.

Where's the mystery? This is not rocket science. Revise the foundational philosophy to the proven effective system. Delete the fluff; the cost of construction will decrease while actual protection increases.

21. **Question:** The criticism of this philosophy is that one is putting all of one's eggs in one basket. The question is often posed in the form of "Are Sprinklers Enough?". Is this criticism valid?

Answer: Sprinklers are enough when they work as designed. Sprinklers act in 3 ways; they are detectors, they pinpoint where the fire is. Sprinklers act to suppress at the pinpointed location. Sprinklers call the fire department for back-up. The fire department arrives early enough to pressurize the sprinkler pumper connection to make the sprinklers super efficient...therefore limiting risk to emergency responders. In reality sprinklers provide the automatic mechanism to a 2<sup>nd</sup> form of protection.

Why is it that after a big fire, the one thing owners do different is that they sprinker when they rebuild? What are they being told? The fire service is telling them "if this building had been sprinklered, this would not have happened". Insurance companies do not give substantial credit for anything other than properly designed and installed fire sprinklers. Occasionally very large plants receive credit for a very specific type of 4 HR wall (maximum foreseeable loss barrier).

In the UBC Chapter 34 (protection of existing buildings) the one feature that is absolutely required to negate existing construction deficiencies....is sprinklers.

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Fire sprinklers are recognized as the single most valued loss reduction tool in every way....except new construction building codes. Why?

Fire sprinklers are 3" tall firemen placed in buildings...in every room.....each with a ½" hose line. Fire sprinklers perform two tasks; efficient suppression-fire control and the flow switch which calls the fire service early in the fire. This is a 1-2 punch. When combined with safeguards against sprinkler failure, very very few buildings will experience substantial hostile fires.

The singular most effective method to protect buildings from fire induced loss should be the primary basis for building code fire safety. This is intuitive.

The results of a 10 year study came out in 2002. 10 years ago the City of Vancouver BC Fire Department acknowledged the only way to save lives in homes was to sprinkler. After 10 years they are the only populous (of over 500,000 persons) to have a record of no loss of lives in (sprinklered) homes. If sprinklers can have zero loss in the more risky occupancy of single family homes, then they can very adequately protect commercial buildings and commercial building occupants.

22. **Question:** In total, what would be the fire safety requirements for buildings under this concept?

Answer: All buildings would be required to have;

1. UBC Chapter 8/Chapter 10 egress provisions: This is a 99% plus Safety System. For purposes of this document, this is Basic Safety System # 1.
2. UBC Chapter 9 fire sprinkler provisions: This is a 99% plus Safety System. Additional safeguards against valve closures would be required above and beyond current provisions. Basic Safety System # 2.
3. Automatic Reporting Flow Switch - Fire Service Manual Suppression aided by Pre-Fire Planning/Reasonable Access. This element can be considered a safety system because there is a reliable method that calls the fire service to action. In some cases additional fire flow requirements would be required if access is marginal. Severely restricted access would call for standpipe systems and safe areas. Basic Safety System # 3.
4. Cooperative Partnered Fire Prevention Program with emphasize on sprinkler system potential failure aspects. Basic Safety System # 4.
5. Specific occupancies with "at risk" occupants are best protected with egress path additional protection (rated corridors, fire detection alarm systems or intrinsically safe paths (high ceilings). Basic Safety System # 5.
6. Retain the Fire Code & specific UBC provisions which detail how to live with the contents we put into buildings (H occupancies, etc). Basic Safety System # 6. Specific alternative form occupancies (Chapter 4 for example) for specific additional features.

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7. Retain Property Line/Exterior wall provisions. Alter to include better value of fire sprinklers more like NFPA 80A or ISO Guide. Basic Safety System # 7.
  8. The 7 Basic Safety Systems would be required for all buildings. The above provisions **are all the requirements that are needed to satisfy occupant life safety, property protection and neighbor property protection issues.**
  9. The issue of emergency responder life safety for the unusual case fire remains purposely not addressed. This discussion between owner/designers and the fire service needs to be based in realism as opposed to statically remote circumstances. It is expected that 95% plus of buildings would be adequately protected by the SEVEN BASIC SAFETY SYSTEMS. The fire service shall develop a list of "helps" of which 1-2 additional elements from this list may be required for best service by the fire service for unusual risk to emergency responder situations. Additional elements are expected to be exception as opposed to the rule and must have clear and distinct justification.
  10. A 8<sup>th</sup> Safety System is prudent to discuss. People. People in buildings are excellent detectors. The human nose ferrets out low smoke levels long before standard smoke detection. Humans have been the primary Occupant Life Safety system (OLS) for "B", "F", "M" and "S" occupancies for the past 50 years. The life history loss record is incredibly low. This factor cannot be counted as a safety system because occupancy levels vary, however, it should be noted human detectors are a highly reliable safety system that is present and automatically operable whenever humans are awake in buildings.
23. **Question:** All buildings?
- Answer: This concept would be for all buildings. The 7 Safety System concept provides a high level of protection for all buildings. "Acceptable Risk" is established by the standardized risk outcome of these systems working. The standardization of protective systems simplifies construction requirements, simplifies enforcement by regulatory agencies and reduces the "grounds" for legal battles to occur.
24. **Question:** What causes high risk to emergency responders?
- Answer: Unchecked fire growth for periods of more than 4-5 minutes causes the fire service to have to deal substantial hostile fires.
25. **Question:** Would risk to fire emergency responders be lower using the 7 Safety System Concept provided in Question 22 than the risk incurred by our current building code designated protection?
- Answer: Yes
- This philosophy limits a fire from achieving substantial hostile fire size and increases fire service involvement in buildings and building design. Fire responder lack of awareness of hazards in buildings is a key contributor to loss of life and injury to emergency responders. In small buildings which would not be sprinklered by current codes but would be sprinklered under this philosophy, the risk factor is tremendously reduced.

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26. **Question:** What would be the projected loss of occupant and emergency responders lives and property loss dollars if buildings had the 7 Safety System concept?

Answer: Losses would be substantially less than current codes deliver on all 3 counts. For buildings that current code require to be sprinklered losses would be similar but there would be greater reliability of primary system performance.

27. **Question:** Would the cost of fire safety protection be lower than the costs incurred by our current building code designated protection?

Answer: Yes, as qualified below;

There may be \$ 1 - \$ 2/SF cost increase for small buildings. In general, the extra sprinkler cost would be offset by reduced other form of protection costs. The vast majority of buildings would save \$ 10 - \$ 30/SF. See later costing questions for more information.

28. **Question:** What should fire safety provisions cost?

Answer: Costs for most building fire safety provisions (except remote site) should predictably be in the \$ 4.00 - \$ 10.00/SF range for all buildings. Beyond the cost of the 7 Safety Systems, there are no additional features which provide a significant incremental increase in safety for their cost. Current code fire safety provisions induce costs of \$ 4.00 - \$ 40.00/SF.

29. **Question:** Can you provide a general breakout of Question # 28 costs based on Question # 22 provisions?

Answer: Yes, these are where costs would be incurred.

1. Safety System # 1: Chapter 8/10 Egress provisions: Functionally most buildings require forms of egress but not redundant paths: Estimate \$ 3 - 6/SF.
2. Safety System # 2: Chapter 9 Fire Sprinklers: \$ 1 - \$ 2/SF. There are ways to reduce costs for remote sites.
3. Safety System # 3: Manual Fire Service - No change in costs, manpower time shifts to Point # 4.
4. Safety System # 4: Cooperative Fire Prevention - See Point # 3.
5. Safety System # 5: Special Occupancy Egress Enhancement(s): \$ 1 - \$ 3/SF
6. Safety System # 6: Fire Code - Higher Hazard Protection \$ 0 - \$ 10/SF.
7. Safety System # 7: Property Line Protection \$ 1 - \$ 3/SF.

**Basic System Cost of Protection: \$ 6 - \$ 24. Most would be in the \$ 6 - \$ 10 range.**

1. Fire Service Special Condition "helps": \$ 1 - \$ 2/SF.

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30. **Question:** What is an example of current code costs and from what requirements?

1. Cost of Fire Safety for a "B" Occupancy Academic Classroom Building. The following example is the cost for a 150,000 SF building with Atrium. Total hard and soft costs: \$ 175/SF. Fire Safety Related Costs:
2. Structural Type II - FR vs Type II - N \$ 95 - \$ 73 = \$ 22/SF
3. Architectural - Plan ..... \$ 7/SF  
corridors, area separations, occupancy separations, shafts, membranes, stairwells, finish materials, glazing, doors, hardware, etc.
4. Civil Engineering..... \$ 3/SF  
large water mains, fire hydrants, access roads
5. Mechanical Engineering..... \$ 3/SF  
fire/smoke dampers, ductwork ,materials, duct layout, equipment safeguards, duct smoke detection
6. Electrical Engineering..... \$ 2/SF  
wiring and conduit for all other trades, plenum wire, elevator recall  
(Note: can be higher if communications systems required)
7. Fire Protection Engineering..... \$ 3/SF  
suppression, fire alarm, standpipe systems
8. Total Cost of Fire Safety Features..... \$ 40/SF
9. NFPA Fire Incident Reporting indicates an average of 2 occupant fire deaths per year in "B" occupancies, 0 actual occupant deaths/year in fire sprinklered "B" occupancies.

31. **Question:** Would cities and localities benefit from changing to this simpler higher performing protection philosophy?

Answer: Building and Fire departments are exposed to liability proportionate to the number of requirements they administer. Lesser number of provisions to enforce means lesser regulatory costs and lesser legal liabilities.

32. **Question:** Would fire departments become obsolete?

Answer: No. Our world is far from enacting fire protection where it is desperately needed... sprinklers in one and two family residences. Populations will continue to grow and more homes will be built unsprinklered. We will always need fire suppression for residential buildings and as the back-up for commercial buildings. Under the philosophy presented in this document fire service personnel time is shifted to be more effective....to increased fire prevention efforts and less (risky) suppression efforts. This concept enables fire department personnel to have a greater positive public presence. According to the Phoenix Fire Department Fire Chief, "visibility is viability".

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33. **Question:** Would fire department personnel's time become more effective?

Answer: Stopping fires (fire prevention) before they start is more efficient than attempting to limit loss of actual fires (and less risky!). A fire chief that went into administration...to a role of telling owners that sprinklers will save their building(s) comments that he has saved more buildings in his 28 months in administration than his 28 years as a fire emergency responder.

34. **Question:** Does the proposed International Codes (ICC) provide satisfactory performance per cost and performance per societal expectations?

Answer: A very good question. "No". One can see a positive trend but the code provisions are still based on "stop substantial hostile fire spread with fire hydrants/fire service at fire walls"..as opposed to automatic fire sprinkler performance.

35. **Question:** Does the NFPA 5000 Code provide satisfactory performance per cost and performance per societal expectations?

Answer: Another very good question. The first draft of NFPA 5000 utilized avant garde free thinking tracking along the lines of this document. In a sad moment in history, the code development committee capitulated to status quo peer pressure. NFPA, of all fire agencies, has the data to develop true risk based provisions and did not do it.

36. **Question:** Does the building size - type of construction "area limits" tables make sense?

Answer: No. Effective loss reduction is achieved by limiting fire size, not building size.

To a large extent construction materials are self governing. Structural engineers must follow strict rules for structural strength to comply with vertical and lateral loads. These rules against collapse safety adequately provide fire safety. For example, a 10 story building requires concrete and steel because wood is cost prohibitive at the required load factors.

37. **Question:** If this formula for success produces lower loss levels and lower risk levels at lower costs to the majority of building projects, why is it not being considered or implemented?

Answer: Good Question!

One can only speculate that this simplistic of an approach would cause too many to lose their jobs.

38. **Question:** Would fire protection engineers profit from this protection philosophy change?

Answer: Our business, as is true for all niche businesses, thrives on codes and system requirements being too complex for ordinary business people to understand and enact on their own. We usually need 60-80 projects ongoing to support our business. The proposed change would simplify and reduce our workload per project by about ½. We would need to go out and get twice as many projects as our current workload to maintain the same income. There is no windfall or specific profit in it for us.

39. **Question:** There is the old adage from owners that they are insured and should not need to provide sprinklers or other protection elements. How does this enter into this concept?

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Answer: Statistically (Factory Mutual) no more than 20-30% of businesses that experience a substantial fire recover to their prior profitability level. The best reasons to protect to this level is reduced insurance rates **and** minimizing disruption to lives. One needs to equate a fire event trauma to the more commonly experienced car accident trauma. What are people's lives like after a significant auto accident event? Live's are interrupted. Multiply that by a factor of 10 or 20. Normal daily activities are pushed aside. Business is interrupted. Our "must have now" business climate does not tolerate minor delays much less major ones. The internet provides ready alternatives for non delivery or excuses. Client loyalties are low.

While the business or property owner may collect insurance money and come out okay, a fire impacts a wide range of people from employees to employee families to the community detrimentally. These people do not get insurance money. In reality, no one wins as a result of fire devastation.

40. **Question:** Do codes (as they relate to fire safety) do what we as a cost and performance conscious society need them to do?

Answer: No. We have the technology to inexpensively limit a fire event to non lethal levels of smoke and heat. Substantial Hostile Fires are not tolerable to owners, occupants, the fire service or building code regulators.

41. **Question:** What changes should be made to make fire safety provisions match societal needs?

Answer:

- Cost accountability mandates a change to a code provision system whereby reasonably informed persons can discern that the fire safety provisions they are being required to buy has clear and specific value and is not unnecessarily redundant with other provisions.
- Codes should have clear specific goal setting, a definition of success and a definition of failure.
- "Acceptable risk" should not be veiled or imbedded. A clear statement of expectations to solve "expected" or "extreme" events is needed. A clear statement of assignment of redundant provisions due to anticipation of other system(s) failure is needed.
- Each code provision should have a clear stated purpose. **This** provision is for occupant life safety, emergency responder life safety, property protection, etc.
- A summary list should be available to discern if there are redundant provisions.
- Performance efficacy should be readily viewable and understandable by the public. As it is now, it is like priests of old pretending the public cannot understand the rules.
- Societal need is to not have substantially hostile fires in buildings. Common sense understands that \$ 1 - 2/SF is an excellent value if this effectively limits loss to 1-2 rooms. Building codes should reflect this.

42. **Question:** Are you suggesting that "Acceptable Risk" be defined by the risk consequence of the 7 Safety System protection concept?

Answer: Yes, that is exactly what I am suggesting. In 95% plus buildings which are constructed under Chapter 3 and Chapter 5 requirements of the UBC (or IBC), no more and no less is needed. This document addresses the major aspects of fire safety. It is noted

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that some minor points will need to be added, this is a “breaking trail” type document. The 7 Safety System concept presented answers the need for higher fire safety performance at less cost to the public and less legal liability for regulatory agencies. It also accomplishes two other critical tasks. This simplified prescriptive path solution reduces the need for “performance” based design alternative strategies.

43. **Question:** Please summarize what the specific objectives of this document are?

Answer: There are 3 specific goals;

1. Goal # 1 is to highlight to the public the expensive fatal flaw of current codes, the proposed “I” codes and NFPA 5000. Building owners are the “buying public”. A buyer deserves to clearly know what the “deliverable” is that their fire protection dollars are buying. Code idiom masks the fact that fire origin buildings are under-protected (sacrificed). The zillions of fire safety features required by codes sets the public up with false and unrealistic expectations of what will be left of their building if a 2 AM fire strikes an unsprinklered building which is “code compliant” and is reliant on passerby notification to the fire service. Fire provisions need a greater level of accountability. Any regulatory document should in it’s initial statements make a clear statement as to the objectives the regulations attempt to accomplish. Codes need to define what is code “success” and what is code “failure” in real life terms in a way the public can understand. Code primary protective philosophy developed 50 years should not be carried forth.  
**The establishment and setting of Specific Risk Consequence Goals is absolutely needed. “Safe” needs to be defined in trackable terms and needs to be fiscally in line with costs to prevent other life loss per capita.**
2. Goal # 2 is to encourage (encourage means to “inspire to courage”) the fire service to be vocal about what makes the best sense for public buildings. The fire service needs to be very vocal about the value of fire sprinklers in reducing fire risk to emergency responders. At \$ 1-2/SF cost, there is no excuse for substantial hostile fire conditions to place fire persons at risk. As is, the fire service takes the brunt of criticism when buildings burn down when it is the underlying antiquated building code protection philosophy at fault.
3. Excellent fire safety need not be expensive. Fire safety is not rocket science. This document lays a framework for a new simplified protective concept that delivers excellently but not excessively.

It should be understood that ZERO loss of life is an unobtainable goal at any price and at any amount of legislation. If ZERO loss is defined, then we must also accept ZERO loss in all other aspects of risk and risk management. We will need to expect all domestic flights to have 4 pilots on board (spaced appropriately apart at all times except for the two in the cockpit) and escorts from fighter planes. We will need to expect street lights at every corner.

This protection concept puts costs in perspective with risk. To spend more is to spend disproportionately for the increment increase in safety gain. Fire deaths are rare compared to many any other ways to die in our fast paced society. **Expense to protect against fire deaths disproportionate to other death causes per capital is fiscally irresponsible.**

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The Basic 7 Safety System concept provides a start point for the development of a mission statement with specific risk performance objectives. "Success" can be compared against the risk outcomes of buildings built under prior codes. An example of such a goal could be "no more than one fire death of persons not intimate with fire origin in 250,000 fires in "B" occupancy buildings. Another fire safety goal could be no more than one emergency responder death in 50,000 fire responses. Another would be for property loss damage in dollars.

44. **Question:** Do you think the publication of this document will change anything?

Answer: No. In order for something to be fixed, it must first be perceived as being "broken". The building code world does not perceive their codified fire safety provisions to be broken.

Fire science shows there are numerous ways to protect buildings better...for less cost. Emergency fire service responders experientially know that this document outlines an optimum protection concept.

45. **Question:** What is the answer?

Early intervention (fire sprinklers) are for buildings what seat belts are for auto-mobiles. It took time for the value of seat belts to be realized. Once realized, seat belts became mandatory equipment. It is time for sprinklers to be mandatory equipment for buildings. The one difference in this analogy is that we did not over load automobiles with multitudinous band-aids meant to do what seat belts do.

The answer is...sprinklers are needed in all buildings. Employ the performance efficacy of early intervention sprinklers and embrace the resultant simplicity. Remove the extra's that were necessary under the prior protection philosophy. Revise code's specific goal to be "elimination of Substantial Hostile Fire" conditions.

Define Fire Service "Success": An Example: Substantial fire extinction achieved within 10 minutes after active manual suppression begins with no more than 1 lost life per 250,000 fires".

Address Comments to: Scott R. Creighton  
Creighton Engineering Inc.  
210 N. University Rd, Suite 100  
Spokane, WA 99206  
[src@creightoneng.com](mailto:src@creightoneng.com)

Please do not use the email "reply" function unless using inserted text as your means of response.

Sincerely,

By Scott R. Creighton (F) PE