# PUBLIC CODE CHANGE PROPOSAL FORM
## FOR PUBLIC PROPOSALS IN THE INTERNATIONAL CODES

## 2009/2010 CODE DEVELOPMENT CYCLE
## CLOSING DATE: All Proposals Must Be Received by June 1, 2009

**The 2009/2010 Code Development Hearings are tentatively scheduled for October 24-November 11, 2009, Baltimore, MD.**

**1)**

| | | | |
|---|---|---|---|
| **Name: Patrick Siegman, Peter Swift & John Norquist** | | **Date: June 1, 2009** | |
| **Jurisdiction/Company: Nelson\Nygaard Consulting Associates, Swift & Associates, Congress for the New Urbanism** | | | |
| **Submitted on Behalf of: Congress for the New Urbanism** | | | |
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**2)** **Copyright Release: In accordance with Council Policy #28 Code Development, all Code Change Proposals, Floor Modifications and Public Comments are required to include a copyright release. A copy of the copyright release form is included at the end of this form. Please follow the directions on the form. This form as well as an alternative release form can also be downloaded from the ICC website at www.iccsafe.org. If you have previously executed the copyright release for this cycle, please check the box below:**

**___ 2009/2010 Cycle copyright release on file**

**3)** Indicate appropriate International Code(s) associated with this Public Proposal – Please use Acronym: **IFC**

If you have also submitted a separate coordination change to another I-Code, please indicate the code: _____
(See section below for list of names and acronyms for the International Codes).

**4)** **Be sure to format your proposal and include all information as indicated below and in the Code Change Proposal Instructions' section on Page 2 of this form.**

**5)** Proposals should be sent to the following offices via regular mail or email. An e-mail submittal is preferred, including an electronic version, in either WordPerfect or Word. The only formatting that is needed is **BOLDING**, ~~STRIKEOUT~~ AND UNDERLINING. Please do not provide additional formatting such as tabs, columns, etc., as this will be done by ICC. **REMOVE TRACKING CHANGES, AUTOMATIC NUMBERING, OR ANY OTHER ADVANCED FORMATTING TOOLS THAT ARE PROVIDED BY WORD, FROM FILES CONTAINING YOUR CODE CHANGE PROPOSAL THAT YOU SEND TO ICC.**

Please use a separate form (see page 3) for each proposal submitted. Note: All code changes received will receive an acknowledgment by approximately June 21, 2009. Please contact the ICC staff listed below if you do not receive an acknowledgment by June 21, 2009.

Please check here if separate graphic file provided. √**YES** Graphic materials (Graphs, maps, drawings, charts, photographs, etc.) must be submitted as separate electronic files in .CDR, IA, TIF or .JPG format (300 DPI Minimum resolution; 600 DPI or more preferred) even though they may also be embedded in your Word or WordPerfect submittal**.**

**Code**
IBC - International Building Code
IEBC - International Existing Building Code
IFC - International Fire Code
IFGC - International Fuel Gas Code
ICC PC - ICC Performance Code
IPC - International Plumbing Code
IPSDC - International Private Sewage Disposal Code
IPMC - International Property Maintenance Code
IWUIC - International Wildland-Urban Interface Code
IZC - International Zoning Code

IECC - International Energy Conservation Code
IMC - International Mechanical Code
IRC - International Residential Code

**Send to:**
International Code Council
Chicago District Office
Attn: Diane Schoonover
4051 West Flossmoor Road
Country Club Hills, IL 60478-5795
Fax: 708/799-0320
codechanges@iccsafe.org

# CODE CHANGE PROPOSAL INSTRUCTIONS

*Please provide all of the following items in your code change proposal (see form on page 3). Your proposal should be entered on page 3 as a separate file. However, please read the instructions provided below for each part of the code change proposal. The sections identified in parentheses are the applicable sections from CP #28 Code Development. The full procedures can be downloaded from www.iccsafe.org.*

## PROPOSAL FORMATTING:

Show the proposal (see form on page 3) using ~~strikeout~~, underline format. At the beginning of each section, one of the following instruction lines are also needed:

- •Revise as follows
- •Add new text as follows
- •Delete and substitute as follows
- •Delete without substitution

The only formatting that is needed is **BOLDING,** ~~STRIKEOUT~~ AND UNDERLINING. Please do not provide additional formatting such as tabs, columns etc. as this will be done by ICC. **DO NOT USE THE TRACKING CHANGES OPTION, AUTOMATIC NUMBERING, OR ANY OTHER ADVANCED FORMATTING TOOLS PROVIDED BY WORD.**

## SUPPORTING INFORMATION: (3.3.4 & 3.4)

The following items are required to be included in your proposal (see form on page 3):

**1.** The proponent shall clearly state the purpose of the proposed code change (e.g., clarify the Code; revise outdated material; substitute new or revised material for current provision of the Code; add new requirements to the Code; delete current requirements, etc.)

**2.** The proponent shall justify changing the current code provisions, stating why the proposal is superior to the current provisions of the Code. Proposals that add or delete requirements shall be supported by a logical explanation which clearly shows why the current Code provisions are inadequate or overly restrictive, specifies the shortcomings of the current Code provisions and explains how such proposals will improve the Code.

**3.** The proponent shall substantiate the proposed code change based on technical information and substantiation. Substantiation provided which is reviewed in accordance with Section 4.2 and determined as not germane to the technical issues addressed in the proposed code change shall be identified as such. The proponent shall be notified that the proposal is considered an incomplete proposal in accordance with Section 4.3, and the proposal shall be held until the deficiencies are corrected. The proponent shall have the right to appeal this action in accordance with the policy of the ICC Board. The burden of providing substantiating material lies with the proponent of the code change proposal. A minimum of two copies of all substantiating information shall be submitted.

**4.** The proponent shall submit a bibliography of any substantiating material submitted with the code change proposal. The bibliography shall be published with the code change and the proponent shall make the substantiating materials available for review at the appropriate ICC office and during the public hearing.

## REFERENCED STANDARDS: (3.4 & 3.6)

List any new referenced standards that are proposed to be referenced in the code and provide a minimum of two copies. For ICC rules on referenced standards, see Section 3.6 of CP #28. Additional copies will be required for committee members. ICC staff will provide you with a mailing list for the appropriate committees.

## COST IMPACT: (3.3.4.6)

The proponent shall indicate one of the following regarding the cost impact of the code change proposal:

1) The code change proposal will increase the cost of construction; or
2) The code change proposal will not increase the cost of construction.

This information will be included in the published code change proposal.

## CODE CHANGE SUBMITTAL EXAMPLE

**Code: IBC–09/10**
**705.1**

**Proponent:** John Doe, P.E., Acme Building Corporation, Inc, representing himself

**Revise as follows:**

**705.1 General.** Each portion of a building separated by ~~one or more~~ a fire wall~~s~~ that ~~comply~~ complies with the provisions of ~~this section~~ Section 705 shall be considered a separate building.

**Reason:** A fire wall complying with Section 705 establishes the equivalent of separate buildings on either side of the fire wall. This proposal provides text that more succinctly states this purpose of a fire wall.

**Cost Impact:** The code change proposal will not increase the cost of construction.

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

**CODE CHANGE PROPOSAL FORM**

(See instructions on page 2)

# Code: IFC–09/10 *(IBC, IEBC, IECC, IFC, IFGC, IMC, IPC, IPSCDC, IPM, IRC, ICCPC, IWUIC, IZC)*

***Code Sections/Tables/Figures Proposed for Revision (3.3.2); Note:*** *If the proposal is for a new section, indicate (new).*

## (New) Appendix I

**Proponent:** ***Name/Company/Representing (3.3.1):*** *(NOTE: DO NOT USE ACRONYMS FOR YOUR COMPANY OR ORGANIZATIONAL NAME)*

Patrick Siegman, Principal, Nelson\Nygaard Consulting Associates, representing the Congress for the New Urbanism
Peter Swift, Owner, Swift and Associates, representing the Congress for the New Urbanism
John Norquist, CEO, Congress for the New Urbanism

**Revise as follows:**

# Proposed *Street Design for Life Safety* Appendix

This Section contains the proposed code change for the *Street Design for Life Safety Appendix* for the International Fire Code.

**Add new text as follows:**

## APPENDIX I - STREET DESIGN FOR LIFE SAFETY

### SECTION 101 GENERAL

**101.1 Intent.**

The purpose of this appendix is to allow jurisdictions to adopt performance-based requirements for fire apparatus access roads, in order to achieve all of the following purposes:

1. Establish the minimum requirements consistent with nationally recognized good practice for providing a reasonable level of life safety and property protection from the hazards of fire, explosion or dangerous conditions in new and existing buildings, structures and premises and to provide safety to fire fighters and emergency responders during emergency operations.

2. On the new and existing fire apparatus access roads required by and regulated by this code, establish requirements consistent with nationally and internationally recognized good practice for achieving a reasonable level of overall life safety, by taking into account and balancing the need to prevent road traffic deaths and injuries and the need to safeguard against the hazards of fire, explosions and other dangerous conditions.

This proposed code change provides an appendix that allows, but does not require, a jurisdiction to substitute revised material for current provisions of the code. That is, if the appendix is adopted by a jurisdiction, then the jurisdiction has elected to substitute revised materials for current provisions of the code. This appendix is intended to allow jurisdictions to take an approach to the design of fire apparatus access roads that improves overall life safety, by allowing jurisdictions to adopt roadway designs that strike the best possible balance between reducing the hazards of fire and reducing road traffic deaths and injuries, given the jurisdiction's own particular circumstances and particular choice of fire apparatus.

**101.2 Scope.**

If this appendix is adopted by a jurisdiction, then the following changes to the current provisions of the code come into effect within the jurisdiction.

**Revise *APPENDIX CHAPTER 1-ADMINISTRATION, SECTION 101 GENERAL, Section 101.2 Scope* as follows:**

# APPENDIX CHAPTER 1-ADMINISTRATION

## SECTION 101 GENERAL

### 101.2 Scope.

This code establishes regulations affecting or relating to structures, processes, premises and safeguards regarding:

1. The hazard of fire and explosion arising from the storage, handling or use of structures, materials or devices;

2. Conditions hazardous to life, property or public welfare in the occupancy of structures or premises;

3. Conditions hazardous to life, property or public welfare on or relating to the design of fire apparatus access roads, including the hazards of traffic, fire, explosion and other dangerous conditions;

4.~~3.~~ Fire hazards in the structure or on the premises from occupancy or operation;

5.~~4.~~ Matters related to the construction, extension, repair, alteration or removal of fire suppression or alarm systems.

**Revise *APPENDIX CHAPTER 1-ADMINISTRATION, SECTION 101 GENERAL, Section 101.3 Intent* as follows:**

### 101.3 Intent.

The purpose of this code is to establish the minimum requirements consistent with nationally recognized good practice for providing a reasonable level of life safety and property protection from the hazards of fire, explosion or dangerous conditions in new and existing buildings, structures and premises and to provide safety to fire fighters and emergency responders during emergency operations. Additionally, on the new and existing fire apparatus access roads required by and regulated by this code, the purpose of this code is to establish requirements consistent with nationally and internationally recognized good practice for achieving a reasonable level of overall life safety, by taking into account and balancing the need to prevent road traffic deaths and injuries and the need to safeguard against the hazards of fire, explosions and other dangerous conditions.

**Revise *SECTION 503 FIRE APPARATUS ACCESS ROADS, Section 503.2.1 Dimensions* as follows:**

### Section 503.2.1 Dimensions.

Fire apparatus access roads shall have an unobstructed width ~~of not less than 20 feet (6096 mm), except for approved security gates in accordance with Section 503.6,~~ and an unobstructed vertical clearance ~~of not less than 13 feet 6 inches (4115 mm).~~ that permits passage of the jurisdiction's fire apparatus and, wherever necessary, provides adequate space for deploying the jurisdiction's fire apparatus and for conducting fire and rescue operations.

~~**503.2.2 Authority.**~~

~~The fire code official shall have the authority to require an increase in the minimum access widths where they are inadequate for fire or rescue operations.~~

### 503.2.3 Surface.

Fire apparatus access roads shall be designed and maintained to support the imposed loads of fire apparatus and shall be surfaced so as to provide all-weather driving capabilities.

**503.2.4 Turning radius.**

The required turning radius of a fire apparatus access road shall ~~be determined by the fire code official.~~ provide for the passage of the jurisdiction's fire apparatus.

**503.2.5 Dead ends.**

Dead-end fire apparatus access roads in excess of 150 feet (45 720 mm) in length shall be provided with an approved area for turning around fire apparatus.

**503.2.6 Bridges and elevated surfaces.**

Where a bridge or an elevated surface is part of a fire apparatus access road, the bridge shall be constructed and maintained in accordance with AASHTO HB-17. Bridges and elevated surfaces shall be designed for a live load sufficient to carry the imposed loads of fire apparatus. Vehicle load limits shall be posted at both entrances to bridges when required by the fire code official. Where elevated surfaces designed for emergency vehicle use are adjacent to surfaces which are not designed for such use, approved barriers, approved signs or both shall be installed and maintained when required by the fire code official.

**503.2.7 Grade.**

The grade of the fire apparatus access road shall be ~~within the limits established by the fire code official based on the fire department's apparatus.~~ limited to grades that permit passage by, and, wherever necessary, fire and rescue operations by, the jurisdiction's fire apparatus.

**503.2.8 Design for road traffic safety.**

Fire apparatus access roads shall be designed and maintained so as to minimize road traffic deaths and injuries, while maintaining adequate provision for the passage of fire apparatus and for fire and rescue operations. To achieve these goals, fire apparatus access roads shall be designed and maintained to both: (a) permit passage of the jurisdiction's fire apparatus and, wherever necessary, provide adequate space for deploying the jurisdiction's fire apparatus and conducting fire and rescue operations; and (b) minimize excess and inappropriate vehicle speeds.

**Reason:**
The text below attempts to provide clear and succinct answers to the questions asked for in the "Supporting Information" Section of the Code Change Proposal Instructions. That is, the following paragraphs state the purpose of the proposed code change, justify changing the current code provisions and seek to explain why the proposed code change is superior to the current provisions of the code.

**1. What is the purpose of this proposed code change (e.g., clarify the code; revise outdated material; substitute new or revised material for current provision of the code; add new requirements to the code; delete current requirements, etc.)?**

Response:

This proposed code change provides an appendix that allows, but does not require, a jurisdiction to substitute revised material for current provisions of the code. That is, if the appendix is adopted by a jurisdiction, then the jurisdiction has elected to substitute revised materials for current provisions of the code. This approach will allow jurisdictions to take an approach to the design of fire apparatus access roads

that we believe improves overall life safety, by allowing jurisdictions to adopt roadway designs that strike the best possible balance between reducing the hazards of fire and reducing road traffic deaths and injuries, given the jurisdiction's own particular circumstances and particular choice of fire apparatus. By allowing, but not requiring, jurisdictions to adopt this proposed appendix, the ICC will make it possible for jurisdictions to demonstrate the efficacy of this approach, without taking the more far-reaching step of simply altering the basic code.

**2. What is the justification for changing the current code provisions? Why is the proposal superior to the current provisions of the code? Proposals that add or delete requirements shall be supported by a logical explanation which clearly shows why the current code provisions are inadequate or overly restrictive, specifies the shortcomings of the current code provisions and explains how such proposals will improve the code.**

Response:

The current International Fire Code specifies dimensions for fire apparatus access roads. Three key points about fire apparatus access roads should be noted:

1. The code requires that at least one fire apparatus access road be provided for every facility, building or a portion of the building hereafter constructed or moved into within a jurisdiction.

2. The code defines a fire apparatus access road as a road that provides fire apparatus access from a fire station to a facility, building or portion thereof.

3. The code defines fire apparatus access road as a general term inclusive of all other terms such as fire lane, public street, private street, parking lot lane and access roadway.

Therefore, since at least one fire apparatus access road must reach from a fire station to every building and facility constructed once the code is adopted, **the current International Fire Code specifies the key dimensions of many, if not most, public and private streets.**

This is significant not only for fire safety, but also for road safety. A substantial body of traffic safety research literature has found conclusively that the dimensions of streets significantly affect road safety. Therefore, **the current International Fire Code sets specifications for the design of many, if not most, public and private streets, and these specifications significantly affect traffic safety.**

Since the essential purpose of the International Fire Code is to provide for a reasonable level of life safety and property protections from the hazards of fire, explosion or dangerous conditions in new and existing buildings, structures and premises and to provide safety to fire fighters and emergency responders during emergency operations, the code may not always be thought of as a code that has significant and far-reaching effects on road safety. The reality, however, is that the International Fire Code does significantly affect road design, and therefore, significantly affects road traffic deaths and injuries.

We believe that the International Code Council can substantially advance the cause of improving overall life safety by taking the following actions:

1. ***Embrace the goal of improving overall life safety***, including preventing not only the tragedies caused by fire, structural collapse and other hazards that have long been explicitly focused on by code enforcement and fire officials, but also road traffic deaths and injuries.

2. ***Dedicate itself to reducing the burden of global road traffic deaths and injuries***, by committing itself to work in partnership with a broad range of organizations and governments to develop and implement road safety strategies, plans and codes.

3. ***Work together with road safety organizations to thoroughly review the existing codes promulgated by the International Code Council to ensure that the codes embrace***

***internationally recognized good practices for protecting life safety, including not only reducing the hazards of fire, explosion and other dangerous conditions in buildings, but also reducing road safety hazards.***

While the International Code Council may never wish to expand its mission to include the task of writing full road safety codes, the Council can and we believe should work closely with road safety organizations to ensure that building codes and regulations, such as the fire apparatus access road provisions of the International Fire Code, allow for and encourage best practices in road safety.

The attached code change proposal is submitted in the spirit of cooperation between code enforcement and fire officials and road safety professionals. It was drafted out of our concern that the current provisions of the International Fire Code for fire apparatus access roads do not strike the best possible balance between reducing the hazards of fire and other building-related hazards, and reducing road traffic deaths and injuries.

This submission is intended as a first step in bringing road safety professionals and fire service professionals together to work on an area of mutual concern: fire apparatus access roads are not only the areas where firefighters must set up equipment and fight conflagrations, but also the site of innumerable traffic deaths and injuries. The design of fire apparatus access roads (that is, the design of many public and private streets) is necessarily a balancing act, where there are frequently conflicts, tensions and trade-offs between the goals of improving road safety and improving fire safety. The very best design for bringing fire engines quickly to the scene of an incident, or the very best design for providing room to deploy equipment at the scene of a fire, is often not the best design for ensuring low motor vehicle speeds and pedestrian safety at a school crosswalk, or on a quiet residential street.

In drafting this code change proposal, we sought to recognize these tensions and trade-offs regarding fire apparatus access roads, and then to draft a code change proposal that would allow jurisdictions to do a better job of overcoming these conflicts. This code change proposal is intended to allow jurisdictions to design roads for overall life safety, including both fire safety and road safety. It is based on the following principles:

1. The necessary minimum dimensions of fire apparatus access roads are driven in large part by the size, weight, configuration and capabilities of a jurisdiction's fire apparatus.

2. The necessary minimum dimensions of fire apparatus access roads also depend on the staffing, strategies and tactics employed by a jurisdiction.

3. The characteristics of fire apparatus, and the staffing, strategies, and tactics of firefighters and emergency responders, vary widely from jurisdiction to jurisdiction, both internationally and within nations.

4. Roadway dimensions and design significantly affect road safety.

5. Therefore, the roadway designs that can be used by a jurisdiction to improve road safety on fire apparatus access roads vary depending on the fire apparatus employed by that community. Designs for road safety that work well in one jurisdiction may introduce significant difficulties for fire fighting in another jurisdiction where the fire apparatus that is in use is significantly larger, less maneuverable or less capable of deploying in a smaller space.

6. Therefore, rather than employing a one-size-fits-all approach to fire apparatus access roads, which assumes that all jurisdictions around the world and across the nation employ similar fire apparatus, this proposed code change recommends a performance-based approach.

7. Employing a more performance-based approach will make it possible to better balance the goals of improving road safety and improving fire and building safety, while taking into account the major differences between jurisdictions in fire apparatus, staffing, strategies and tactics.

We note that the existing provisions for fire apparatus access roads in Section 503 contain a mix of prescriptive and performance-based requirements. This proposed code change moves further in the direction of a performance-based approach, in the interest of making it more feasible to adopt roadway design solutions that resolve conflicts between road safety and fire safety, are carefully tailored to the fire apparatus in use in a jurisdiction, and improve overall life safety.

As background, the following sections briefly review several considerations that are crucial for designing streets that improve overall life safety. These sections briefly review:

- the magnitude of road traffic deaths and injuries
- road safety risk factors
- the relationship between street design and road safety
- examples of roadway design elements that improve road safety
- the tensions and trade-offs between accommodating needed access for and operations of fire apparatus, and designing streets that improve road safety

First, what is the magnitude of the road traffic safety problem, and why should the ICC be concerned about it?

## Why should the International Code Council be concerned about road safety?

The Commission for Global Road Safety succinctly describes the reasons why all citizens, and particularly those of us who dedicate their professional lives to improving public safety, should focus our attention on road safety. According to the Commission's 2006 report, *Make Roads Safe*[1]:

> *Deaths and injuries from road traffic crashes are a major and growing public health epidemic. The World Health Organization has estimated that in 2002 almost 1.2 million people died in road crashes worldwide and as many as 50 million were injured. Unless action is taken, global road deaths are forecast to double by 2020 and yet many of these deaths and injuries are known to be preventable…*
>
> *High income countries have developed effective road safety measures after decades of trial and error and human tragedy. While more effort is still needed in the industrialised nations the major challenge now is to ensure through early intervention that low and middle income countries do not have to experience the same bitter learning curve…*
>
> *The World Report on road traffic injury prevention, published by WHO and the World Bank in 2004, details the key road injury 'risk factors', the major contributing factors to road crashes and injury severity, including drink driving; lack of helmet use; seat belt non compliance; excessive speed; and poor infrastructure design and management.*

As a leading international organization -- if not the leading international organization -- devoted to building a safer world, the International Code Council can play an important role in solving this epidemic. At a minimum, even if it seeks no active role, the ICC will nonetheless be involved, because by specifying the key dimensions of so many public streets (i.e., the dimensions of fire apparatus access roads), the ICC's codes now play a major role in street design and therefore in road safety.

## What Are Road Safety Risk Factors?

As the Commission for Global Road Safety's *Make Roads Safe* report notes, road safety specialists frequently refer to risk factors.

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1 Commission for Global Road Safety. *Make Roads Safe*. London, United Kingdom. Commission for Global Road Safety, 2006, p. 2. [Accessed June 1, 2009]. Available at http://www.makeroadssafe.org/publications/Documents/mrs_report_2007.pdf

**Primary Risk**

The report notes that, “Primary risk describes the factors that contribute to the risk of occurrence of a road crash.” Two of the four primary risk factors are *behavioral factors*, which are influenced by roadway dimensions and design, and the *road environment*, which is directly determined by roadway dimensions and design.[2]

According to the report, regarding behavioral factors:

> *Excessive or inappropriate speed is a key contributor to crash risk. Speed choice is influenced by the legal speed limit, but also by road layout...*

According to the report, regarding road environment:

> *Road safety engineering and traffic management make a direct contribution to reduction of crash risk. Crash risk is increased by lack of attention to safety in both planning and design of new road networks and new roads. Road design affects road user behavior and crash risk through the speed the drivers will perceive as appropriate, through detailed design factors such as curves...*
>
> *In modern road systems, vulnerable road users are disadvantaged because such systems are largely designed for the motor vehicle. The absence of footpath and cycle tracks, or traffic calming measures to reduce speed where pedestrians and cyclists mix with motorised traffic, increases the risk of a crash occurring and its severity.*

**Secondary Risk**

"Secondary risk", the report explains, "includes the likelihood of injury occurring and its severity." As with primary risk, two of the major risk factors are behavioral factors, which are influenced by roadway dimensions and design, and the road environment, which is directly determined by roadway dimensions and design. As the report explains:

> *Impact speed is a crucial determinant of injury severity for vulnerable road users. For example, 90% of pedestrian survive impacts with cars at speeds up to 30 km/hour [18 mph], but more than half will die at speeds of 45 km/hour [27 mph] or more…*
>
> *[F]or vehicle occupants also, injury severity increases with impact speed. The probability of fatal injury increases from close to zero to almost 100% as the change in impact speed increases from 20 km/hour to 100 km/hour…*
>
> *Road design can also provide protection for vulnerable road users by reducing impact speed through traffic calming measures.*

Other traffic safety research arises similar conclusions. For example, other research studies have found that when people walking are hit by a car:

• At 20 mph, only 5 percent of walkers are killed, most injuries are slight, and 30 percent suffer no injury;

• At 30 mph, 45 percent of walkers are killed, and many are seriously injured;

• At 40 mph, 85 percent of walkers are killed.[3]

**Understanding the links between the dimensions of fire apparatus access roads and the likelihood of road traffic deaths and injuries on these roads**

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[2] Ibid. p. 60.

3 Limpert, Rudolph. *Motor Vehicle Accident Reconstruction and Cause Analysis.* Fourth Edition. Charlottesville, VA. The Michie Company, 1994, p. 663. See also *Killing Speed and Saving Lives*, United Kingdom Dept. of Transportation, London, England.

The transportation safety research literature makes clear that:

1) The behavior of motor vehicle drivers, bicyclists, pedestrians and other road users is substantially affected by the dimensions of streets.

2) Key roadway dimensions which have been found to significantly affect driver behavior include the following:

   a) roadway widths,

   b) lane widths,

   c) the presence or absence of raised medians, pedestrian refuges and similar measures (note that feasibility of including such measures in a roadway design is often dependent upon the requirements for roadway widths in the vicinity of these measures)

   d) the presence or absence of roundabouts, traffic circles, splitter islands and similar intersection design measures (again, note that feasibility of such intersection designs is highly dependent upon the requirements for roadway widths in the vicinity of these measures)

   e) turning radii (a.k.a. horizontal curvature) at curves in a roadway,

   f) turning radii (i.e., horizontal deflection) at roundabouts, traffic circles, median islands and channelized turns,

   g) curb radii at intersections,

3) The roadway dimensions and features described above affect important aspects of driver and pedestrian behavior. For example, the presence or absence of a raised median on a roadway affects the ability of drivers to make passing maneuvers, midblock turns or to drift into oncoming traffic.

4) It is particularly important to note that the key roadway dimensions mentioned above affect the speed at which motor vehicle drivers choose to drive. As described above, motor vehicle speed is a key determinant of both the likelihood of a crash occurring and crash severity.

5) Because the dimensions of streets strongly affect the behavior of motorists, bicyclists, pedestrians and other road users, the dimensions of streets significantly affect traffic safety.

Section 503.2 of the current code sets specifications for the dimensions of fire apparatus access roads, including specifying the following key dimensions:

- fire apparatus access roads shall have an unobstructed width of not less than 20 feet;

- the required turning radii of fire apparatus access roads shall be determined by the fire code official.

While these two specifications are brief, their effect is far-reaching. By setting specifications for the key dimensions of road width and turning radii, Section 503.2 of the code sets specifications for many of the roadway dimensions and street design features (mentioned above) which are known to significantly affect traffic safety.

The following paragraphs provide several examples of the relationship between these two crucial street dimensions (roadway width and turning radii) and the ability to include important design features for traffic safety in a roadway design. In many circumstances, an absolute requirement to provide an unobstructed width of not less than 20 feet at every point along a roadway creates significant conflicts with the need to include roadway design features that improve traffic safety.

Often, these conflicts can be and have been resolved through careful design that consciously balances the need for traffic safety and the needs of firefighters to reach incidents and conduct fire and rescue operations. For example, while particular critical points along a roadway may be intentionally designed with a width of less than 20 foot clear, in order to reduce vehicle speeds and improve traffic safety, other areas along the same block will be provided with at least 20 foot clear, in order to provide, wherever necessary, sufficient space to set up equipment and fight fires.

The proposed appendix, by creating performance-based standards for fire apparatus access roads, will assist in the process of reconciling these conflicts. It provides more flexibility for street design, while still ensuring that streets are designed to allow for the passage of fire apparatus, and space to conduct fire and rescue operations.

**Street Design for Traffic Safety: Examples**

A few examples of roadway designs that can significantly improve traffic safety, but that frequently require roadway designs with less than 20 foot clear (at some, though not all places along a roadway) include the following:

1. Modern roundabouts

2. Raised medians

3. Low-volume local streets

Each is described in turn below.

**1. Modern Roundabouts**

The California Department of Transportation recently concluded, "The modern roundabout is now recognized nationally as an intersection type and traffic control treatment capable of providing unique and significant operational and safety benefits over a wide range of traffic volume and conditions. In particular, national research has confirmed that the single-lane version is especially effective in reducing collision frequency and/or severity for all highway users."[4]

*Safety of modern roundabouts:* Both overseas and in the United States, modern roundabouts have achieved a 50% to 90% reduction in injury accidents compared with intersections using stop control or traffic signals. The most comprehensive survey of roundabout safety in the United States was carried out in 1997 by the Transportation Research Board, and found that at intersections which were converted to roundabouts, overall crashes were reduced by 37% and injury accidents by 51%. The study also broke the results down for large roundabouts with three-lane entries, and smaller roundabouts with one- or two-lane entries. At these smaller roundabouts, crash reductions were even more pronounced: total crashes fell by 51%, with injury crashes reduced by 73%.

*Capacity:* roundabouts can often offer higher traffic-moving capacity than traffic signals, which in many circumstances leads to significantly reduced delays. The Transportation Research Board survey of intersections converted to roundabouts in the United States, for example, found that in the eight cases where vehicle delays had been measured, rush hour delays had been reduced by an average of 77%.

[4] *California Department of Transportation Design Information Bulletin #80-01: Roundabouts*. October 3, 2003, p. 1. [Accessed June 1, 2009]. Available at http://www.dot.ca.gov/hq/oppd/dib/dib80-01.pdf.

**A typical modern roundabout in University Place, WA. At the roundabout entry, the clear width provided is only approximately 13 feet: this is an intentional design element to keep vehicle speeds low. Photo: IMG0032.jpg**

**Another modern roundabout near a school in Montpelier, VT. Again, note that the entry widths are kept to no more than 13 feet, to ensure low speeds both at the pedestrian crosswalks and within the intersection. Photo: IMG0027.jpg**

The conflict between the current code requirement for 20 foot clear width at all points along every fire apparatus access road and the design of roundabouts occurs primarily with the design of roundabouts with one-lane entries. Roundabouts *are* designed to ensure that the largest fire apparatus (as well as tractor-trailer trucks and other large vehicles) that will use the roundabout are accommodated. However, as explained in *Roundabouts: an Informational Guide*, the Federal Highway Administration's widely-used guide to roundabout design:

> *Roundabouts operate most safely when the geometry forces traffic to enter and circulate at slow speeds. Horizontal curvature and narrow pavement widths are used to produce this reduced-speed environment.* [5]

Furthermore, the Guide explains:

> *To maximize the roundabout's safety, entry widths should be kept to a minimum..The design should provide the minimum width necessary for capacity and accommodation of the design vehicle in order to maintain the highest level of safety. Typical entry widths for single-lane entrances range from 4.3 to 4.9m (14 to 16 ft); however, values…lower than this range may be required for site-specific design vehicle and speed requirements for critical vehicle paths.*

Thus, to design safe single-lane roundabouts, it is routinely necessary that at the roundabout entries, entry widths must be kept below 20 foot clear. This particular circumstance occurs only for a short distance at the intersection entry. However, it is a critical dimension and one that constantly conflicts with a requirement of 20 foot unobstructed width at all points along fire apparatus access roads.

## 2. Landscaped medians

There are important advantages to raised and landscaped medians, beyond their aesthetic appeal. In general, published studies conclude that on major roadways, raised central medians provide significant safety benefits when compared to undivided roads and roads with two-way left-turn lanes.

For example, examining overall crash rates – both midblock and intersection – for suburban arterials, Bowman & Vecellio's comprehensive study[6] found a rate of 373 vehicular crashes per million vehicle miles for roadways with a raised median, versus 676 vehicular crashes per million vehicle miles (or some 80% higher) for roadways with a two-way left-turn lane. Overall rates of rear end, right angle, head-on and left-turn crashes were all significantly reduced by the use of a median. Medians also ease crossings for pedestrians, and studies have found medians to be significantly safer for them. On suburban arterials, Bowman & Vecellio found the pedestrian crash rate for suburban arterials with raised medians to be 6.3 per million vehicle miles, versus 12.9 pedestrian crashes per million vehicle miles for those with two-way left-turn lanes.

The conflict that occurs here with the requirement for 20 foot clear is that many roadways only have room within the right-of-way for, and also function most safely (from the point of view of traffic safety) with one traffic lane and one bicycle lane in each direction on each side of the median. This results in a roadway cross section typically provides 17 feet of clear width on each side of the median.

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[5] *Roundabouts: An Informational Guide*. US Department of Transportation Federal Highway Administration Publication No. FHWA-RD-00-067. Washington, D.C., 2000. , p. 130. [Accessed June 1, 2009]. Available at http://www.tfhrc.gov/safety/00-0676.pdf.

6 B. L. Bowman and R.L. Vecellio. *Effect of Urban and Suburban Median Types on Both Vehicular and Pedestrian Safety*. Transportation Research Record No. 1445. TRB, National Research Council. Washington D.C., 1994.


**An example of an undivided roadway. Photo: IMG0064.jpg**

**An example of a roadway with a raised median and approximately 17 feet of clear width on each side of the median. Photo: median.jpg**

**3. Local Street Standards**

Low-volume local streets are often purposefully designed to enforce low-driving speeds, obviating the need for future retrofits with speed bumps and other harsh traffic calming measures that can severely impact fire apparatus. For best traffic safety result, these minor residential streets are consciously designed to maintain average speeds of 20 mph or less. To achieve this, low-volume local streets are designed as traditional "yield streets". As the Institute of Transportation Engineers' Residential Streets, Third Edition explains:

> *Yield flow occurs when two-way traffic is impossible where parked vehicles are present. Thus, some motorists must stop and yield the right-of-way to oncoming vehicles. For decades prior to the 1960's, yield flow was the widely accepted norm for local streets. …Most local streets with low ADT [average daily traffic] may have yield-flow operation.*[7]

The AASHTO Greenbook, the standard reference on the geometric design of streets, also explicitly endorses yield streets:

> *The level of user inconvenience occasioned by the lack of two moving lanes is remarkably low in areas where single-family units prevail… In many residential areas a 26-ft.-wide roadway is typical. This curb-face-to-curb-face width provides for a 12-ft. center travel lane and two 7-ft. parking lanes. Opposing conflicting traffic will yield and pause on the parking lane area until there is sufficient width to pass*.[8]

The traffic safety research literature finds that yield streets result in a strong reduction in injury accident rates. Recent research compared injury accidents per mile per year on local streets against thirteen physical characteristics.[9] Street width was found to be significantly related to injury accidents, with the authors concluding that, "as street width widens, accidents per mile per year increases exponentially." The study's regression analysis found that a typical 36-foot wide residential street has 0.16 accidents per mile per year as opposed to 0.03 accidents per mile per year for a 24 foot wide street. This difference is about a 487 percent increase in accident rates (see figure, below). The safest streets were the narrow, 24-foot wide streets, with parking allowed on both sides, resulting in a clear width of approximately 10 feet.

[7] Kulash, Walter. *Residential Streets, 3rd Edition*. Washington, D.C.: Institute of Transportation Engineers, National Association of Home Builders, American Society of Civil Engineers, and Urban Land Institute, 2001.

[8] American Association of State Highway and Transportation Officials. A Policy on Geometric Design of Highways and Streets (a.k.a. the AASHTO Greenbook). Washington, D.C.: AASHTO, 1990.

[9] Swift, Peter, Dan Painter, AICP and Matthew Goldstein. *Residential Street Typology and Injury Accident Frequency*. Denver, Colorado: Swift & Associates, 2006.

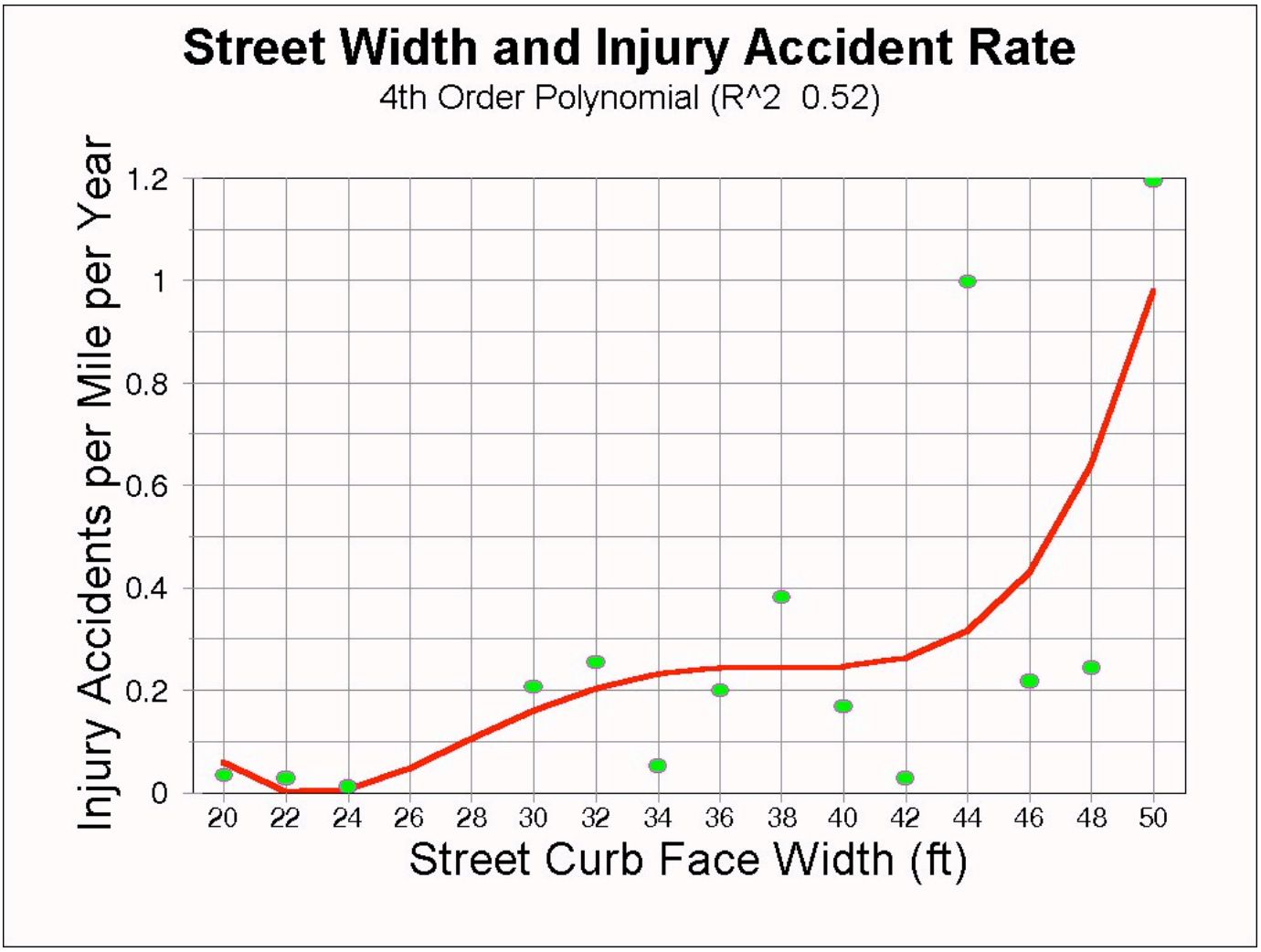


**Photo: 4THORDER.JPG**

On low-volume local streets, providing widths of less than 20 foot clear can clearly provide numerous traffic safety benefits. The conflict between creating yield streets to meet this traffic safety goal, and the goal of ensuring safe access for fire and rescue operations, has been reconciled in numerous different ways by different jurisdictions. Frequent solutions include requiring that such streets always be through streets (rather than cul-de-sacs); requiring such streets to provide locations with 20 foot clear width at regular intervals (e.g., at all fire hydrants), so that areas exist to allow fire engines to set up and hook up hoses; and limiting building heights on such streets, so that is not necessary to deploy aerial ladders.

**4. The proponent shall submit a bibliography of any substantiating material submitted with the code change proposal. The bibliography shall be published with the code change and the proponent shall make the substantiating materials available for review at the appropriate ICC office and during the public hearing.**

The requested bibliography is provided below.

**Bibliography**


Commission for Global Road Safety. *Make Roads Safe*. London, United Kingdom. Commission for Global Road Safety, 2006, p. 2. [Accessed June 1, 2009]. Available at http://www.makeroadssafe.org/publications/Documents/mrs_report_2007.pdf

Limpert, Rudolph. *Motor Vehicle Accident Reconstruction and Cause Analysis*. *Fourth Edition*. Charlottesville, VA. The Michie Company, 1994, p. 663. See also Killing Speed and Saving Lives, United Kingdom Dept. of Transportation, London, England.

California Department of Transportation. *Design Information Bulletin #80-01: Roundabouts*. October 3, 2003, p. 1. [Accessed June 1, 2009]. Available at http://www.dot.ca.gov/hq/oppd/dib/dib80-01.pdf.

*Roundabouts: An Informational Guide*. US Department of Transportation Federal Highway Administration Publication No. FHWA-RD-00-067. Washington, D.C., 2000. , p. XX. [Accessed June 1, 2009]. Available at http://www.tfhrc.gov/safety/00-0676.pdf.

B. L. Bowman and R.L. Vecellio. *Effect of Urban and Suburban Median Types on Both Vehicular and Pedestrian Safety*. Transportation Research Record No. 1445. TRB, National Research Council. Washington D.C., 1994.

Kulash, Walter. *Residential Streets, 3rd Edition*. Washington, D.C.: Institute of Transportation Engineers, National Association of Home Builders, American Society of Civil Engineers, and Urban Land Institute, 2001.

American Association of State Highway and Transportation Officials. *A Policy on Geometric Design of Highways and Streets* (a.k.a. the *AASHTO Greenbook*). Washington, D.C.: AASHTO, 1990.

Swift, Peter, Dan Painter, AICP and Matthew Goldstein. *Residential Street Typology and Injury Accident Frequency*. Denver, Colorado: Swift & Associates, 2006. [Accessed on June 1, 2009]. Available at http://www.cuesfau.org/cnu/docs/Residential_Street_Typology_and_Injury_Accident_Frequency-Swift-Painter-Goldstein.pdf.


**REFERENCED STANDARDS: (3.4 & 3.6)**

**List any new referenced standards that are proposed to be referenced in the code and provide a minimum of two copies.**

Response: No new standards are proposed to be referenced in the code

**Cost Impact:** The code change proposal will not increase the cost of construction.

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