

TITLE: History Continues to Rewrite the Future – Safety Design and Codes

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"If you compromise on safety-you compromise on life"

.....Paul A. Nichols, director Creighton University, Department of Environmental Health & Safety

Safety issues in the workplace have always been the focus in building and labor codes. Since September 11, 2001, building codes, architectural and industrial design, educational courses, are changing and being developed throughout the world focusing on human safety, prevention of disasters, anti-terrorist attacks, and biometric warfare.

This portion of the paper will introduce and discuss measures currently being taken in the United States to address safety issues of the future. I have broken this paper down into six sectors:

- a. Building codes and standards;
- b. Tall buildings – history, criticism, fact;
- c. Homeland security - innovations in behavior, techniques and developments;
- d. Performance based design and safety codes– a new parameter to address safety;
- e. Lifestyle changes – People Power

Further reading sources for more complete information along with references will be found within and at the end of this paper.

#### BUILDING CODES AND STANDARDS

The code profession is very reactionary. New and changes in codes result from disasters. The Triangle Shirtwaist Factory fire in 1911 changed fire and building codes, especially with regard to means of egress. The Coconut Grove fire in 1942 changed requirements for construction materials and egress. The Beverly Hills Supper Club fire in 1977 changed the codes' approach to fire sprinklers in nightclubs and places of assembly. (Julius Ballanco 10/2001, "Terror and the Codes"). The nightclub fires in February 2003 in Chicago and Warwick, Rhode Island, killing a total of 118 people, have created a review of thresholds for automatic fire sprinkler protection, interior finishes and decorations, egress and exiting arrangements, application of code requirements, inspections and permits, general admission seating, and the education of crowd managers, all affecting The National Fire Protection Association's (NFPA) Life Safety Code. ([www.nfpa.org](http://www.nfpa.org).) The terrorist attack on the World Trade Center Twin Towers has escalated attention on safety in design, education and code changes, particularly in tall buildings.

The consolidation of services, products and operations of the three national leading building safety organizations, the building Officials and Code Administrators, (BOCA), International Conference of Building Officials (ICBO) and the Southern Building Code Congress International (ICBO), into one member service organization, the International Code Council (ICC) means that it has united "...our nation's leading building safety experts under one common goal—to serve public health and safety...This will ensure that", more than 97% of United States cities will "...receive quality technical and educational services that support the ICC International Codes[I-Codes]"...This will help in creating a single model code system that will set the standard for building safety." (Bob Heinrich, Chief Executive Officer). ([www.HydrogenSafety.info](http://www.HydrogenSafety.info))

The Americans With Disabilities Act (ADA) requires the same accessible egress as required in local or nation building codes. New buildings that do not require supervised automatic sprinkler systems must provide areas of rescue assistance on each level that does not have an accessible exit. They must have a smoke-proof and fire resistant enclosure and have communication with the outside. Designated personnel will transport people with disabilities in these areas of rescue out of the buildings.

(Sections 4.1.3(9) and 4.3.11 of the Standards for Accessible Design, pages 35614 and 35626.)

The Occupational Safety and Health Agency(OSHA) unveiled a new strategic management plan for the next five years. Dedicated to saving lives, preventing injuries and illnesses and protecting America's workers in the workplace, their goals are:

- A three percent drop in construction fatalities and a one percent drop in general industry fatalities for years 2003-2004.
- A four percent drop in injuries and illnesses in construction, general industry, and high hazard industries.

- Use cooperative and outreach programs to workplace violence, and motor vehicle accidents
- Focus on emergency preparedness, education workplaces to respond natural disasters or terrorist attacks.

www.osha.gov.

## TALL BUILDINGS

Since September 11<sup>th</sup> there have been many critical editorials revisited and written against the Tall Building.

“We are convinced that the age of skyscrapers is at an end. It must now be considered an experimental building typology that has failed. We predict that no new mega towers will be built, and existing ones are destined to be dismantled.” (J.H. Kunstler, N.A.Salingaros, 09/17/02)  
[www.planetizen.com](http://www.planetizen.com)

“Tall buildings have been blamed for crime, mental breakdowns, the generation of urban pathologies – they deform the quality, the function, and the long-term health of urbanism in general by overloading the infrastructure and the public realm of the streets that contain them.”(L. Krier. *Houses, Palaces, Cities*. 1984)

"The first alternative to Modern Dogma should obviously be a moratorium on high-rise construction. It is outrageous that towers more than a hundred stories high are being built at a time when no honest engineer and no honest architect, anywhere on earth, can say for certain what these structures will do to the environment -- in terms of monumental congestion of services (including roads and mass-transit lines), in terms of wind currents at sidewalk level, in terms of surrounding water tables, in terms of fire hazards, in terms of various sorts of interior traumata, in terms of despoiling the neighborhoods, in terms of visually polluting the skylines of our cities, and in terms of endangering the lives of those within or without, through conceivable structural and related failures". (P. Blake. *Form Follows Fiasco*).

And finally, blaming The Twin Towers itself to be the reason for the terrorist attack claiming that they were:

“... a prominent modernist architectural symbol that was specifically targeted to be attacked and destroyed; (ii) the leading terrorists (Mohamed Atta and Osama bin Laden) had an architecture/urbanist/construction background...that the third world -- and the Islamic world in particular -- feels a rage towards the United States...least in part due to the modernist architectural and urban models we have”. (N.A. Salingaros, September 1, 2002)

In 1871 18,000 buildings built of wood and brick, with some iron facing, burnt to the ground in the great Chicago Fire. Commercial interests demanded that a new fireproof city be built and better real estate use in Chicago's crowded downtown area be planned. Tall fifteen-foot steel-framed buildings became typical with the invention of the mechanical elevator by the turn of the century. The Empire State Building was built in the early thirties. Today architects and developers still attempt to reach the skies. (John Lienhard, University of Houston. Peters, T. F., *The Rise of the Skyscraper from the Ashes of Chicago. American Heritage of Invention & Technology*, Fall 1987, pp. 14-23.)

If the World Trade Center did not remain in place for a period of time the loss would have been more than 50,000. (Julius Ballanco, P.E., PM Engineer -12/01)

<http://users.comkey.net/daniel/flatiron.htm>, <http://www.skyscraper.org>, <http://www.worldstallest.com/>

## HOMELAND SECURITY AND TERRORISM

It is impossible to predict the level of a terrorist attack. The United States (and Canada) never considered an attack from a foreign country or foreign aggressor to be within the realm of possibility. The Building Code has never tried to address a terrorist act. Focus on terrorism has now become a catalyst for new parameters in fire safety controls and education.

The United States government is now working to form a strong offense. Being alert to everything around us has become the main education objective of the newly formed Homeland Security Agency. Breaking patterns of habit, improving security systems in commercial construction, improving voice activation systems and alerts, changing the approach of our firefighters and police officers to terrorist acts, will help thwart the intent

of terrorism.

In June 2003 the National Institute of Standards and Technology (NIST) hosted the first meeting of the American National Standards Institute Homeland Security Standards Panel (ANSI-HSSP) comprising of professionals, experts and creative minds from the standards and conformity assessment community. The initial goal was to identify and coordinate the development of standards systems that will meet national and international needs of homeland security for radiological/nuclear detectors, chemical/explosives sensors, anthrax detectors, modeling, simulation and analysis, decontamination standards, training emergency responders, cyber security standards, interoperable communications, biometrics for entry/exit programs, and certification of equipment and personnel.

[http://ansi.org/news\\_publications/news\\_story.aspx?menuid=7&articleid=430](http://ansi.org/news_publications/news_story.aspx?menuid=7&articleid=430)

Courses are being offered nationwide to understand the behavior of structural and infrastructural systems under various threats and attacks; the psychological make up of the terrorist; to assess and reduce future vulnerabilities; to produce cost-effective changes to national practices and standards; and to better prepare and equip facility owners, contractors, designers, first responders and emergency personnel for future disasters, natural or intentionally initiated; and to train everyone on how to identify potential threats to the nation.

#### PERFORMANCE-BASED CODES AND DESIGN

New parameters of design processes are being written and advocated:

1. Performance-based design process: (vs. prescriptive design)

Safety solutions designed to achieve a specified goal for a specified use or application. This process allows performance-based documents to be implemented and insures that their goals are met. The following describes a performance-based design procedure:

- Establish safety goals
- Evaluate the condition of the occupants, building contents, process equipment or facility in question with regard to safety
- Identify potential hazards
- Define appropriate hazard scenarios
- Establish performance objective and performance criteria
- Select suitable calculation methods (e.g. computer models)
- Develop a proposed solution
- Assess the proposed solution
- Obtain approval of the proposed solution.

Within this new paradigm designing and specifying products and finishes that have high functionality and achieve higher safety standards rather than minimum prescribed standards will be in demand. Advocates claim that the benefits of performance-based design will be increased design flexibility, greater cost efficiency, better structural and fire performance, increased safety, and improved global competitiveness.

2. Performance-based codes for a safer built environment (vs. prescriptive code solutions.)

- Establish safety goals
- Reference approved methods that demonstrate compliance with their requirements.
- Demonstration of such satisfaction with engineering analysis using accepted methods and data, demonstrative testing, or experience with similar products or systems in similar applications (expert judgment).

The document may be phrased as a method for quantifying equivalencies to an existing prescriptive-based code or standard, or it may identify one or more prescriptive codes or standards as approved solutions. Either way, the document allows the use of any solution that demonstrates compliance.  
(National Fire Prevention Agency(NFPA) Performance-Based Codes and Standards)

## PEOPLE POWER

History has shown that power is having a strong offense, not a strong defense. We cannot build a city to withstand every disaster. But we can be better prepared. We can change our emergency procedures; develop evacuation plans that take into consideration people with disabilities and the frail. We can better educate Life Safety Codes for obstructions in the paths of egress and safety control, and better equip our rescue teams. We must learn to understand the behavioral indicators of people who are out to harm our country and us and be prepared to report any thing suspicious to the proper authorities.

It is unfortunate that we need catastrophes to address safety issues in architecture, education, workplaces, and building codes. But hindsight is our teacher for the future. We hope will profit by it.