

# **Broad, Historical Perspective—and Prospective—Approach to Making the Case to the International Code Council (ICC) for Stairway Usability and Safety Requirements for New Homes**

***This is the Formal Appeal submitted in 2020 to ICC on Proposal RB116-19  
(with option of RB112-19) for the ICC International Residential Code (IRC)***

by  
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## **OVERVIEW**

**The case behind the appeal includes several evidential bases or foundations:**

- **Precedent** (e.g., based on what is done—and accepted as necessary—in other settings)
- **Ergonomics** (i.e., science of interactions of people and their environments)
- **Economics** (*all* benefits—including public health—and costs for individuals & society)
- **Parity** or equity among occupancy and building settings (e.g., all stairways per IBC)
- **Survival** of society, organizations (e.g., ICC), and individuals (in terms of safety)

**Historical Outline for Perspective and Prospective Views of “PEEPS” Case:**

**1993 – BOCA & CABO deliberations on stairways for US model building & dwelling codes**

**2003 – ICC and NFPA deliberations on stairways for their internationally used codes**

**2010 – Prior Appeal on home stairway step dimensions when ICC Board failed to act**

**2013 – Key paper to *International Conference on Fall Prevention and Protection*, Tokyo**

**2019 – Proposals on stairways and baths/showers to ICC for *International Residential Code***

**2020 – COVID-19 pandemic, ICC Appeal, and *Project 2020* initiation in USA & Canada**

**2023 – Possible final decisions by ICC & the Courts in new world of public health & codes**

## Requirements of ICC CP#1-03–Appeals:

**“2.0 Right to Appeal:** Any person may appeal an action or inaction in accordance with the policies of the ICC Board, excluding those beyond the control of ICC.” **The subject of this appeal is within the control of the ICC.**

**“3.1** An appeal (other than certification status-related appeals) shall be in writing, and shall be directed to and received by the ICC CEO within 30 days of notice of the action or inaction which forms the issue being appealed or no appeal shall lie.” **The 30-day window for this appeal occurred on late April 2020 and ends on Friday, May 8, 2020 (according to ICC).**

**“3.3** The appeal shall include the following:

**3.3.1** A specific description of the issue being appealed; **See below.**

**3.3.2** A statement describing precisely why the issue is being appealed; **See below.**

**3.3.3** All appeals, except as to a staff action or inaction or certification status-related, shall also include the following:

**3.3.3.1** A detailed description of how the issue being appealed will adversely affect the appellant. **See below.**

**3.3.3.2** A statement indicating the requested remedial action; **See below.**

**3.3.3.3** The names and mailing addresses of individuals and organizations that may have an interest in or be affected by the matter being appealed. Notice of the appeal will be provided to those parties in accordance with Section 6.1; **See below.**  
and

**3.3.3.4** A nonrefundable filing fee of \$500.” **This was sent by US Mail to ICC’s Washington Office on 28 April 2020 in the form of a check, for \$1,000.00 covering this appeal and one other, dealing with a separate proposal, RB81-19, which shares many background facts with this appeal on RB116-19.**

### Specific Description of the Issue Being Appealed

In relation to IRC proposal RB116-19—on home stairways, submitted by the Appellant, the ICC process has badly failed hundreds of millions of people to whom the ICC owes a duty to provide reasonably competently produced, and timely model codes addressing critical issues, in this case, evidence-based model codes for usability and safety of buildings, *especially homes* for which families and others make their largest financial and other investments. The most dangerous and most problematic in terms of usability and safety are home stairways; yet the ICC has—since its earliest days (in the late 1990s)—had an agreement, drastically impacting homes stairs, with the National Association of Home Builders (NAHB). This agreement unreasonably biases the development and adoption of the ICC *International Residential Code* (IRC) in return for NAHB’s support in *reducing, if not preventing*, the adoption and use of superior, more-evidence-based, public health-oriented model codes and safety standards produced by the National Fire Protection Association (NFPA). (There might be violations of law here—related to (un)fair trade practices, but this Appeal focuses on the quality and timeliness of the IRC-development process and product, especially relative to ICC’s respect for and use of public health, ergonomics,

economics, and other sources of relevant evidence.) Specifically, there are abundant reasons for ICC to act, in time for its 2021 IRC edition, to institute stairway usability and safety requirements that are equivalent in performance to relevant stairway requirements in the *International Building Code* (IBC) applicable to other buildings and the dwelling unit requirements of NFPA 101 (*Life Safety Code*) and/or NFPA 5000 (*Building Construction and Safety Code*) which track each other on home stairway issues.

### **Statement Describing Precisely Why the Issue Is Being Appealed**

This will significantly reduce predictable, preventable injuries in people's use of stairways, including single steps, in homes. If not completely preventable, this will also mitigate—e.g., with more-functional handrails—the severity of missteps (departures from normal pedestrian gait) and falls. This has the potential of significantly reducing the 100 billion dollar annual toll in US societal injury costs from stair-related injuries, at least 90 percent of which happen in home settings. As an expert in the field, with knowledge of the relevant ergonomics, public health issues, economics, etc., the Appellant also has unmatched evidence at his disposal about the efficacy of various design and construction features in significantly reducing the injury toll while also improving usability.

This is a growing objective as our population ages and becomes more vulnerable in good times as well as during pandemics like we now endure—*largely in our homes* which, due to flaws in the *I-codes* and other earlier codes, serve us very badly. We have over four million stair-related falls each year that receive professional medical attention in the USA alone—many, many times more than are injured in home fires.

### **Detailed Description of How the Issue Being Appealed Will Adversely Affect Appellant**

It is not because I stand to gain financially. Indeed if ICC responds to this Appeal in a responsible fashion, by making sure the 2021 edition of the IRC contains home stairway requirements equivalent in safety performance to that achievable with requirements of NFPA 101 or 5000, I will have only modest consulting and education-delivery income for the remaining decade of my professional career. Currently, consulting income is growing well beyond my capability to serve all requests—with the largest litigation cases (e.g., stair-related, injury-caused quadriplegia, traumatic brain injury, or both), on which I serve in an expert capacity—*now involving home stairway falls*. With this Appeal, I am making the investment in seeking the improvement in the I-codes, particularly the IRC, because I am a professional imbued with social, ethical and moral responsibilities in public health, ergonomics and other aspects of my career. This is best reflected in the Honorary Doctor of Science degree in 2017 conferred by the University of Greenwich. I take, very seriously, this and other public service honors from academia and the two leading public health organizations in North America.

If there is a selfish interest, it is in reducing my own, growing vulnerability to a life-changing fall, a legitimate concern in ones 78<sup>th</sup> year and, for the first time in decades, perhaps facing the need to occupy a single-family home rather than the 1,500 square feet I now rent in apartments and off-site storage (four locations overall) in two countries. My financial resources are sufficient to buy such a home, *but suitable homes have not been, and are not being, constructed*. My cohorts and I deserve better than what ICC has done for us since its inception. There has been too much corruption of the code development process with its kowtowing, and worse, to the homebuilders, namely NAHB. ICC makes my life more difficult and dangerous; my cohorts (to

say nothing of the many younger adults—in even larger cohorts—following us) deserve much better from ICC (as well as the homebuilders).

Note, I am not alone in the foregoing views. AARP has, for decades, gotten similar results in surveys of people over 50; overwhelmingly—by more than 80 percent— they (like me) want to stay in their homes forever. Recent pandemic experience with hugely heightened risk of death in various types of retirement housing due to COVID-19 occurring in at least a few countries has added a new urgency to this need for *homes for life*. Here are yet more indications of an overdue paradigm shift that will only increase the need for single-family homes that have their stairs—leading the features that now force people to give up their homes—subject to, mostly, the same criteria as required for buildings for which the home-builders are NOT responsible and, for which, ICC has more evidence-based safety requirements.

I have been given great skills, plus work opportunities, in my life and want to share the benefits, *particularly where these gifts have given me unusually important insights into how and why bad things happen to people using buildings of all sizes and types—including homes—in multiple countries*. It would be better for everyone if ICC and I work together on this rather than being on opposing sides of impending legal procedures. In such procedures, I represent the public interest, especially, with superior evidence and safety experience that courts of law will recognize.

### **Statement Indicating the Requested Remedial Action**

The responsible Committee has to consider the evidence competently and do so impartially—not biased by their occupation, etc.—rather than “blow-off” a serious, well documented proposal with the weak Committee Reason statements provided last spring. (See p. 13 for full, exact text from Committee.) At the very minimum, the Committee needs to stick to facts; e.g., NFPA 101 does NOT need to be bought by every inspector. Moreover, the IRC purpose is not defeated. Its critical life safety purpose has been badly weakened by Committees at immense cost to those using IRC-influenced homes across the USA. That terrible legacy has to be addressed ASAP.

In the Committee’s third reason about a “work group,” the Committee has apparently not read (at all or carefully) the lengthy detailed “Reason” statement thoroughly, if at all. The “Reason” statement provides abundant empirical and other data. The task is not so much to gather more “empirical data,” but to carefully examine and utilize what is *already well identified* and set out in the provided information. (Again, for full Committee text, see page 13.)

Committees have a high duty; this committee apparently has failed to deliver on its duty. As a member of many NFPA committees—including the TC on Residential and, since 1978, the TC responsible for stairway requirements—(with 230 committee-years of committee memberships overall), I have learned well what we are taught about addressing proposals. If we do not think a proposal is “ready for prime time,” it is our duty to set out *all* the reasons that, *if addressed by the proponent in the public comment process*, this should result in the proposal’s acceptance. Please respond to well-developed proposals specifically and in detail: i.e., what are the specific aspects of the proposal that have errors or weaknesses, so that instead of wasting yet more years, ICC can finally get the codes that befit its lofty ambitions and use of “SAFE” in its Web URL.

Getting to specifics, I would have much preferred more work on the part of the Committee to set out how a “work group” would refer to and pick up on the immense work done by CABO BCMA in the 1980s and similar committees (like BOCA’s Stairway Safety Committee in 1993—with ICC leaders like Wayne Jewell and Tim Ryan as members). The BOCA Committee

met multiple times over a few months period rather than the several days in three years ICC Committees now put in—with only skimpy attention to stairways. Some of us have high expectations of code-development committees and are increasingly frustrated with ICC’s.

More practically, recognize that some proposals take more work and mental effort than the majority of proposals or comments on the agenda. First of all, recognize which ones address really significant safety and regulation issues (rather than market share skirmishes—especially when millions of injuries must be mitigated, if not prevented—and address them accordingly. RB116-19 is one of those issues, along with RB112-19 (plus RB81-19 on bathing/showering grab bars). These deserved more thoughtful Committee Reason statements, particularly when relatively well-justified, much-needed proposals are “Disapproved.”

**Names and mailing addresses of individuals and organizations that may have an interest in or be affected by the matter being appealed.** (Notice provided per Section 6.1.)

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## Historical Outline for Perspective and Prospective Views of “PEEPS” Case:

### 1993 – BOCA & CABO deliberations on stairways for US model building & dwelling codes

The Council of American Building Officials (CABO) Board for the Coordination of the Model Codes (BCMC), in 1993, issued a landmark report on *General Building Requirements*. Noteworthy to this ICC Appeal, BCMC adopted—and the CABO Board subsequently approved—the following for dwelling units:

“Treads and Risers. In Group R3 occupancies, riser heights shall be 7 inches maximum and 4 inches minimum. Tread depths shall be 11 inches minimum.

The minimum depth of a winder is limited to 6 inches and the tread shall have a minimum depth of 11 inches at 12 inches from the narrower.”

I was the seconder of the motion for this and when it was voted on, it marked *the* high point in US model code development—at least in my view.

BCMC’s work started in early 1973 and continued to late 1995 when ICC was new. Now, ICC is barely older than BCMC was in 1995. Of course BCMC had a much narrower focus. ICC, now an ethically-compromised monolith, also needs to focus at least as well as BCMC did on the home stairway issue. So far ICC, in over 25 years, has made less progress on home stairway safety issues than BCMC did between 1982 and 1993—all done with buy-in from all model code bodies *and NFPA*—without any taint of a *quid pro quo* deal with “Strategic Partner” NAHB.

Notably, BCMC specifically invited me to come to its spring 1982 meeting to speak on and discuss, *for a half-day* with the eight BCMC members, evidence-based changes to egress and stairway safety issues. This was highly unusual for BCMC. Today, my very frequent offers—in my proposals and comments (on RB81-19, RB112-19 and RB116-19) I have explicitly offered free half-day educational sessions for ICC chapters. *To date not one has approached me about these*. This is a very clear message that ICC does not care about the abundant evidence—and enforcement strategies and tactics—behind the currently appealed RB81-19 and RB116-19.

Earlier in 1993, BOCA created a Stairs Task Group. It had several meetings across the northeast US and issued a report calling for better home stairs, including much better stair step geometry than the NAHB was willing to accept. This led to the NAHB Board of Directors adopting a policy—still being advocated today, with some success, by the builders: “Support the adoption of stair geometry standards consistent with the 1993 BOCA and 1992 CABO Codes.” These antiquated, pre-1994 codes had a very old rule allowing dwelling unit stairs with step rise of 8.25 inches with 9-inch tread run dimensions.

From testimony on RB116-19 (as well as B112-19) at the ICC hearings in 2019, many states are still being pressured by the home builders to not allow even the deficient ICC requirements with step rise of 7.75 inches with 10-inch tread run dimensions.

Also coming from the mid 1990s, ICC still allows NAHB to appoint one-third of IRC Committee members which gives the builders a huge ability to stop almost anything they do not like (with NAHB only needing an additional two votes—easily achieved with either other industry representatives or building official members (under home builder pressure in their work) voting with NAHB members. Meanwhile anyone else needs to get seven members to vote in favor of a proposal. The system is clearly rigged to the builders’ advantage—and the ICC Board has not

lifted a finger to stop the extreme homebuilder bias on IRC committees. This appears to be a classic *quid pro quo* deal between ICC and NAHB with the latter able, politically, to stop NFPA codes from being adopted in place of the ICC codes—something the courts should address, especially as ICC and NAHB refer to this as a “Strategic Partnership.”

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## **2003 – ICC and NFPA deliberations on stairways for their internationally used codes**

The year 2003 was a very busy one with ICC adopting the second editions of its codes and NFPA adopting a new model building code, NFPA 5000. The latter, along with NFPA 101, the Life Safety Code, accepted my proposals for dwelling unit stairs to have the “7-11” step geometry rule. My similar proposal, at 40 pages—the largest ever submitted on the topic, for ICC codes—got nowhere. The outline for the 40-page submission, which follows here (for main headings only), gives a good idea of how comprehensive the proposal was.

- ICC Public Proposal Form identifying proponent, etc.
- Legislative Text of Proposed Changes (to sections similar to those now addressed by RB116-19).
  - R311.5.3 Stair treads and risers.
  - R311.5.3.1 Riser height.
  - R311.5.3.2 Tread depth.
  - R311.5.3.3 Profile.
- Benefit-Cost Analysis for Improved Stairs in the USA
- Injury Epidemiology
- History of Debate on Improved Step Geometry Requirements in Codes & Standards
- Benefits and Costs
- Industry’s and Regulators’ Reviews of Research
- Latest Research on Step Geometry from Britain
- Politically-driven Local and State Adoption Process
- Building and Marketing Improved Stairs
- The Problem of the Double Standard
- Intimidation of Building Officials
- Roles of NFPA and APHA
- Summary

The summary of the 2003 proposal to ICC is also reproduced here (with italics added).

*“The matter of riser-tread geometry is essentially very simple. If the so-called “7-11” stair geometry is the minimum standard—both for safety and usability—for nonresidential stairs where the toll of injuries is much lower and where the use conditions are far less demanding, then the “7-11” should be the minimum requirement for dwelling units where the use conditions include the widest range of user capabilities and needs. The “7-11” has been the unchallenged minimum standard for stair geometry (other than for dwellings) in the BOCA National Building Code, Uniform Building Code, Life Safety Code, American National Standard for Accessibility and Usability of Buildings and Facilities (ICC/ANSI A117.1), National Building Code of Canada plus the first two editions of the International Building Code. There is no basis for the double standard which unreasonably imperils home stair users and which makes such stairs unnecessarily difficult to use. NFPA 5000 and NFPA 101 have eliminated this double standard; now it is high time for the ICC to demonstrate similar good judgment and concern for the safety and usability of stairways for all users, especially those who increasingly want to (and have to) “age in place” in their homes. The contrast between NFPA and ICC will be increasingly stark and known to the public. ICC will have only itself to blame for the loss of credibility and public standing it faces if it continues to pursue the double standard for residential stair design mainly to appease the homebuilders while turning its back on a growing public health problem.”*

Also in 2003, NAHB appealed to NFPA over the builders' attempts to have only inferior rise and run requirements for dwellings in NFPA codes. It failed by a near-unanimous vote—a good indicator of how this issue fares when there is not a *quid pro quo* deal corrupting fair, evidence-based code development.

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## **2010 – Prior Appeal on home stairway step dimensions when ICC Board failed to act**

Another of my attempts to have dwelling unit stairs in the I-Codes meet the same requirements as for all other buildings failed at the hearings stage and attempts to have a full Appeal—*particularly action by the ICC Board*, were denied in 2010. Here follows the Appellant's formally submitted recommendations to the Appeal. Not all have been implemented by ICC.

### **Jake Pauls' Appeal Recommendations to ICC Appeal Panel and Board of Directors (derived from Comment submitted 1/28/10) February 12, 2010**

1. The ICC Board of Directors must become more responsive and its statements more forthcoming on matter of ethics and investigation, assessment and enforcement of rules of ethical conduct. It must go beyond what former Board member Greg Johnson said at the Town Hall Meeting in New Orleans in March 2010, when he described ICC as an “organization with utmost integrity” and its ethical policy as “aspirational and affirmational.” I have repeatedly requested—in writing—a formal review of the ethics of the entire ICC Board of Directors and it has refused to even acknowledge the request, let alone act on it. As much as it might pain them, the ICC Board members should create, as soon as possible, an independent body to investigate, evaluate and adjudicate charges of ethical lapses by any members of ICC, its staff and those appointed to its committees.
2. In a non-response to the Appellant's formally submitted question to the ICC Board of Directors, in March 2009, about making ICC's Code of Ethics easier to find on the ICC website, it appeared that the Board was even unaware that it deals explicitly with Ethics, using the Code of Ethics, outside of CP37-09. The Code is part of the certification process ICC has. If ICC leaders are not even aware of ICC's Code of Ethics, and in issuing a new CP37-09 on ethics, it failed to provide for an enforcement mechanism, a clear message is being sent: ethics do not matter. However, ethics do matter! ICC should begin acting as if ethics matter rather than giving the impression of operating in an “ethics-free zone.”
3. Repeating what was included in the 1999 American Public Health Association (APHA) Policy 9916, addressed to ICC and other code-developing bodies: APHA “Urges the ICC to modify its policies and procedures to better support public health and safety, to fairly balance interest participation on committees, to develop and enforce ethical rules for the code-development process, and to broaden voting rights for the approval of new model code requirements.” Ten years later, in an update of this policy, adopted by APHA as Policy 2009-13, again APHA recommended: “ICC should modify its policies and procedures to better support public health and safety by emphasizing the reduction of hazards on the quality of life through a public health approach; to fairly balance interest participation on committees; to develop, publicize, and enforce ethical rules for code development, adoption and enforcement; and to broaden voting rights for the approval of new model code requirements.” ICC has been worse than unresponsive; it appears to be moving backwards on ethics.
4. ICC code-development policy CP28-05 should be revised to prevent ICC staff censorship of code-change proposals and comments on purported grounds that some substantiation is not “technical.” If all substantiation is required to be technical, why does CP28-05, section 3.3.4.3,

require that “The proponent shall substantiate the proposed code change based on technical information and substantiation” (italic emphasis added here)? Another appeal will be filed if the comment the Appellant has submitted on the IRC-BE committee’s disapproval of E74-09/10 Part 2 is censored by ICC staff.

5. Compared to NFPA procedures in which its technical committees’ statements giving reasons for proposal rejection “shall be sufficiently detailed so as to convey the TC’s rationale for its action so that rebuttal may, if desired, be submitted during the Comment period,” ICC’s code-change committees are held to a much, much lower standard. They do not have to give all the reasons why a proposal is rejected, they can give as few as they like and they do not have to give understandable nor logical reasons. A prime example was in the IRC BE disapproval reasons for E74-09/10 Part 2. ICC should make its code-development process as rigorous as is NFPA’s or it should leave such serious work to others better able to perform it.

6. Rather than hide the fact that there is an Appeal being pursued, as with E74-09/10 Part 2, ICC should disclose this to its membership. The Appellant, in his appeal application, specifically requested this. ICC has been unresponsive on this request. Even if responsive, this should occur as a matter of normal course, not requiring a request by the Appellant. Thus there is a double failure of ICC on the Appeal process.

7. Another reasonable request by the Appellant was rebuffed by ICC staff. Thus the Appeals Board should recommend that the ICC Board correct this by extending—for some reasonable time after the Board decision on the Appeal—the deadline for submittal of public comments for E74-09/10. Also, it is incorrect to blame the Appellant for the timing of the public hearing coming a few days after the February 8 deadline for comment submission to ICC. The Appeal was filed with ICC in a timely fashion on November 22, 2009 within 24 days of the IRC BE Committee action (on October 28, 2009) and within two weeks of the IBC Means of Egress action on the companion proposal E74-09/10 Part 1. Yet then, ICC dragged its feet and did not even schedule the date of the IRC-BE Committee reconsideration (January 19, 2010—about 12 weeks after the Baltimore hearing action on E74-09/10 Part 2) in timely fashion. Furthermore, the Appeals Board should make a general recommendation that such timing snafus not happen again.

8. The Appeals Board should recommend that the ICC Board of Directors immediately address the matter of flawed guidance documents that was brought to the ICC Board’s attention in March 2009. Even newer versions of the two flawed documents—that fail to include current IRC requirements critical to construction and inspection of home stairs—checked in January 2010, are still defective. Evidence suggests this is leading to serious flaws in new homes that could be contributing to thousands of excess (avoidable) injuries each year in the US. The two documents are the *Residential Inspectors Guide* and the *Home Builders Jobsite Codes*.

9. ICC should begin to take much more seriously its claims about relative quality, even superiority of its code development process or withdraw such claims. See especially the two ICC PR items included as items 35 and 36 in the Appellant’s set of references to his Appeal Hearing Comment.

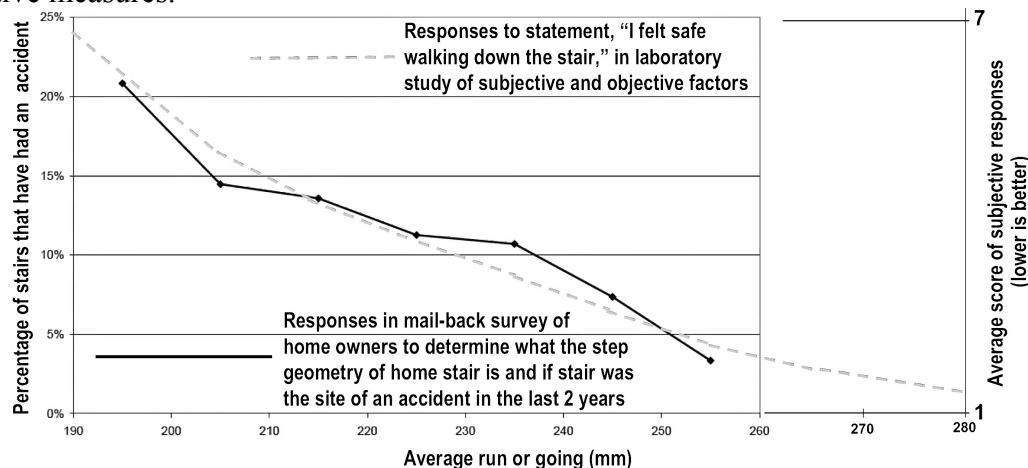
10. Appeals Board member, Mr. Greg Wheeler, C.B.O., who apparently chairs the Board of International Professional Standards (BIPS) should explain why his participation on the Appeals Board is not a conflict of interest. It appears that BIPS is partly responsible for the non-enforcement of ICC requirements covering the ICC certification of many if not all ICC Board of Directors members, the group that the Appellant has charged with breaches of ethical conduct explicitly covered by ICC’s Code of Ethics.

11. ICC should stop giving one organization, NAHB, one third of the 12-person membership — and over 36 percent of 11-person voting membership—of its code-change committees responsible for the International Residential Code or, at a minimum, enforce CP37-09 by having all NAHB members recuse themselves on all matters where NAHB has a code-related policy making impossible the unbiased consideration of proposals such as E74-09/10 Part 2.

12. ICC should revise CP28-05 section 5.4.6, or issue a directive that this section be interpreted along the lines addressed by the ICC Industry Advisory Committee Task Group on Time Limits (on which the Appellant served). Currently, there is no adjustment made allowing relatively more time for proposals that have much greater public health ramifications and which require the careful examination plus evaluation of much more technical information than do the vast majority of other proposals. It is perverse economics (of time) to argue that every issue— regardless of its impact and complexity—gets the same inadequate time for testimony. Again, ICC should look at how NFPA handles such issues or the way that the courts (other than kangaroo courts) give issues the time they deserve, not some very short time limited arbitrarily. The current system, employed almost mindlessly in the hearing process does a disservice to certain proponents (and, sometimes, opponents), committee members, ICC voting members and, most of all, public health. ICC’s pattern of “sound bite” or “drive by” code development has improved neither the efficiency of its process nor the quality of its products. E74-09/10 is perfect example of a proposal demanding more time and attention, especially as it addresses a major contributor to an injury toll exceeding that from fire by a factor of 60 in the case of nonfatal injuries occurring to civilians.

## 2013 – Key paper to *International Conference on Fall Prevention and Protection*, Tokyo

Major efforts on a scientific front displaced the futile code effort in 2013. One of three papers presented at the *International Conference on Fall Prevention and Protection* in Tokyo was titled, “**Combining Risks from Two Leading factors in Stair-related Falls.**” The entire paper is very relevant to this Appeal, especially on the matter of rise and run of home stairs and the best available estimates—as of 2013—on the serious injury consequences of stair-related falls. Hence it is reproduced in its entirety as Appendix A to this Appeal Application. Figure 1 is especially relevant in refuting some incorrect testimony (from David Cooper) who tried to denigrate the work by UK colleagues, Wright and Roys, by unfairly claiming that it was only based on subjective measures.



**Figure 1. Graph combining results from a subjective measure of stair safety in a laboratory study with results from a survey of home step dimensions and experience with “accidents” on the stair (Wright and Roys, 2005, 2008)**

The truth is that the UK research was based on multiple measures including about a dozen subjective measures as well as many objective measures including those from laboratory studies and a mail-back questionnaire seeking objective information on falls that had occurred within homes as well as getting information on the dimensions of the steps in such homes.

What Mr. Cooper failed to state is that the result of *both* subjective measures—*specifically the very appropriate, “I felt safe walking down the stair”*—and the most appropriate objective measure—*actual falls in real homes*—had the same relationship to tread run (going) dimensions. That relationship of about a 20-to-230 ratio is found between the risk of a fall (referred to as an “accident” in the UK study) between, respectively a stair with an 11-inch run and one with a 7.5 inch run. Between those two run dimensions are the run dimensions commonly found in homes.

What table 2 does (for the first time) is to relate these findings—from the UK work which was based on uniform step dimensions—with Canadian observations of the heightened risks of missteps and falls on stairs with nonuniformities.

Furthermore, for the first time in any report, Table 2 incorporates epidemiological findings from the USA on risks (per 100,000 population) of stair-related incidents leading to hospital Emergency Department visits. The mean rate, per year (for the years 2010-2014) was 374.5 ED treatments per 100,000 population based on the table below from the Pacific Institute for Research and Evaluation (PIRE), the pre-eminent organization for US injury epidemiology and economics.

Stairs			Hospital-admitted		Total
Age	Doc/Outp	ED	via ED	Direct	
00-09	369.2	327.1	10.7	3.7	710.8
10-19	569.9	290.6	5.4	2.0	867.8
20-29	962.0	453.2	10.6	3.5	1,429.2
30-39	1,381.9	454.3	13.9	4.7	1,854.8
40-49	1,489.6	406.3	21.7	7.2	1,924.8
50-59	1,164.3	342.9	34.6	11.9	1,553.6
60-69	905.9	298.2	52.3	17.8	1,274.2
70-79	981.6	374.4	101.2	34.1	1,491.3
>=80	917.0	478.0	200.4	54.7	1,650.1
Total	980.5	374.5	31.5	10.2	1,396.7

The relevance of these US epidemiology data, relative to the UK and Canadian input, is that—for the first time we are able to get a better idea of the impact—to actual falls of not only the nominal step dimensions but other powerful influences on the *occurrence—or risk—*of serious stair related incidents—*mainly falls*—that result in visits to hospital emergency departments.

Hospital ED visits are mid-range professionally treated injuries, between the vast majority treated in doctors’ offices or clinics and hospital admission. In Table 2 from the paper in Appendix A, also reproduced on the next page, look at where the ED visit mean of 374.5, per 100,000 population, occurs in the table; the most relevant boxes in Table 2 (on the next page) are those with “380” (per 100,000). Note that this can occur with all of the nominal tread run conditions with the changing occurrence of Top Of Flight Flaw (TOFF)—the most common *systemic* non-uniformity defect with home stairs. In plain language, even a good nominal step geometry—with 11-inch runs—can be dangerous if there are dimensional nonuniformities.

**Table 2. Estimated relative annual risks per 100,000 population, of US hospital emergency department visits for home stair-related falls with various nominal run (going) dimensions and with various occurrences of Top of Flight Flaw (TOFF) non-uniformity**

Uniformity condition: Percentage of stairs with TOFF	Annual injurious fall risk rates with various nominal tread runs				
	Risk rates shown are per 100,000 population				
	190 mm Effective run with carpet	210 mm Used in codes in Canada	230 mm Favored by US home builders	250 mm Minimum in ICC codes	280 mm Minimum in NFPA codes
0	230	140	110	50	20
2	250	150	120	62	<b>32 (Ref)</b>
5	260	170	140	80	50
10	290	200	170	110	80
15	<b>320 (10 x Ref)</b>	230	200	140	110
20	350	260	230	170	140
25	380	290	260	200	170
30	410	<b>320 (10 x Ref)</b>	290	230	200
35	440	350	<b>320 (10 x Ref)</b>	260	230
40	470	380	350	290	260
45	500	410	380	<b>320 (10 x Ref)</b>	290
50	530	440	410	350	<b>320 (10 x Ref)</b>
55	560	470	440	380	350
60	590	500	470	410	380

This underlines the urgent need (for ICC education programs for stairway inspections) to do a much better job, than currently the case, teaching inspectors how to spot—and document—dimensional nonuniformity in rise, run or both dimensions. This is not happening even though the skill required to spot the most common defect, TOFF, can be taught in seconds to even an ordinary person. (See the Appellant’s video “One-Minute Stairway Flight Inspection” for this—as well as a text version—at [www.bldguse.com/One-minute\\_Stairway\\_Flight\\_Inspection.html](http://www.bldguse.com/One-minute_Stairway_Flight_Inspection.html).)

A set of 11-inch (280 mm) run stairs having 60 percent of them with TOFF will have the same injury risk (380 per 100,000) as a set of the homebuilders favorite 9-inch (230 mm) run stairs having only 45 percent of them with TOFF. But TOFF is a very easily diagnosed defect; almost all instances can be spotted visually in less than ten seconds by doing a crouch-and-sight test. Assuming good construction with two very different runs; e.g., the home builders’ choice—9 inch (230 mm)—versus the most widely used minimum for reasonably safe stairs—11 inch (280 mm)—the risk difference for perfectly constructed stair flights is 110 per 100,000 (bad) for the homebuilder choice versus only 20 per 100,000 (good) for the most justified, widely used standard, a ratio of 5.5-to-1.0 more danger for the homebuilders’ choice.

Again the greatest value to Table 2 is for everyone involved—builders, regulators, home inspectors, home owners, etc.—to recognize the great impact to safety of step run dimensions as well as making sure the stairs are free of dimensional nonuniformities where the NFPA (and other model code standard *between adjacent steps* is 5 mm or 3/16 inch versus the less justified ICC tolerance of 10 mm or 3/8 inch.

***Finally, we must keep in mind that there are other defects that can impact stair safety and these can also result in the national average risk being 380 per 100,000.*** These include faulty handrails (such as allowed by the IRC in terms of facilitating—or *not* as with the IRC’s defective Type 2 railings—a power grip with thumb and fingers able to encircle the handrail complying as a Type 1 railing), etc. This multiple hazard approach is taken into account with proposal RB116-

19 as virtually all of these defects are addressed by NFPA 101 whereas the IRC deals, very badly, with almost every aspect of stairways by allowing multiple defects.

See Appendix B for the Checklist for Stairways (especially serving homes. This was developed decades ago; it went through international peer review two decades ago; and is now posted in both metric and inch dimension versions at the Appellant's web site, [www.blduse-and-safety.com](http://www.blduse-and-safety.com).

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## **2019 – Proposals on stairways and baths/showers to ICC for *International Residential Code***

Three proposals and three public comments were submitted by the Appellant for the 2019 hearings for the ICC IRC. All were initially disapproved by the responsible IRC Committee. All three had public comments submitted only by the Proponent. All received a perfunctory three comments, most of which were not well thought out, if not also irrelevant. (Note this particular IRC committee appeared to adhere, at least as an average for disapproved proposals—*comprising 78% of proposals*—to three comments; the exact average for this part of the IRC, on building planning, was 2.93 comments for 27 such proposals.) The exact texts of the three sets of committee comment (shown in quotation marks), for the Appellant's proposals were as follows:

- **RB81-19** with highly detailed 8-page proposal on grab bars for new bathing/showering facilities: “These requirements should be optional. The dimensions are not sufficient for all medical conditions. It might be more palatable if only the blocking had to be installed. (Vote: 11-0)” See separate Appeal on RB81-19 for full details.
- **RB112-19** with one unique page plus eight referenced pages (in accompanying, RB116-19) on changing only the rise and run dimensions to “7-11” for consistency with the IBC: “This will limit homeowner and design options. The proponent did not provide information related to accidents that were specific to the code geometry that is now in the code. This should be looked at in more depth by ICC. (Vote: 10-1)”
- **RB116-19** with eight pages on replacing all IRC stairway requirements with NFPA 101 requirements for dwelling unit stairways: “This would require that NFPA 101 be bought for every inspector. The IRC is intended to be a standalone code and this defeats the purpose. We need a work group to gather empirical data on this issue. (Vote: 10-0)”

Significantly, there was a written public comment submitted by the Appellant for RB116 which was not permitted to be discussed during the public comment hearing unless the voting membership voted against the Committee's disapproval so it could be considered—as *pointed out by the Appellant to no avail*. That comment was for the following *new* text:

“R311.7 Stairways. Stairways shall comply with Sections R311.7.1 through R311.7.12.2 or the stairway requirements of NFPA 101 for one- and two-family dwellings.”

*Discussion of the comment would have revealed that its adoption would completely address four of the Committee reasons for disapproving both RB112-19 and RB116-19, leaving only two similar reasons recommending and commenting on future action by ICC, i.e., “This should be looked at in more depth by ICC” and “We need a work group to gather empirical data on this issue.” Clearly, the Appellant regards improvement of IRC's stairway requirements as essential but, as a fall back solution that the Committee reconsideration of RB116-19 should look at, Proposal RB112-19 **with the Comment applied**, would be a win-win for all parties—as an *interim measure* until ICC comes to its collective senses about the following:*

- **Precedent**, e.g., based on what is done—and *accepted as necessary*—in other settings including the IBC as well as, more completely, NFPA 101 plus NFPA 5000, should as acceptable for homes; that is no code should prohibit design that is better than the minimum requirement and acceptance of the NFPA codes as an acceptable alternative should thus be a “no-brainer.” Employing “brains,” i.e., intelligence, more is expected, especially following the precedent of NFPA treating home stairs and their users based on sound public health, natural justice, and other evidence rather than kowtowing to industry based on tradition or political power.
- **Ergonomics**, i.e., science of interactions of people and their environments is practiced and/or relied upon by all of the 47 people listed on page 5 who are to be informed about this Appeal; at least 8 are members of leading national and international ergonomic societies, most are certified in the field. This is clearly a field (along with listed persons in closely related fields of biomechanics, universal design, public health, etc.) that should be considered very relevant to contributing to this Appeal by drawing on substantial, relevant evidence bases.
- **Economics**, *all* benefits—including public health—and costs for individuals & society are also extremely relevant to this Appeal and, notably, the top injury economist in the world, Dr. Ted Miller—also on the list on page 5—has contributed very significantly including being on a few of the 30 videos—and *generally speaking about stairway safety*—posted for free streaming viewing at [www.bldguse.com](http://www.bldguse.com) which also include close colleagues of Dr. Miller on other videos posted there.
- **Parity**, or equity among occupancy and building settings (e.g., all stairways per IBC public building requirements should—as quickly as possible—be at least acceptable, if not required very soon for dwelling units which, with the COVID-19 pandemic have replaced many types of IBC-type buildings as places to work; assemble; dine; recreate; learn; worship; recuperate: receive daycare, medical care, post-procedure care, palliative care; etc.
- **Survival** of society, organizations (e.g., ICC), and individuals (in terms of safety) depends on making homes work much better for everyone for everyone and the best evidence for that is now glaringly obvious in a time of extended pandemic which could well become the new normal and, with that realization, the whole concept of a double, lower standard for dwellings has to be reconsidered—*on an urgent basis* by ICC if it wants to survive and this includes legal challenges against ICC, easily depleting all of its resources for failing to serve everyone using homes and other buildings, not just in a time of pandemic, but the time where we all grow older and, hopefully, live longer and need to be productive to survive.

This leads directly to current time and the near-term future. . . .

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## 2020 – COVID-19 pandemic, ICC Appeal, and *Project 2020* initiation in USA & Canada

### The *Pandemic* of COVID-19 and the *Endemic* of Home Stair-related Injuries

The world is almost completely caught up currently with the COVID-19 pandemic which, according to the WHO, as of May 6, 2020, reported 3,588,773 cases worldwide (to which are added the daily new cases: 71,463). While the pandemic rages around the world, in the USA we

also have an *endemic* situation, *home stair-related injuries* for which the latest comprehensive analysis was for the years, 2010-2014, when there were an estimated 4,384,000 medical treatments for stair-related injuries, about 90 percent of which, at that time, were from home stairs. See table below (from the Pacific Institute for Research and Evaluation, PIRE) for stair-related injuries medically treated in the USA *annually* for the years 2010-2014.

**Incidence of Medically Treated Injuries by Treatment Level, for Stairs, Annually for 2010-2014  
(Source: PIRE)**

Stairs Age	Doc/Outp	ED	Hospital-admitted		Total
			via ED	Direct	
00-09	149,389.0	132,344.0	4,313.0	1,515.8	287,561.8
10-19	240,132.0	122,449.0	2,288.5	824.6	365,694.1
20-29	422,114.0	198,838.0	4,634.7	1,533.7	627,120.4
30-39	560,978.0	184,438.0	5,628.9	1,910.3	752,955.2
40-49	634,787.0	173,156.0	9,241.0	3,050.3	820,234.3
50-59	502,896.0	148,100.0	14,928.3	5,133.4	671,057.7
60-69	286,908.0	94,429.1	16,556.9	5,644.9	403,538.9
70-79	173,515.0	66,176.8	17,891.0	6,021.7	263,604.5
>=80	106,489.0	55,507.0	23,272.4	6,356.7	191,625.1
Total	3,077,207.0	1,175,439.0	98,754.8	31,991.4	4,383,392.2

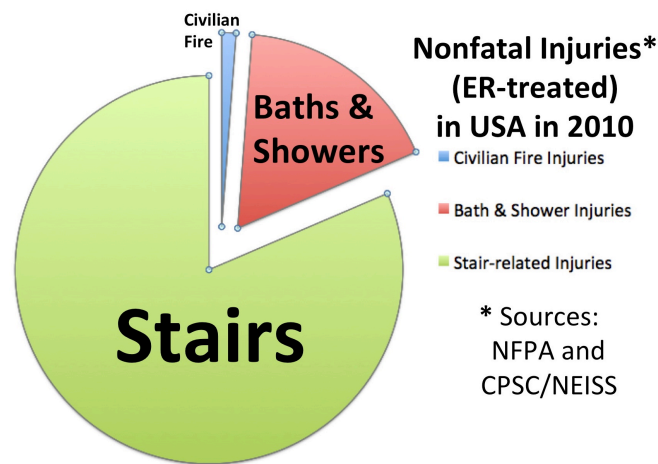
At the time this table was prepared, homes accounted for about 90 percent of the stair-related injuries; that figure is likely closer to 100 percent currently due to the pandemic and sheltering requirements at home.

For comparison in 2020, let's assume that there is a continuation of an average annual growth rate of 3.1 percent (based on the US CPSC category of "Stairs, Ramps, Landings and Floors" for nine years of ED treatments, 2007 to 2016). This is a conservative estimate. Note that the 2020 annual stair-related injury estimate—*1,500,000 ED treatments for stair-related injuries and, using the extrapolation ratio in the table below, 5,597,593—is rounded to 5,600,000 medically-treated stair-related injuries for 2020 in the USA.* This is a low estimate as, with much more-intensive use of homes *and home stairs—during the pandemic and associated home-sheltering*, the estimate could approach a figure up to twice as high. We will see in several months.

In any event, the estimated number of medically-treated (or sufficiently serious, *in better times*, to be medically treated), stair-related injuries in the USA rival even the *world incidence* to date in 2020 of COVID-19 cases reported by the WHO. We can at least say that medically treated stair-related injuries are in the same order of magnitude, even if we restrict ourselves to the USA, for which COVID-19 cases, by May 6, 2020, numbered 1,193,813 according to the CDC.

**Semantics and Stairway-related Injuries.** The COVID-19 figures are for a "*pandemic*" (the term used when an epidemic spreads throughout the world). An "*epidemic*" is an outbreak of disease that attacks many peoples at about the same time and may spread through one or several communities. Stair-related injuries do not constitute an epidemic; they are more aptly referred to as "*endemic*:" (a disease, such as malaria, that exists permanently in a particular region or population). Given the decades of stair-related injury statistics in the USA for stair-related injuries, with CPSC documenting these since 1975 (when there were just under an estimated 400,000 ED treatments annually for stair-related injuries) to today's estimate of about 1.5 million annually, this is a true case of an endemic problem that the building regulatory community largely "owns." It can be contrasted with fire-related injuries, which—over the same period—have decreased very significantly and are two orders of magnitude smaller.

This disparity between what we have accomplished with fire-related injuries and what we have failed to address with stair-related injuries (plus bathing/showering-related injuries) was graphically illustrated in the pie chart provided on page 757 of the *2019 ICC Public Comment Agenda*. See the pie chart below.



### ICC Response to the Home Stair-related Injury Endemic during the COVID-19 Epidemic

The following information and views were shared, first, in the context of recent ICC Webinars focused, entirely and in part, on building inspections (partly) performed “remotely” or “virtually” on April 13 and 29, 2020. Secondly they were shared, by email, with ICC leadership, particularly ICC CEO, Dominic Sims, on May 1, 2020. (The following are now being shared beyond ICC.)

The Appellant had the opportunity of participating—as a submitter of comments and questions to the April 29th ICC Webinar that touched on remote and virtual inspections. These followed an earlier attempt to post related comments in the chat box for ICC's April 13th Webinar devoted entirely to remote and virtual inspections. These first postings, which were submitted late in the first Webinar, were completely ignored by the ICC Host and panelists, *apparently deliberately*.

#### First the Appellant’s chat box postings in the April 13th webinar:

"There was no mention of stairway inspection. What do you do with them?  
(See next two comments for background.)

With greatly increased use of homes & increased occupant vulnerability with all work & education in homes, is this not the time for ICC members to reconsider the double, lower—indeed dangerous—stairway design standards of the IRC—injuring 4 million a year.

The 4 million a year figure is only the tip of the stair-related injury 'iceberg.' It is merely the injuries, 90 % occurring in homes, that are treated by medical professionals. The annual societal cost of the stair-related injuries exceeds \$100 billion."

**Next, the chat box posting for the April 29th webinar.** About ten minutes into this one-hour Webinar, the Appellant submitted the following five comments/questions which turned out to be

the *only* postings in the Webinar chat box and thus stayed there—*prominently, occupying about one-third of the Webinar screen*—for about 35 minutes, about the middle half of the Webinar's scheduled duration. Here are the five posted comments/questions (which were also captured with screen shots):

"Neither ICC's website nor prior Webinar on virtual & remote inspections deal with home stairway inspections. How do you do them during the pandemic? See next few comments for my own responses to this question—*which I suspect ICC is very loath to address*.

With greatly increased use of homes & greater occupant vulnerability with reduced fitness if not illness, is this not the time for ICC members to reconsider the double, lower—*indeed dangerous*—stairway design standards of the IRC—injuring 4 million a year?

The 4-million injury figure in the preceding comment is for professional medical treatments for stair-related injuries—*a decade ago & 90 percent for homes*. That figure has grown and, with the pandemic, there could be several million such injuries in 2020.

With homes now used well beyond assumptions for IRC's inferior stairway rules, inspections are more critical—*as is a much-improved IRC*. Four key stairway inspection tasks, taking only 1 minute, are posted at [www.bldguse.com](http://www.bldguse.com) in text and 8-min. video form.

All the issues are covered at the Appellant's web site ready to go into an inspection protocol."

The final comment was posted in response to panelists' very brief, incomplete responses to the Appellant's first four postings; they asked if he could provide guidance on what the inspections should cover, a remarkable question coming from ICC "experts" in inspection. The posting of his final comment (above)—*about the issues all being covered at his web site*—led to the host going to a new topic. One assumption for this is that they did not know what aspects of their inspections would deal with stairway safety. (See comments below on this matter of knowledge and preparedness—*by panelists and more generally*—to do stairway inspections.)

ICC staff and members cannot say they did not have a "heads-up" about the whole matter of home stairway inspections—even in the last few weeks. The full record of both webinars (on ICC's web site) will clearly reveal just how unprepared even the best of ICC's members and staff are to deal with the matter of home stairways. Here the Appellant is reminded of the old adage, "*What can you expect of iron when gold rusts?*"

These Webinar postings may well turn out to be exhibits in future court actions. Important here is ICC's apparent inability—*as well as organizational reluctance*—to, in part, defy (or at least stand up to) the NAHB.

There have been decades of compromised, if not also corrupted code development—*plus inadequate enforcer education* in the legacy code organizations (with the partial exception of BOCA) and ICC as well. *Moreover, ICC should start requiring home stairways to be regulated*

***with most, if not all, of the requirements currently found in the IBC. Notably NFPA 101 and 5000—address this much better in their chapters covering dwelling unit stairways.***

Having participated in the two recent ICC Webinars (plus one on May 7), the education of code officials struck the Appellant—*especially at the ends of all webinars*—as a glaring issue. He had high expectations of the Webinar participants, but came away disappointed, indeed shocked.

But this was not an entirely new revelation to the Appellant as he has spoken about this in public presentations and published on this topic for a long time. One example of the latter is the publication that a very expert colleague and the Appellant prepared for lawyers on the west coast of the USA where the colleague focused his forensic practice. (The citation for this is: “Johnson, D.A. and Pauls, J., 2012. Why should home stairs be less safe? *Trial News*, 47(8), Seattle: Washington State Association for Justice, 11-15.”) Both authors were appalled to learn about the extremely unprofessional way ICC was teaching home stairway inspection. An excerpt of that publication (also provided in full as a PDF file) follows (with the bold, italics portion pertaining to ICC's education for inspectors):

### **“Inspection Techniques**

In Newcomer's (2006, 50) manual, “A practical guide for home inspection”, stairs are hardly mentioned, and then only those leading to the basement.

Stairways: Interior stairways to the basement should be inspected for safety.

The home inspector should check for proper lighting so people going down the stairs can see their way to the bottom. Handrails should be present and securely fastened.

Note: Nothing is mentioned about handrail graspability which is critical for safety following a misstep.

Steps should have risers of equal height and should be level, uncracked, unworn, and stable.

Note: the guide does not mention tread runs or that they too must be uniform.

The same deficiencies were noted in another publication for home inspectors in that nonuniform risers are mentioned, but uniformity of runs was not (Hankey, 2008). The writer goes on to state, “My experience indicates the key method of inspecting stairs is to walk them, in both directions (up and down) while using the handrail.”

Other examples of flawed, incomplete guides are those coming from sources one would expect to be authoritative; e.g. the “Residential Inspector's Guide: Building and Energy, based on the 2009 International Residential Code, Chapters 1-11,” published by ICC and the “2009 Home Builders' Jobsite Codes: A Quick Guide to the 2009 International Residential Code,” published jointly by ICC and NAHB. Both omit any mention of the IRC rules prohibiting non-uniform tread nosing projections, the chief factor in the “Top of Flight Defect.”

***In a class one of the authors [Johnson] audited, conducted by the International Code Council for building inspectors, no specific information on how to accurately measure stairway geometry was mentioned. The “test” to evaluate the safety of the stairs entailed simply walking on the stairs; no measurements were suggested and no sighting to determine variation in step geometry was mentioned.***

Thus, even though excessive variation in stair geometry causes missteps and falls, many (perhaps most) inspectors do not attempt to detect, let alone measure, non-uniformities.

As such they cannot tell if the stairs conform to code.

Even if excessive variations were noted, it is unlikely an inspector—especially a private-sector-based one who depends financially on future referrals—would require a new but poorly-constructed stairway in a home to be torn out and reconstructed. In fact, Newcomer (2006, 35) cautions inspectors against bringing in an engineer: ‘Don’t raise this alarm when you don’t need to. You won’t get any more referrals from real estate agents if they figure you’re going to suggest an engineer for every house.’

Pauls and Harbuck 2008, (with the latter author being a teacher of inspection) also address the problem of faulty inspections, both in governmental inspections and in private-sector home inspections. In the latter, home inspectors who identify defects run the risk of being labeled ‘deal breakers’ by the real estate agents who retaliate by no longer referring such inspectors to clients.”

Much of the foregoing background information is part of what is currently called "Project 2020" which includes the two appeals to ICC (as well as attempts to get appeals in the Canadian national model code development process even accepted, let alone processed fairly). Moreover, as noted in the last paragraphs of the foregoing paper excerpt, blame is also shared with the post-construction, (usually resale/purchase-related) home inspection profession.

These are only the first elements of a larger program which, in part involves the tactic, with apologies to Shakespeare for modifying his famous quotation, “Let’s skill all the lawyers.” The Appellant has spent decades “skilling” lawyers as part of his work investigating and reporting on, in great detail, serious stairway-related injuries.

The Appellant is already published, in Canada (a decade ago), on the matter of naming, not only code officials, but model code development organizations in future law suits and will continue this educational program, with increased intensity, now that the evidence of inadequate attention to code development and enforcement (as well as associated education of those implementing such codes in the field) is so powerful.

It is also far more relevant—*than ever before*—in the age of the COVID-19 pandemic and associated home sheltering. Homes are the setting for so many activities that, previously, were performed in buildings having much more stringent—but very well justified—requirements for stairways.

Home stairways are being more intensively used, during the pandemic—and *into the future*—not only due to fear of pandemic but the realization at societal, individual and family level that older people will want to stay in their homes much longer—and thus avoid the dangers of retirement and long-term care settings which are proving deadly in addition to their other negatives that, now, will begin to outweigh some of their positive qualities.

Today we must rely on our homes to replace many relatively well regulated buildings where we—in *better times*—and *without the physical debilitation of disease*:

- worked,
- assembled,
- dined,
- recreated,
- exercised,
- learned,
- worshiped,
- received daycare,
- healed from injury, surgery or other procedures,
- relied on for care for our most vulnerable family members,
- produced much of the live radio and TV currently broadcast,
- even fabricated the face masks now required for many social interactions.

These are matters ICC and other code-development bodies ignore at their peril, *ethically and morally as well as financially*. Thus, the double, much-lower standard for home stairways has to be challenged.

Finally, as part of the Appellant’s ability to say, “I told you so,” he is producing more videos that put the message more starkly and directly, not only to the building regulatory community, but to others. Exhibit 1, as evidence of that, is the 8-minute video—on the “*One-minute Stairway Flight Inspection*”—produced within a few hours *before* ICC’s April 13 webinar. It went through post production within a week and now is available for free streaming viewing at the web site, <https://vimeo.com/channels/1063550>.

All of the foregoing—and *much, much more documentation*—is being assembled and discussed with legal counsel for these ICC Appeal submissions, the appeal process, *and beyond*. Already several attorneys, with whom the Appellant works, have been involved in discussions of “Project 2020” with him as have been journalists and professional colleagues in the USA and Canada.

ICC has a precious few months to demonstrate if is part of the solution rather than being a big part of the problem. (The CCBFC and *Codes Canada*, in Canada, have already received candid views on their vulnerability to public mistrust at best and devastation at worst—after a public inquiry and more.)

Clearly, with all the Appellant’s efforts in recent decades—both within ICC and through his worldwide publications (see Appendix C for these and many more, by others, in his library), as well as his presentations, and advocacy, he is counting on ICC leadership making good decisions, indeed far better decisions than it made the last time the Appellant attempted an appeal on the home stairway issue several years ago. If ICC fails now, it will be as the Appellant said at the close of the aforementioned, 8-minute video, “*There will be lawyers all over this thing.*”

Even if the Appellant succumbs to COVID-19—and thus is cut short in working on these matters, there is a huge trail of publications and videos that can be used by those who follow him to pursue this matter. To them the Appellant’s final wish on the aforementioned video, was “Have a really great day.”

This disaster must be stopped from growing and, ideally, eliminated entirely. That sounds a bit like the efforts of so many people now to do the same to the Corona virus. The Appellant sincerely doubts that the ICC leadership wants to have ICC compared to the Corona virus. So the Appellant looks forward eagerly to the appeals and ICC leadership action—*finally*—after decades of trying to get action on this matter.

Once the appeals to ICC provide an idea of how ICC plans to proceed—e.g., via committee reconsideration—the rest of “Project 2020” will be set in motion. That will involve even more lawyers who will be “skilled” on the relevant history—*amounting to hundreds of pages*—of ICC and the homebuilders’ interactions plus much more. “Project 2020” will provide the opportunity to consider the matter of home stairways in much more detail than permitted in the almost totally inadequate ICC system of hearings, for example, with their virtually locked-in 2-minute and 1-minute testimony times—something unheard of in the law courts where testimony time is determined by the complexity of the facts to be addressed. NFPA does not have such draconian, unworkable time limits. *ICC needs to reconsider theirs.*

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## **2023 – Possible final decisions by ICC & the Courts in new world of public health & codes**

Although ICC’s appeal process will occupy only a few months (?) of 2020, possibly extended somewhat due to logistics of doing this in the middle of a pandemic, it now appears that—with lawyers waiting to get involved with possible legal actions *on a select few cases* in which ICC might be named as a co-defendant along with local code officials—“Project 2020” is named by the year of initiation, not completion.

The year 2023 has been chosen as a marker here partly based on the speed—or lack thereof—with which legal procedures operate and, more definitively, as the next year (after 2020) in which ICC could make the much needed changes in the *International Residential Code* as well as related portions of the *International Building Code*.

2023 is also a realistic year in which the research might be completed on the lasting impact the *recently begun* pandemic has on American society—*involving the possibly reduced importance that larger buildings for work, public assembly, long-term care, education, etc. have relative to dwelling units*. The Appellant looks forward not only to seeing and documenting this but, of course, surviving in good health to see how the world has become a better place, a place where (beyond NFPA) evidence is finally fairly treated—with *better attention to public health and safety*—in the ICC code-development process, associated education programs, and the better homes beginning to be available especially to the more-vulnerable populations in the future.

Generally, this Appeal should be a small part of a *Paradigm Shift* for ICC and the role of building codes and safety standards plus their adoption and enforcement in the USA and beyond.

## Appendix A

Proceedings of International Conference on Fall Prevention and Protection, Tokyo, October 2013

# Combining Risks from Two Leading Factors in Stair-Related Falls

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Two key aspects of stairway step geometry are *nominal dimensions* of step rise and run (also known as “going”) plus the *uniformity of those dimensions*. A survey of UK home step dimensions found a risk range of 0.02 to 0.10 “accidents” per year, varying inversely with runs from about 250 to 195 mm. An inverse relationship, with more variables documented, was found in earlier research in a UK laboratory with a wider range of step runs, 280 to 190 mm, as used generally in buildings. Other research identified *non-uniformity* of step run and/or rise as a potent risk factor with risk ratios estimated in one or more orders of magnitude (i.e., factors of 10). A newly identified research challenge is to determine what the overall risks are—for a large set of stairs—when both nominal step geometry and uniformity are jointly implicated in falls. This improves understanding of how national fall injury data might be distorted by faulty nominal and non-uniform step dimensions.

## Introduction

Stairs are a major site for injurious falls whether in occupational settings, where there can be relatively good control of most risk factors, or homes, where there is little control of risk factors including those resulting from significantly lower standards for design, construction and use plus their regulation. In the USA there are relatively good national statistics, including stair-related injuries treated in hospital emergency departments, from the US Consumer Product Safety Commission (CPSC) National Electronic Injury Surveillance System (NEISS). Annual national estimates, which can be tabulated by treatment, setting, victim age, etc., are freely available on the Internet (CPSC/NEISS, 2013). Using NEISS data, analyses have been done of the disproportionate occurrence—and relatively rapid recent growth—of more-serious, stair-related injuries in home settings, relative to all others (Pauls, 2011).

Important environmental factors in stair-related falls have been identified over the last few decades. During this time, and in several countries, the role of step geometry has gained growing prominence. Selected highlights of this prominence include studies by researchers, in the USA, e.g., Alessi, *et al.* (1978), Archea, *et al.* (1979), Templer (1984, 1992), Hay and Barkow (1985), Cohen, *et al.* (2009); in Japan, by Kose, *et al.* (1985), Nagata (1985), Nagata and Kim (2007); and in the UK by Roys (2001), Roys and Wright (2005), Wright and Roys (2005, 2008). Other research findings include work by Johnson and Pauls (2010) and Pauls (2011). (A 20-page list of literature providing primary, secondary and tertiary treatments of stairway safety/risk factors, and associated controls including safety codes and standards, is available from the lead author.) Complementing such historical studies is extended research, for example, in major laboratories studying falls: Japan NIOSH, US NIOSH, UK HSL, Liberty Mutual Research Institute for Safety in the US, and, in Canada, the Toronto Rehab Institute iDAPT research centre—responsible for the best website on stair usability and safety research plus technology (TRI iDAPT, 2013). It is fortunate to find that physical aspects of stair construction are implicated in injuries. These aspects can be accurately measured and produced in construction and remediated after the fact of a fall.

## Early estimates of stair-related injury risks

Generally, risk is described as the ratio of some outcome relative to a unit of exposure. One of the early estimates of stair-related risk was published by Archea, *et al.* (1979). The outcome measures ranged from minor missteps (defined as departures from normal gait) through to death, per stair flight use. *Flight use* is a meaningful measure of a user's encounter with a stair flight (sometimes referred to simply a *flight*, defined, like *stair*, as a single series of steps). Risks of a misstep are highest within one, two, or three steps of the transition from level walking to stair walking and in the transition from the other end of the flight in transitioning to level walking.

Table 1 provides these estimates—*based on very early NEISS data*—for the year 1975. The terminology used is exactly that used in the 1979 report. The third column, derived from the second column, was added in Table 1 to make the estimates of Archea, *et al.* more useful.

**Table 1. Risk estimates for US by Archea, *et al.* (1979)**

Incident type	Incidents/year	Risk per flight use
Flight uses	1,953,000,000,000	1.0
Noticeable missteps	264,000,000	1 / 7,400
Minor Accidents	31,000,000	1 / 63,000
Disabling Accidents	2,660,000	1 / 734,000
Hospital Treatment	540,000	1 / 3,617,000
Related Deaths	3,800	1 / 513,947,000

## Updating early estimates of stair-related injury risks

If Table 1 were revised for conditions in the US based on NEISS national data for 2012, it would be relatively definitive at 1,297,930 for all stair-related hospital emergency department visits (growing by a 2.4 multiple). After correcting for population growth (215,973,199 to 313,933,954), this would still represent a large increase—*by a multiple of 1.65*. Rates per 100,000 population were respectively 250 and 413 for emergency department visits in 1975 and 2012. The 2012 rate for 78,876 stair-related hospitalized cases was 25.1 per 100,000 population.

Obtaining an estimate of flight uses for 2012 is problematic; the 1975 estimates by Archea, *et al.* were based on about 25 flight uses per day per person in the USA. Given many lifestyle and other changes over the intervening 37 years, we would estimate a somewhat lower per capita use of stair flights, say 20 flight uses per day. Aging of the population during this interval is a separate trend that may need to be taken into account. However, in calculating risk, this can be accounted for in estimating exposure, by lowering it accordingly.

Therefore, the 2012 risk is about one hospital emergency room visit (“Hospital Treatment” in Table 1) for every 1,766,000 flight uses, a doubling of the risk in the intervening 37 years.

Analysis by Pauls (2011) supports a doubling of the risk based on analysis of stair-related hospital-admission cases with more comparable data for the period, 1997-2009: “In the 12-year period, *age-adjusted rates (per 100,000 population)* of such injuries grew 103 percent (3.8 to 7.7) for people <65 years of age; 85 percent (36.9 to 68.1) for people ≥65 years of age.”

As shown in Pauls’ (2011) analysis of the NEISS data from 1974 to 2009, there was relatively modest growth of stair-related injuries in the US until 1997. Between 1997 and 2009, the ratio of all estimated US emergency department visits (and to some extent for hospital admissions) for home settings versus all other known settings grew from about 5-to-1 (the ratio between 1975 and 1997) to about 10-to-1 in 2009.

## Utility of information for stair-related injury risks

In the foregoing discussion there are two different metrics used to describe risk; one typical of traffic and other safety professionals based on incidents per exposure (i.e., kilometers, hours of use), the other based on incidents per population per year. The other is more typical of public health epidemiology professionals, the

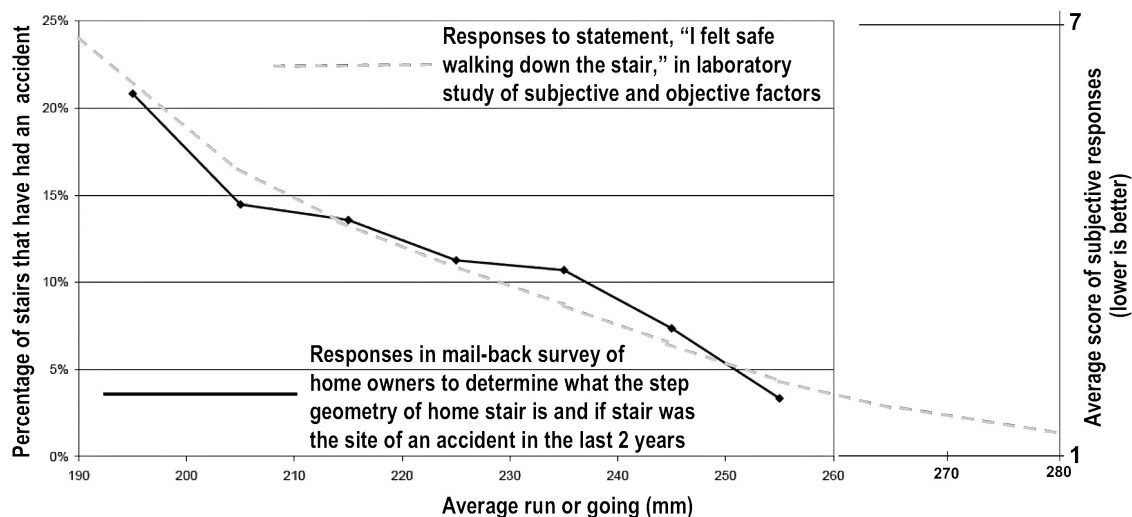
source of much of the admittedly limited information about the risk of falls and the even more limited information about how and why falls occur. If there were no material changes in stair usage (“exposure”) over time, the epidemiological approach and the safety approach should track one another.

A dramatic change began about 1997 in the relative risks of stair use in US homes versus stair use elsewhere in the US. Much of the impetus for this paper is to help make a case for research to determine how and why this happened in the US (and possibly elsewhere, including Canada). Our hypothesis is that the *combinations* of risks for these settings changed, partly due to the differences in both nominal step geometries and the uniformity of such geometries.

For example, “Top Of Flight Flaw” (TOFF), is a disturbingly pervasive, systemic non-uniformity defect in home stairs in the US and Canada, as described by Johnson and Pauls (2010). TOFF is a candidate, partial explanation for what is happening with risk of stair use. TOFF incidence exacerbates safety if occurring with other step dimension defects; for example, *systematic* TOFF might be accompanied by *random* non-uniformities in step geometry. *Both* complicate the risks coming from systemically smaller (nominal) step runs (going) in homes.

Non-uniformities, have a large impact on observable missteps on stairs as well as risk of serious injuries. Johnson and Pauls (2010) estimate impacts in orders of magnitude (factors of ten). Also, forensics-based insights have repeatedly shown that non-uniformities are often implicated as proximate causes for missteps and falls (e.g., Cohen, *et al.*, 2009).

Publications from the last decade and especially, conference presentations provide important insights from UK studies into the effect of differences in nominal step size, particularly the run (going) dimensions (Wright and Roys, 2005, 2008). As shown in Figure 1, this work, using both objective and subjective measures in laboratory and field survey work, suggests that nominal step geometry, notably the run (going) dimensions can impact actual and perceived safety by a multiple of 7 (as much as 11 for residential-type carpet covering which reduces *effective* tread run to as little as 190 mm). These multiples could be a key part of the answer along with the order-of-magnitude estimates of non-uniformity effects noted above.



**Figure 1. Graph combining results from a subjective measure of stair safety in a laboratory study with results from a survey of home step dimensions and experience with “accidents” on the stair (Wright and Roys, 2005, 2008)**

### **Combined risks of different nominal step run or going dimensions with varying incidence of top-of-flight non-uniformities**

Table 2, below, is a illustrative result of combining two risks. This is acceptable to the degree of which they can be considered as acting *independently*, linearly, and are otherwise numerically well-behaved. Not included here is a table showing results if those simplifying assumptions cannot be sustained (e.g., with *dependent* factors that require multiplication). An example of dependent probabilities occurs if the misstep in a TOFF situation is more difficult to mitigate due to generally short tread runs, e.g., 210 mm, permitted in Canadian homes.

**Table 2. Estimated relative annual risks per 100,000 population, of US hospital emergency department visits for home stair-related falls with various nominal run (going) dimensions and with various occurrences of Top of Flight Flaw (TOFF) non-uniformity**

Uniformity condition: Percentage of stairs with TOFF	Annual injurious fall risk rates with various nominal tread runs				
	Risk rates shown are per 100,000 population				
	190 mm Effective run with carpet	210 mm Used in codes in Canada	230 mm Favoured by US home builders	250 mm Minimum in ICC codes	280 mm Minimum in NFPA codes
0	230	140	110	50	20
2	250	150	120	62	<b>32 (Ref)</b>
5	260	170	140	80	50
10	290	200	170	110	80
15	<b>320 (10 x Ref)</b>	230	200	140	110
20	350	260	230	170	140
25	380	290	260	200	170
30	410	<b>320 (10 x Ref)</b>	290	230	200
35	440	350	<b>320 (10 x Ref)</b>	260	230
40	470	380	350	290	260
45	500	410	380	<b>320 (10 x Ref)</b>	290
50	530	440	410	350	<b>320 (10 x Ref)</b>
55	560	470	440	380	350
60	590	500	470	410	380

Relative risks *as affected by nominal step geometry* come from Figure 1, based on studies by Wright and Roys (2005, 2008). Increased risk posed by TOFF is conservatively assumed to be a factor of 30, based on observations by Pauls as reported in Johnson and Pauls (2010).

The 10 times criterion (“10 x Ref”) is based on what has been documented for the entire US during the period 1997 to 2009, with home stairs responsible, by 2009, for about ten times as many hospital emergency department treatments as those for all other known settings. (Recall that this was compared with a multiple of only five in the 23 years during which NEISS data were collected before 1997.) In Table 2, the cell, “**32 (Ref)**,” for 280 mm run combined with 2 percent incidence of TOFF, applies to US non-home stairs associated with 32 emergency department visits, per 100,000 population, for stair-related injuries during 2012.

Risks shown in Table 2, described using the surrogate measure of emergency department visits per 100,000 population, are hypothetical based on a few assumptions derived from the work of a few leading researchers into stair safety over a period 1975 to 2008 (specifically Archea, *et al*, plus Wright and Roys, 2005, 2008, along with conference presentations by the latter). Contributing to the amalgam of such diverse studies is the judgment of the lead author of this paper, using these inputs to develop first-order—or *better*—estimates of risk, expressed in units widely used in public health. These can compared with epidemiology data such as NEISS national estimates of stair related injuries in 2012 resulting, in hospital emergency department visits—at an annual rate of about 413 per 100,000 population.

It should be clear that Table 2 represents *theory-based estimates* to spur further research and analysis. These estimates are therefore superior to first-order estimates and relate most closely to US data. The authors intend that the relative risks inform the Canadian home stair safety situation with its code-permitted, 210 mm runs and evidence of much non-uniform construction.

Not included in Table 2 is the near worst-case scenario with *every* stair having non-uniformities due to TOFF (at the top of stair flights) *or* randomly located ones. These would result in estimates of about 600 to 800 per 100,000 population for the step geometries arrayed across the table. The logical end-point would be the combination of both systemic *and* random non-uniformities plus very short tread runs. Sadly, such a prospect cannot be dismissed if competencies in home construction and its inspection continue an apparent downward trend.

In Table 1, relationships among missteps and falls (from Archea, *et al*, 1979) have been used to re-characterize the two-year “accident” survey results of Wright and Roys (2008). Both sources used the term “accident” to describe falls, but failed to be specific about severity or consequence. For example, Archea, *et al*, used the designation “disabling accidents” to describe incidents that led to the need for some minor medical attention (i.e., either in home or in a doctor’s office, urgent care center or hospital) not long-term disability.

Using injury epidemiology, we now know that, in the US, for every visit to a hospital, there are about 1.5 professional medical treatments in other settings. From this we could estimate that, for every hospital emergency department visit, there are on the order of four other treatments, either within the home or undocumented in another treatment setting. This results in a ratio of about 5-to-1 between what Archea, *et al.* termed “disabling accidents” and “hospital treatments” (their estimates being, respectively, 2,660,000 and 540,000, a ratio of 4.93-to-1, for the year 1975 in the US). With significant changes in healthcare delivery, there are and will be difficulties using the foregoing assumptions in future analyses of risk.

## Discussion

Along with firearms and tobacco, stairs are among the most dangerous product we utilize in our homes in terms of public health costs, particularly relative to costs of manufacture or construction or remediation. While less recognized as being an aspect of public health, usability is also a major area where stairs, especially in our homes, exact huge costs comparable to or even greater than, the injury costs. Comprehensive, societal injury costs estimated by Lawrence, *et al.*, (1999) were on the order of five million dollars per hour in the US for 1995. With recent growth in injury costs, the current estimate is about 10-million dollars per hour in the US.

Inevitably, stair behaviour is influenced by the perception of risk (Hay and Barkow, 1985). After all, there are no falls until a user takes their first step. The perceptions of risk held by users are most veridical and hence lead to the safest outcomes when grounded in factors known to be risky from objective studies such as those summarized in this article.

In Hay and Barkow (1985) the user rankings of stairs were compared to actual fall data and to expert opinion. Naïve users, it was found, are not naïve about risks because their ranking of 40 stairs correlated  $r=.78$  with a panel of recognized experts and  $r=.28$  with the cost of injuries. So it is useful to relate factors empirically known to be risky such as TOFF to the degree in which *users* perceive them as risky. Moreover, as part of a comprehensive program of stair safety, users need education in stair defect identification, e.g., TOFF (Johnson and Pauls, 2010).

Regarding research, and other public health measures to better understand how stair-related risks can be assessed and managed or mitigated, *if not eliminated*, we need:

- Improved epidemiological data collection, analysis, interpretation and publication.
- Surveys of homes (and other buildings) to determine the incidence of, and factors determining, the actual dimensions of steps of stairs, taking into account nominal values as well as non-uniformities, their types, sizes, locations and conspicuity.
- Studies of adaptations people employ to detect and mitigate non-uniformities.
- Programs to educate designers, builders, regulators and others about stair risk reduction. What information is held by ergonomists and safety experts, for example, that is not communicated and worse, is not applied. How many inspectors, for example, know how to do the “crouch-and-sight test,” that takes no more than ten seconds to perform? Yet it is effective and should be tried at the start of an inspection (Johnson and Pauls, 2010).
- Information on stair hazards needs to be communicated to users so as to make their perceptions of risk veridical—accurate and meaningful—as they begin their first step.

The foregoing list is incomplete and the reader, having gotten this far into this paper, will have thought of much more. Like two other papers submitted by the lead author to ICFPP2013 (and prior conferences in this series, e.g., Pauls, 2007, dealing with misstep typology), the objective is not only to spur badly needed new research but to improve our ability *now* to identify and discuss the key issues using more specific terminology than, for example, “minor accidents.” Stairways—the term used to describe not only the steps but also the handrails and other features of stairs—have long fascinated a wide range of people for technical as well as many other reasons. *They clearly warrant our careful attention, and much more.*

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**Appendix B — Checklist for Stairways**  
**With special application to home stairways**  
**Developed by Jake Pauls, BArch, CPE, HonDSc**  
Contact: bldguse@aol.com.

Permission is granted to reproduce with source identified. Revised, with bold emphasis, Sept. 2014.

**General:**

- [ ] **Locate steps only where they are necessary and their presence is obvious to all.**
- [ ] Avoid small changes of floor or walkway levels, especially very problematic, single steps.
- [ ] Use safety glazing for glass that could be impacted in a fall on a stairway.
- [ ] Arrange for any doors adjacent to steps not to swing over any steps. Doors and stairs are very problematic in close proximity (closer than 3 feet) such as at entrances to a home.
- [ ] Install securely latched gates, safe for infants and toddlers, to prevent access to stairs.
- [ ] Avoid sudden changes of views and visual distractions, including glare, from stairways.

**Steps:**

- [ ] **When you sight down the steps, the nosings (leading edges), including those at each landing, must all line up. Irregularities are especially dangerous.**
- [ ] Make sure risers and treads, measured nosing to nosing, are consistent in size (within 3/16 in).
- [ ] If nosings project beyond stair risers, keep nosing projections uniform in the flight—including **at landings**—configured so that there is no tripping danger to those with poor foot control.
- [ ] For older and very young users, have new step rise dimensions no higher than 7 inches.
- [ ] Build new step run dimensions at least 11 inches front to back, measured nosing to nosing.
- [ ] Conspicuously mark flights having inconsistently sized steps; e.g., paint a contrasting stripe (of consistent width in range of 1 to 2 inches) on all step nosings (right at the leading edges of the treads) so that the non-uniformity stands out and is visually obvious.
- [ ] **Carpets and padding on treads should not exceed 3/8 inch in total thickness.**
- [ ] **Fix tread coverings securely; coverings must be tight against the nosings.**
- [ ] Remove/repair tripping surfaces such as projecting nosing caps and screws or nails on treads.
- [ ] Provide slip-resistant (rough) finish on exterior stair treads subject to wetting.
- [ ] If stairs are subject to wetting, slope treads approximately 1/8 inch per foot for drainage.

**Visibility:**

- [ ] **Make steps visually prominent so that their presence is obvious.**  
**Avoid tread materials and coverings with visually distracting patterns.**
- [ ] Provide slightly rounded nosings (maximum radius 1/2 inch) for visibility and injury reduction in case of a fall against the steps
- [ ] Mark all nosings permanently—**not with tape**—if they are not distinctly visible in descent.  
Note that a 1-inch painted stripe works very well, and looks good, even on carpet.
- [ ] Provide lighting without shadows or glare. Tread nosings must be distinctly visible
- [ ] Illuminate stairs with no less than two light sources
- [ ] Have light levels on stairs at least as high as on adjacent floor areas.
- [ ] Unless continuously lit or automatically switched on, provide light switches at each stair access.
- [ ] Install permanently illuminated, shielded, small light sources (e.g., LED night lights) on stairs so that all steps in each flight are fairly uniformly, and not too brightly, illuminated.

**Handrails:**

- [ ] **Install a handrail around which fingers and thumb can encircle, rather than merely pinching the railing. A measuring tape, wrapped completely around the railing, should measure less than 6 1/4 inches. Use a smaller size for children.**
- [ ] Provide at least one handrail on each stair—**regardless of the number of steps.**
- [ ] Continue handrails between stair flights on the side providing the shortest path of travel.
- [ ] Extend the handrail, without a break, the full length of the stair between floors.
- [ ] Augment any decorative, ungraspable stair railing system with a functional handrail.
- [ ] Maintain adequate hand clearance (2 1/4 inches) between the handrail and nearby surfaces.
- [ ] **Position handrails at about adult elbow height, e.g., 36 to 38 inches, measured vertically above step nosings to the top of the handrail.**
- [ ] Provide handrails that are visually prominent.
- [ ] Fix handrails securely to walls and posts. You should be able to bear your entire weight on the handrail without damaging the handrail. **Easily-grasped handrails can meet this criterion; they do not need to be oversized to be "sturdy."**

## Appendix C

### Selected Publications on Stairway Use, Safety and Design with Annex of References to Related Social Issues

List compiled by Jake Pauls, BArch, CPE, HonDSc  
Based on personal library holdings of Jake Pauls Consulting Services\*  
www.bldguse.com & bldguse@aol.com  
Updated November 24, 2019

***\*No representation is made that these documents are “authoritative.” Most are the work of reputable researchers and knowledgeable practitioners with notable expertise on stairways. Some are deeply flawed, but are included due to their unfortunate, thankfully limited influence (except among some practitioners in the building design and construction fields).***

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### **Media Productions on Falls & Stairway Research and Safety Available for Public Viewing**

Rick Mercer Report (2013) on stairway safety research in Toronto.

[www.youtube.com/watch?v=qa0rKge99aI&list=UUt3Ag7rdgR6mtzOMeHd\\_v6g&index=1](http://www.youtube.com/watch?v=qa0rKge99aI&list=UUt3Ag7rdgR6mtzOMeHd_v6g&index=1)  
 “Rick visits a leading centre for rehabilitation research and takes part in experiments aimed at improving quality of life for Canadians.” Humorous treatment of cutting-edge falls research at Challenging Environments Assessment Laboratory (CEAL), Toronto Rehab Institute, March 5, 2013, 6-minute running time. (Accessed 11/24/19)

For more on the work at the Toronto Rehab Institute see also

[www.ctvnews.ca/mobile/health/increasing-stair-depth-could-save-lives-researchers-1.2693664?hootPostID=97119dd43f1c1435bbcb35b9085e454a](http://www.ctvnews.ca/mobile/health/increasing-stair-depth-could-save-lives-researchers-1.2693664?hootPostID=97119dd43f1c1435bbcb35b9085e454a) (Accessed 02/15/17) and  
<http://www.cbc.ca/news/health/labs-living-1.3378604>. (Accessed 11/24/19)

Hidden Killers: The Victorian Home. <https://www.youtube.com/watch?v=nhJOul3n9788>  
 (Accessed 11/24/19)

Introduction to stairway usability and safety, including definitions of terms and examples for several types of missteps, by Jake Pauls at the Pre-conference on Stairways at the Canadian Public Health Association Annual Conference, Edmonton, 2012. These, and about 30 other videos, are available for free live streaming via links at [www.bldguse.com](http://www.bldguse.com), specifically to the video page, <http://www.bldguse.com/VideoPage.html> where all videos are indexed by subject. The earliest video available at this site is “The Stair Event” produced in 1979 and, to this day, it is the only documentary film on stair use, safety and design. (Accessed 11/23/19)

## **Annex: General references useful in pursuing stairway safety**

(Note that the following listing is not maintained in as up-to-date a fashion as are the references listed above that are more focused on stairway usability and safety.)

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