

August 4, 2005

WTC Technical Information Repository
Attention: Mr. Stephen Cauffman

provide additional assistance as required by NIST to facilitate bringing the results of the NIST investigation to the public forum managed by ICC.

The attached comments focus on specific areas in the NIST reports that are associated with building regulations, codes, standards and related issues. All comments are in the form requested by NIST, listing the report number, page, sentence and paragraph and then the comment, reason and suggested revision. In some instances the comments are editorial in nature or suggest clarifying language. Other comments are more substantive in nature and we trust they will be considered in the collaborative and supportive manner in which they are intended.

One common thread in a number of ICC's comments is the manner in which the reports refer to building regulations, codes, model codes, building codes, standards, and similar terms and then also refer to specific documents such as the NYC Building Code, BOCA Basic Building Code, ICC International Building Code, etc. As different NIST authors and contractors were involved in writing the reports it is understandable that different terms associated with building codes, standards, regulations, etc. would be used. Being intimately familiar with the U.S. system of development, adoption, implementation and enforcement of building regulations, ICC had some difficulty with these aspects of the reports and at times questioned the accuracy of portions of the reports.

As these reports will be read with interest by a vast world-wide audience, ICC feels it is important to be clear, consistent and precise when discussing building regulations and associated terms, whether in general or with respect to specific documents. For this reason a number of ICC's comments have attempted to revise the reports so they are consistent and more accurate. In addition, as the U.S. system of building regulations is unique and can be quite confusing to others not intimately familiar with the U.S. system, the ICC has also recommended that an appendix document be developed for the reports that provides an overview of the U.S. system and can serve as a needed foundational piece for better understanding the reports and implementing the recommendations. ICC would be pleased to work with NIST staff on the creation of such an appendix to the reports.

The ICC appreciates the opportunity to provide this input to NIST. Once again ICC would like to commend NIST for the valuable and comprehensive work that has been performed in completing the subject reports. Should additional information be needed, or should NIST want to participate in the code development process or involve ICC further through our relationship with state and local officials and the building community, please do not hesitate to contact us.

Sincerely,

A handwritten signature in black ink that reads "Sean C. Yakes". The signature is written in a cursive, slightly slanted style.

Comments on NIST Reports on World Trade Center Investigation

International Code Council Staff

August 4, 2004

The following comments apply to the report number indicated and are in order of the presentation of reports by NIST (e.g. 1, 1-1, 1-2, etc.). Where comments are made on a particular report and review of reports that form a basis for that particular report (e.g. 1-4D forming a basis for 1-4) indicates the same comment would be applicable ICC assumes that in accepting the comment to the primary report (e.g. 1-4) that the text upon which the primary report is based will be similarly corrected in the supporting report (e.g. 1-4D) and has, therefore not restated the comment from the primary report in its review and comment of the supporting report.

Report Number: NCSTAR 1 (Executive Summary of the Final report)

Page Number: Section E.1 page xli

Paragraph/Sentence: 2nd bullet and item 4

Comment: The terms “codes, standards, and practices” and “building and fire codes, standards and practices” are used and area focus of the objectives of the study.

Reason for Comment: Clarification and to establish an understanding early on the role codes, standards and practices can play in addressing building safety and performance.

Suggestion for Revision: Add a footnote to provide further clarification to the above citations as follows: “The enhancement of building design, construction, and operation can be affected through mandatory means such as building construction regulations. It can also occur through market forces that create change in the absence of regulatory action. The terms building and fire codes, standards and practices are presented in a generic sense. It is recognized that these documents are typically developed within the U.S. voluntary sector and then made available for adoption as a basis for building regulations as well as voluntary programs outside the regulatory community. In using the terms “codes, standards, and practices” throughout these reports it is the intent of NIST to recommend enhancement, revision, and improvement to such documents as well as to foster their increased adoption and implementation through appropriate building regulatory and voluntary market driven mechanisms.”

Page Number: xlv and 172

Paragraph/Sentence: 1st paragraph second sentence on page xlv and last bullet on page 172

Comment: The statement that egress capacity from current building codes is based on single floor calculations should be changed if it is intended to apply to model building codes or clarified if it applies to current NYC building codes.

Reason for Comment: As presented the statement is misleading. First, as noted above, the appropriate term in this case is building regulations. Building codes are one vehicle to address this issue but there are other documents that, while not specifically named building codes, address this issue and are part of a larger set of regulatory documents. From a technical standpoint the issue of egress is based on occupant load and not single floor calculations. Pursuant to Chapter 10 of the International Building Code (IBC), a document adopted by the vast majority of federal, state and local agencies, required egress width is determined based on the total occupant load served by the means of egress. In multi-story buildings the

occupant load associated with each floor would be additive with the load from above stories in determining egress capacity moving downwards through the building.

Suggestion for Revision: “Egress capacity required by the building codes adopted and enforced for the WTC buildings”

Page Number: xlv

Paragraph/Sentence: Second bullet, all but the first sentence

Comment: The text may not adequately present the intended conclusion in a defensible manner. As there were a considerable number of “other” building codes at that time it is not likely that the design was compared to those codes. In addition the concept of approval processes is raised. While it is relevant to refer to the approval processes of the Port Authority compared to those of the city, the statement about “other building codes of that time” is not relevant to approval processes as they are determined by state and local government.

Reason for Comment: To improve the accuracy of the report and eliminate confusion between code requirements and approval processes.

Suggestion for Revision: “Nevertheless, the actual design and approval process produced two buildings that appear generally consistent with nearly all of the provisions of the New York City Building Code and the approval processes of the city in effect at that time. The loads for which the building was designed exceeded those of the New York City Code. The quality of the structural steels was consistent with the building specification. The departures from the New York City building code did not have a significant effect on the outcome of the events of September 11.”

Page Number: xlvi

Paragraph/Sentence: Fifth bullet, first sentence

Comment: the term “selected other building codes of the day” is too general and misleading. Some readers may also be confused because other building codes applicable in other areas would not logically have wind loading criteria for NYC in them.

Reason for Comment: improve the accuracy of the report.

Suggestion for Revision: “...Code and the wind loads found in national model codes and standards available at the time the WTC was designed.” Alternatively note by name the specific “building codes of the day” that were selected and upon which this portion of the report is based.

Page Number: xlvi

Paragraph/Sentence: First paragraph, second sentence

Comment: the term “building codes” is not broad enough to address the point being made. Building codes are a subset of a larger body of requirements commonly considered building construction regulations. Such regulations include the building code but also fire codes, structural design and loading standards and a number of other relevant criteria not found in a “building code” but relevant to the subject of design to address the impact from aircraft.

Reason for Comment: clarify the report.

Suggestion for Revision: “...severity; building construction regulations do not...”

Page Number: xlvi and 200

Paragraph/Sentence: First bullet and item 1

Comment: standards cover the design and construction of structural systems

Reason for Comment: clarification

Suggestion for Revision: "...and the design and construction of ..."

Page Number: xlvii and 200

Paragraph/Sentence: Second and third bullets and items 2 and 3

Reason for Comment: as presented the recommendation does not focus on a key component that will ensure better building performance.

Suggestion for Revision: revise the recommendation to read as follows: “The procedures and practices used in the design, construction, review, approval and maintenance and operation of buildings should be enhanced to further ensure that the plans and specifications meet or exceed code. This should be provided at initial occupancy and during the life of the building. The records associated with as-built and operational conditions should be retained during the life of the building. Technological changes applicable to egress and fire detection and protection should also be applied to existing buildings.”

Page Number: xviii and page 200

Paragraph/Sentence: Third bullet and item 8

Comment: there is a need to train all those associated with building design, construction, operation, maintenance, review and approval. As written the focus is on professionals with no inclusion of the individuals in the building regulatory or fire service sectors.

Reason for Comment: increase scope of recommendation to apply to all those who can impact building safety.

Suggestion for Revision: add a second sentence as follows: “The skills of building regulatory and fire service sector individuals should also be upgraded so as to compliment the enhanced skills of building designers and enhance their knowledge of building technology, conformity assessment and other factors affecting delivery and maintenance of safe buildings.

Page Number: xviii

Paragraph/Sentence: fourth paragraph

Comment: a statement is made about waiting for codes, standards and practices to change. While these documents are relevant to improvements in building safety, as previously noted these documents are part of a larger set of building regulations. In addition, since codes and standards are developed in the voluntary sector, it is more appropriate to recognize that one should not wait until building regulations change.

Reason for Comment: clarification

Suggestion for Revision: “...without waiting for changes to occur in building regulations.”

Page Number: xviii

Paragraph/Sentence: last paragraph

Comment: as written the text does not address federal buildings.

Reason for Comment: clarification and enhancement.

Suggestion for Revision: change to read as follows: “NIST further urges federal, state and local agencies having any responsibility for building design, construction, approval, inspection, operation and maintenance to rigorously implement and enforce building regulations to ensure that the level of safety

intended by those regulations is actually delivered at initial occupancy and during the life of the building. Unless they are satisfied, the best building regulations, codes and standards which make up those regulations and their foundational research cannot effectively provide for the intended public safety.”

Page Number: xlix

Paragraph/Sentence: headings under “responsible community”

Comment: the titles applied to “responsible community” are confusing. These need to be changed to more clearly designate who is responsible for each action.

Reason for Comment: clarification

Suggestion for Revision: Change the designations of responsible community to actual job descriptions or titles so individuals will know who has what responsibility. For instance “adoption and enforcement” should be changed to “federal, state and local government agencies”. Education and training could be changed to university and college, trade associations, and government.

Page Number: 1

Paragraph/Sentence: last paragraph, second sentence

Comment: the term building codes, as noted before, can

Paragraph/Sentence: footnote 3

Comment: reference is made to the prescriptive codes. It is unclear which codes the report is referring to.

Reason for Comment: clarification.

Suggestion for Revision: "...was not accounted for in the building regulations that governed the design and construction of the WTC towers."

Page Number: 8

Paragraph/Sentence: second paragraph

Comment: the report mentions the unique nature of the pre-fabricated modular approach to constructing the steel structural elements but does not appear to cover (at least on page 8) the impact that this has on inspection associated with building regulatory compliance as well as design verification. The report should mention how fabrication of the structural steel elements was inspected off-site, by whom and was determined to satisfy the design, specifications and relevant codes and standards adopted as part of the building regulations.

Reason for Comment: enhance value of the report and to cover the issue of off-site steel assembly fabrication and conformity assessment that is an important element to verifying the building satisfies relevant criteria.

Suggestion for Revision: no suggested revision other than to add a paragraph on the issue or if included elsewhere in the report add a reference to the subject of off-site steel assembly fabrication and conformity assessment activities that occurred to ensure design, specification and building regulatory compliance.

Page Number: 11 and page 12

Paragraph/Sentence: first title on page 11 and last paragraph on page 12

Comment: the title of the section is fire protection systems but the text discusses fire-resistance ratings. Fire protection systems are typically considered sprinklers, standpipes, fire alarm and detection systems, alarms, and smoke control systems. In other words items that protect once a fire has been detected and is underway. The text presented refers to fire-resistance ratings and might not be readily distinguished as fire protection systems. The last paragraph of page 12 then describes the previous discussion about ratings as passive fire protection and then initiates a discussion about sprinklers.

Reason for Comment: increased accuracy for experts and clarification for those who may not recognize the difference between fire protection systems and fire-resistance rated construction

Suggestion for Revision: change title to read "Building construction with respect to resistance against fire" and then add a new title at the bottom of page 12 to read "Fire protection systems". In the alternative leave the text as presented and add an introductory paragraph or "sidebar" to explain the subtleties between active and passive fire protection systems.

Page Number: 15

Paragraph/Sentence: third paragraph, second sentence

Comment: the text suggests that automatic sprinklers, covered in detail on page 12, were installed after the building was initially designed and occupied. This would seem to be a significant fact that may not be readily apparent to most readers. It also appears that the application of automatic sprinklers allowed the removal of some of the passive fire protection systems (e.g. fire-rated construction).

Reason for Comment: enhancement of information on the WTC buildings as designed and as they existed in 2001.

Suggestion for Revision: include text that better covers the as built situation regarding active and passive fire protection and what occurred over time and the end result with respect to these issues in 2001. Include also the driving forces for these changes (e.g. addition of sprinklers and elimination of passive fire protection assemblies).

Page Number: 15 to 17

Paragraph/Sentence: all text

Comment: after considering the above comment and reading further there is discussion about food service, stairways from floor to floor, etc. that would make it appear that over the life of the building that renovations, tenant build-outs, and other modifications

code (18 months between each new edition). Federal, state or local government who regulate building design and construction will adopt these model codes as a basis for their building construction regulations. Adoption typically lags publication of new editions of the model code by 6 to 18 months and may also involve amendment of the model code by the adopting entity. To a lesser and decreasing extent, federal, state and local government have developed their own unique building construction regulations until now no state and only a handful of local governments do not use the model codes as a basis for their regulations. The federal government role in this process has increased due to the National Technology Transfer and Advancement Act and most federal agencies with authority to adopt and implement building regulations adopt model codes pursuant to 40 USC Chapter 12 Section 619 or refer to the state or local code applicable where the federal building is located.”

Page Number: 51

Paragraph/Sentence: third paragraph, first sentence

Comment: standards developers do not develop the standards but instead provide a process by which interested parties come together to develop standards.

Reason for Comment: clarification.

Suggestion for Revision: revise sentence to read as follows: “The model codes adopt by reference a number of standards developed within the voluntary sector under the auspices of a sponsoring organization.”

Page Number: 51

Paragraph/Sentence: fourth paragraph

Comment: stakeholder groups are not necessarily responsible for the codes via the code development process. They do participate but, as written, the text seems to convey that they have more control over the process. These groups are not the only entities that

Reason for Comment: clarification.

Suggestion for Revision: Add a sentence or sidebar statement indicating to the reader that the NYC code has been a “home grown” city-developed code since its inception and only now with the planned adoption of the International Building and Fire Codes will NYC become one of the last local jurisdictions yet to migrate from development of their own self-written regulations to basing them on a model code.

Page Number: 52

Paragraph/Sentence: first paragraph, last sentence

Comment: changes to building construction regulations are not typically retroactive until an existing building undergoes renovation. As presented, the reader is under the impression that new code provisions would never apply to an existing building.

Reason for Comment: clarification and accuracy.

Suggestion for Revision: change sentence to read: “In general changes to building regulations will not apply retroactively to existing buildings that are not undergoing any renovation or major work. Existing buildings that are having work done will typically have the work being done covered by the code in effect at the time of the work and depending on the extent of the work the entire building could be required to comply with the code as if it were new construction.”

Page Number: 54

Paragraph/Sentence: first paragraph

Comment: the report notes a comparison of the 2001 NYC code to the 1968 edition. It would be important to point out how the 1965 BOCA Basic Building Code had changed over the years and compared to the 2000 International Building Code, which took the place of the BOCA code.

Reason for Comment: three documents available in 1965 are mentioned and compared to the NYC code (the 2001) (the 2006 Tw m 0.0

Page Number: 54

Paragraph/Sentence: first paragraph

Suggestion for Revision: revise to read as follows: “Model building codes typically classify...“Classes,” and in some cases subdivisions within a Class.” Also “The Port.....to provide the WTC towers with fire protection as required for Class 1B buildings under the NYC Building Code.”

Page Number: 57

Paragraph/Sentence: fifth paragraph, last sentence

Comment: as occupant load is additive and would be expected to increase in lower stories as additional floors are added the codes need not refer to building height when the codes provide for total available egress width as a function of occupants served.

Reason for Comment: clarification

Suggestion for Revision: re-review the codes and as warranted correct the text to address the concept that as building height increases the occupant load would increase and the methodology for establishing required egress width would automatically account for an increased occupant load attributable to multiple stories.

Page Number: 57

Paragraph/Sentence: last paragraph, second sentence

Comment: it is noted that the 2003 edition of two codes are used and the 2000 edition of the IBC. The 2003 edition of the IBC was available at the time this work was performed and should have been used. Also delete the reference to NFPA 5000. The criteria for egress are found in NFPA 101 (Life Safety Code) and, as that document was previously referenced in the report, it should be a basis for comparative work on egress.

Reason for Comment: consistency and comparability.

Suggestion for Revision: any work that requires consideration of contemporary model codes should be based on the latest available documents and where multiple documents are used they should be comparable (e.g. all 2003). Also delete the reference to NFPA 5000 and replace it with a reference to the Life Safety Code.

Page Number: 58

Paragraph/Sentence: second paragraph

Comment: See comment to page 57 regarding reference to the Life Safety Code and comparability of editions of referenced documents (e.g. all 2003).

Reason for Comment: see comment to page 57

Suggestion for Revision: see comment to page 57

Page Number: 173

Paragraph/Sentence: first bullet

Comment: it is stated that the building was constructed with three independent means of egress but that the NYC Building Code would have required four. As noted on pages 51 and 52 the buildings were not required to comply with any building code but the Port Authority directed they comply with the NYC Building Code (2nd and 3

Suggestion for Revision: delete the second sentence.

Page Number: 189

Paragraph/Sentence: sixth bullet

Comment: the statement about a fire protection engineer still not required to be involved in the building design may be true with respect to the NYC Building Code, but that is unclear in the report. Contemporary model codes would require construction documents be prepared by a registered design professional, which is determined by state and local rule and would typically include a fire protection engineer on a building of this nature.

Reason for Comment: clarification

Suggestion for Revision: indicate that the statement applies to the current NYC Building Code or clarify it so it represents what is currently required by state and local building regulations.

Page Number: 191

Paragraph/Sentence: last sentence

Comment: the previous text refers to the differences associated with the 1938 and 1968 NYC Building Codes and their impact on the WTC design and by inference safety. The last sentence says these reductions are contained in current codes. Which ones? More importantly a reduction requires two reference points of comparison. Is the statement that current codes contain these reductions based on their comparison to the 1938 NYC Building Code, previous versions of those codes, or some other baseline? As written the statement would lead a reader to conclude that current codes are not satisfactory based on the 4 comparative points presented when in fact buildings are now considered as entire systems more today than in the past and there are numerous technologies available that make such reductions possible while ensuring safety to life. Consider fire escapes. Does their elimination as a requirement in new buildings mean such buildings were no longer safe?

Reason for Comment: the text is misleading

Suggestion for Revision: delete the sentence as it adds little to the report or if it is to be retained then provide specifics as to which codes are considered, the basis for comparison, and quantify exactly which and how many of the items in question are relevant.

Page Number: 192

Paragraph/Sentence: last bullet

Comment: it is noted that no code provision for fire testing existed. Which code? As previously noted the report has references to specific codes and codes in general. It is important in making statements to be specific as to the code in question. In this instance it is likely the NYC Building Code applies yet the more general term code is used, creating confusion. Where a generic "code" is intended then a footnote or other information as previously suggested that provides an overview of the "code situation" outside NYC at the time and today would be helpful to r

Suggestion for Revision: cite the specific code, which is assumed to be the NYC Building Code.

Page Number: 193

Paragraph/Sentence: first bullet

Comment: the current edition of the IBC is the 2003 and should be referenced as previously noted (as

Comment: the term current model building codes is not specific

Reason for Comment: clarification

Suggestion for Revision: as previously noted the report should be specific where possible. In this case either name those codes or provide in a separate appendix as previously suggested general information on

granted the authority under the U.S. Constitution for such action, to govern building design, construction,

Rigorous enforcement of building construction regulations by the responsible agencies by well trained and supported agency staff is critical to ensure that what is intended in the model codes and standards is actually delivered at the initial point of occupancy of a building and during the life of the building. They in turn need a reliable conformity assessment system that validates the acceptability of testing labs and

Suggestion for Revision: suggest changing responsible community to area of focus with the sub-bullets being improve professional practices and guidance, enhance provisions in model codes and standards, further adoption and enforcement of those model codes and standards, conduct research to provide a basis for future change in model codes and standards and their implementation, and develop and deploy education and training for all those involved with building design, construction, operation and maintenance

Page Number: 201

Paragraph/Sentence: recommendation 1, second line

Comment: nationwide adoption could be construed to mean preemptive federal requirements. In addition model codes and standards have been generally referred to throughout the document and should be referred to in this case. Model codes provide the basis for building regulations and standards are referenced in the model codes.

Reason for Comment: clarification

Suggestion for Revision: revise sentence to read as follows: "...development research and documentation to support change and enhancement to model codes and standards to implement the results of the research along with ..."

Page Number: 202

Paragraph/Sentence: first paragraph, section under national model codes

Comment: model codes should be referred to simply as model codes. The recommendation that state and local government should adopt and enforce the improved model codes is confusing as a jurisdiction would only need to adopt one model code. It has taken significant effort for the U.S. to get to where it is today with respect to building regulations. With minimal federal preemption the voluntary sector and state and local government are almost on the same page. Furtherance of the objectives of the WTC study will be ensured if all federal, state and local agencies work together and do not dilute the critical mass moving toward a truly national code in the U.S. Note also that incorporation of the reference standard in the model code would allow that standard, after coming out of the standards development process, to be subject to further modification through the model code process.

Reason for Comment: clarification and to facilitate implementation of the recommendations by focusing everyone's efforts on a singular set of model codes and standards.

Suggestion for Revision: revise to read as follows: "...conditions. Model Codes: the standards should be adopted in the model codes by mandatory reference to the latest reference to the standard with any necessary language to facilitate integration of the standard with federal, state and local codes and standards." (12/11/18)

Paragraph/Sentence: r

Comment: that incorporation of the reference standard in the model code would allow that standard, after coming out of the standards development process, to be subject to further modification through the model code process. This could overly complicate and confuse the development and adoption of the standard.

Reason for Comment: to ensure the report provides appropriate recommendations

Suggestion for Revision: delete “, or incorporation of,”

Page Number: 205

Paragraph/Sentence: first paragraph

Comment: the recommendation that model building code committees review, develop and submit changes to the codes is not consistent with the processes by which the codes are developed. As such the recommendation has little chance of being implemented.

Reason for Comment: the model codes are developed with input from all interested and affected parties and in the case of the ICC process there is strong reliance on individuals, organizations and others to prepare and submit code changes as opposed to that being done by committee. The ICC does have the ability to establish ad hoc committees and has done so on many emerging issues. That being said all interested and affected parties must work together to develop, submit and support proposed changes to the codes. NIST should consider working with interested parties to actually generate appropriate code changes to accomplish the recommendations in the reports.

Suggestion for Revision: change to read as follows: “Interested and affected parties working cooperatively under the auspices of an unbiased third party organization such as the National Institute of Building Sciences (NIBS) should undertake....above and then adapt that work as proposed revisions to the national model codes and undertake the necessary steps to secure approval of those revisions.”

Page Number: 206

Paragraph/Sentence: second bullet

Comment: the report states that SFRM inspection procedures are not required by codes. This is not true as previously noted. Chapter 17 of the International Building Code covers special inspections and Section 1704.11 specifically addresses SFRM. While the investigation may have determined that codes related to SFRM inspection might not have been enforced with respect to the WTC buildings, the data forming the basis for the report do not support NIST being able to make any broad statement that essentially reports, “existing standards of practice related to SFRM inspection and codes are not enforced”.

Reason for Comment: accuracy of the report

Suggestion for Revision: “... they are not required by all codes (the 2003 IBC in Chapter 17 does require such inspections). Further.... recommendation”

Page Number: 206

Paragraph/Sentence: recommendation 6

Comment: add a new bullet to address in-situ monitoring of SFRM adherence and retention in place

performance code. In addition the International Building Performance Code should be reviewed and enhanced if necessary.”

Page Number: 211, 212 and subsequent pages

Paragraph/Sentence: last paragraph to recommendation 16 and recommendation 17 and subsequent places in the report

Comment: the focus of this group is on professional skills of building and fire safety professionals (engineers and architects). Certainly they can and do have a significant impact on the development and implementation of designs and technology to address many of the issues raised in the report. They can also affect change in codes and standards and to the degree to which they are retained during construction or required by code to be on-site they can have an impact on actual construction. The report also mentions code officials, the fire service and other individuals involved in implementation and enforcement of the codes and standards that the report addresses and suggests are improved. These individuals are not only responsible for initial design and construction but for the building as occupied, years after the design professionals are out of the picture. The building regulatory and fire service should also be addressed via enhanced education and training.

Reason for Comment: the report does not support a significant opportunity to enhance future building safety

Suggestion for Revision: add a new sentence to read as follows: "The skills of the building regulatory and fire service should be comparably upgraded to ensure they have the same baseline understanding as design professionals and the necessary skills to conduct building review, inspection and approval tasks for which they are responsible."

Comment: the ICC is affected by many more of the recommendations

Reason for Comment: accuracy

Suggestion for Revision: the ICC is in some way, as a publisher of model codes, developer of standards and provider of products and services in support of those codes to the entire building community, affected by all the recommendations and consideration should be given to listing ICC with other recommendations.

In reality many more organizations can and should be added to the report and through the public review process it is assumed they will step forward.

Report Number: NCSTAR 1-1 Design, Construction, and Maintenance of Structural and Life Safety Systems

Page Number: xxvi

Paragraph/Sentence: last bullet

Comment: the term national building and fire codes is misleading in that it suggests that the U.S. has such documents within the federal sector. As suggested under comments to Report Number NCSTAR 1, NIST should use the terms building code, fire codes, standards or model codes throughout the documents. Further explanation of how the U.S. system works regarding development, adoption, implementation and enforcement of these documents is also needed for both U.S. and foreign readers that may not fully understand the U.S. system. NIST is encouraged to use “Getting Building Technology Accepted”, produced for and available from the U.S. Department of Housing and Urban Development as a basis for this needed general treatise on the subject.

Reason for Comment: clarification and to enhance the application and intent of the reports by entities who may not fully understand all the nuances of the U.S. system.

Suggestion for Revision: delete “national” and use the term “model building and fire codes, voluntary standards, and practices” throughout when referring to the broad group of documents that are the target for change pursuant to the WTC reports.

Page Number: xl

Paragraph/Sentence: first full paragraph

Comment: It is noted that Section E.3 provides information on codes in effect during the 1960’s and compares those codes to the NYC Building Code of the time. This establishes as basis for comparison amongst different documents of the time. Then certain reference standards are included in the comparison. Finally the comparison is updated as to the then and 2001 NYC Building Code and certain reference standards. Since the “jump” is made with respect to comparison of certain reference standards there should also be a “jump” made for contemporary model building codes. It is suggested that a comparison with the 2000 or 2003 International Building Code also be included as a basis of reference with the model building codes of the time (e.g. BBC and UBC referenced in the document).

Reason for Comment: completeness of the document and to address comparability of current and past model codes with the companion comparisons for NYC codes and reference standards.

Suggestion for Revision: the comparative work is not complete and when completed should be appropriately referenced and highlighted in the report.

Page Number: xlvi

Paragraph/Sentence: first paragraph, second sentence

Comment: it is not normal practice to apply building code changes to existing buildings when such buildings are not undergoing renovation, repair, and other changes. It is, however, a requirement in most codes that existing buildings undergoing renovation, repair, addition, etc. meet certain provisions of the codes based on the nature of the work being undertaken in the existing building. This may not be clearly conveyed as currently written in the report.

Reason for Comment: clarification

Suggestion for Revision: revise second sentence to read as follows: "...changes to existing buildings not undergoing renovation, repair, addition or other change, but the"

Page Number: xlvi and 149

Paragraph/Sentence: fourth paragraph, last sentence and fourth paragraph, last sentence

Comment: a reference is made to requirements for voice systems and the text infers that such requirements appeared in national standards. Standards typically provide guidance on product and system design, construction and performance. Codes would typically indicate if and to what degree such systems were required and mandate a level of performance. In addition, as previously suggested, the term national may be misinterpreted by those familiar with the U.S. system.

Reason for Comment: clarification

Suggestion for Revision: revise the last sentence to read: "Standards for voice systems were first developed in the early 1980's and requirements for such systems first appeared in model codes in the mid 1980's, at the...."

Page Number: xlviii

Paragraph/Sentence: third paragraph, last sentence

Comment: it is not clear which "code" is being referred to in the text. Since the terms code, model code, national building code, NYC Building Code, etc. are used throughout the document it is important that a clear convention be established so there is no confusion.

Reason for Comment: clarification

Suggestion for Revision: specify the "code" being referred to (which is assumed to be the NYC Code).

Page Number: xlviii

Paragraph/Sentence: fourth paragraph, first sentence

Comment: as previously noted there are instances where existing buildings are covered retroactively by the building code.

Reason for Comment: clarification

Suggestion for Revision: revise to read as follows: "...retroactive requirements or when the existing building may have renovation or repair work causing application of the adopted and current building

Page Number: 2

Paragraph/Sentence: second bullet

Comment: BOCA is Building Officials and Code Administrators International, now consolidated with the other 2 U.S. model code organizations at the International Code Council (ICC)

Reason for Comment: clarification

Suggestion for Revision: change conference of America to code administrators international.

Page Number: 3

Paragraph/Sentence: last paragraph

Comment: the term “codes” is used throughout and it is not clear which codes are being referred to in specific or general terms.

Reason for Comment: clarification

Suggestion for Revision: throughout the reports where specific codes (e.g. NYC Building Code) are the subject of the text then use the name of the specific code. Where the term is broader such as model codes then use that term and if the intent of the text is to apply to all codes or codes in general then use that term. Explain this distinction in a footnote in each report the first time any of these terms are used or alternatively include a discussion on the topic in the introductory material to each report.

Page Number: 4

Paragraph/Sentence: second paragraph, first sentence

Comment: federal, state and local government adopt codes

Reason for Comment: accuracy

Suggestion for Revision: change to read as follows: “...adopted by federal, state and local authorities

Suggestion for Revision: cite the edition year of each document and for consistency throughout the document base the report, analysis and related findings to the 2003 IBC.

Page Number: 157, 158, 160 and 164

Paragraph/Sentence: last paragraph on page 157, first sentence in first and second paragraphs on page 158, last paragraph on pages 160 and 164, and first paragraph on page 165.

Comment: the text suggests that ASME 17.1 covers elevator design and operation in all building codes. While this is likely true it should be noted that there are different editions of ASME 17.1 that could be adopted and there are no data provided that indicate that all building codes, which we assume NIST intends to mean federal, state or local codes, adopt ASME 17.1. In addition NIST again refers to elevator and building codes. Having referred throughout the document to national model codes, model building codes, and specific building codes like the NYC Building Code, the term “building codes” is not specific enough. The use of the term “building codes” continues in other paragraphs and should be clarified as to which codes are addressed (e.g. model codes, specific codes, or as a general statement to refer to federal, state and local building codes). If the latter then data indicating a research basis for such a broad statement must be provided and if no data exist then specific codes and/or model codes should be cited. On page 160 the term “many other codes” is used and it is not clear as to the scope of that statement (e.g. federal, state and local, model codes, or other documents). On page 164 the term “codes” is used and it is assumed the report means the NYC codes but one could also conclude that the report refers to codes in general. The report needs to be specific when referring to a particular code or codes and when the report is referring to codes in general it should have introductory materials, as previously suggested, so the

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Paragraph/Sentence: fourth paragraph

Comment: a statement is made about Port Authority inspections and surveys and compares them to requirements in New York City and other codes and practices. This is a comparison of apples and oranges and inappropriately suggests that “other codes” are inferior. The Port Authority is in essence the building owner and regardless of codes and practices would logically want to inspect and survey these buildings on their own above and beyond any state or local requirements. In addition the highly visible nature of the buildings suggests that any owner, regardless of location or codes, would likely undertake such activities. Note also “requirements in NYC” is not specific as to codes but is general enough to cover many other requirements and law beyond codes.

Reason for Comment: clarification and accuracy in making comparisons.

Suggestion for Revision: revise sentence to read as follows: “...in New York City and in other localities with similar buildings, and generally”

Page Number: 168

Paragraph/Sentence: last sentence

Comment: the term “building code standards” is undefined and given previous comments about the use of specific and general terms to address codes is confusing.

Reason for Comment: clarification

Suggestion for Revision: cite the specific “building code standards” to which the comparative statement and subsequ4(en.4(sps)-3.8(t)-0.4(ate)-3.7(m)2.4(ento)Te(7(f)0ew{()Tj0 -1.1475 TD0.0005ragraph/rsTJgh)38 Tco009 Tw

retention is not necessary. Moreover we cannot find any data submitted by NIST to substantiate the

Paragraph/Sentence: listing of references

Comment: as the NIST report refers to the International Building Code it should also be included in the list of references

Reason for Comment: completeness of the report

Suggestion for Revision: add the following reference: “International Building Code, International Code Council, Falls Church, VA, 2003.”

Page Number: 64, 91 and 296

Paragraph/Sentence: second paragraph, first sentence on page 64, first paragraph, third sentence on page 91 and finding 5 on page 296

Comment: the term “current building codes” is used and is a very general non-specific term. As previously commented such terms need to be qualified so readers can understand if the statement is related to one or more specific codes or just codes in general and if the statement applies to model codes or actual federal, state and/or local codes.

Reason for Comment: clarification

Suggestion for Revision: identify the specific building codes NIST reviewed and upon which the statement is made or if the statement is intended to generally apply to building codes as a whole without citing any specific codes then include a footnote that clarifies that for the reader.

Report Number: NCSTAR 1-4 Active Fire Protection Systems

Page Number: 32

Paragraph/Sentence: fourth paragraph, last sentence

Comment: a reference is made to the “model code” but the specific model code is not referenced. Earlier in the report references are made to the NYC Building Code and NFPA standards related to sprinklers and standpipes. While the term “codes and standards” is used as well, it is used in very general terms. Up to this point in the report the reader has also not been made aware that model codes, such as the BOCA Basic Building Code applicable at the time of WTC construction or the current ICC International Building Code, exist, how they are used as a basis for building regulations and the degree to which they refer to documents such as NFPA 13 and 14. The term “model code” at this point is confusing and should be replaced with a specific reference. In addition, in doing so, other parts of the report leading up to this section should at least introduce the concept of a model code and advise readers that such codes reference NFPA standards such as 13 and 14, and through those references such standards are applied in building regulations.

Reason for Comment: clarity and to make the report complete with respect to its treatment of codes and standards

Suggestion for Revision: revise the sentence in question to specifically address the model code by name. Also add descriptive text as appropriate in prior portions of the report to explain the difference between a model code and a standard, what model codes and standards were/are available to address active fire

Page Number: 73

Paragraph/Sentence: first sentence

Comment: the NYCBC is not a model building code and should not necessarily be compared to one. The purpose of the sentence is to convey the concept that the NYCBC differs from other building codes (e.g. state or locally adopted building regulations) in that local laws in NYC can apply building code provisions retroactively to existing buildings. If there is a need to address how model building codes address the issue of retroactive treatment of existing buildings then an additional sentence or discussion should be added, possibly in the main WTC report. As the purpose of the sentence is to focus on how NYC compares with others the appropriate basis for comparison is with building codes at the state and local level as opposed to model building codes. As information the ICC International Existing Building Code and ICC International Fire Code provide criteria applicable to existing buildings.

Reason for Comment: clarification

Suggestion for Revision: delete the word “model”.

Page Number: 85

Paragraph/Sentence: third paragraph

Comment: the text refers to a requirement for exhaust to be the greater of six air changes per hour or 1 cubic foot per minute per square foot of floor area. The text incorrectly indicates that the latter at 48,000 cfm would be the requirement. Given the floor area and an assumed 10 foot height the volume of each floor was on the order of 480,000 cubic feet. In order to achieve 6 air changes per hour the exhaust rate would have to be 80,000 cfm (480,000/6). Since 80,000 cfm is greater than 48,000 cfm the former would apply. Note that this comment also applies to page xl of the 1-4D report and the third line of the relevant paragraph in that report incorrectly shows floor area as 40,000 square feet.

Reason for Comment: technical accuracy

Suggestion for Revision: correct the paragraph using the correct code-required exhaust rate.

Page Number: 88

Paragraph/Sentence: last sentence

Comment: the text states that best practices in smoke management design are enforced in many jurisdictions in the U.S. There is a significant difference between best practice and minimum code and it is doubtful that local jurisdictions would require best practice design when they have adopted and enforce building regulations, unless such regulations were written to say “designers shall use best practice in the design of smoke management systems.”

Reason for Comment: text incorrectly suggests that local officials require best practice as a basis for building regulations or in the absence of building regulations simply require best practice.

Suggestion for Revision: delete the words “enforced in many jurisdictions in the United States” and replace with “considered relevant”.

Report Number: NCSTAR 1-4D Smoke Management Systems

Page Number: 5 and 108

Paragraph/Sentence: Section 2.1 in general and Section 9.2.1 in general

Comment: the report refers to codes as defining the objectives of smoke management systems and then lists and discusses specific standards and guideline documents related to the subject. As the NIST reports refer to codes and model codes in a number of other instances, the absence of any discussion on the relevance of Section 909 of the IBC dealing with smoke management systems would appear to be a

systems in existing buildings and should be addressed in the report. The third paragraph, also suggests that the referenced standards as guidelines were not written into the model codes. This may be true but the absence of any treatment of the IFC as suggested above, while supporting the report's statement that maintenance and testing is not generally required by jurisdictions, means the report is totally incorrect.

Reason for Comment: the report is not complete

Suggestion for Revision: add discussion on page 17 of the report to address how the IFC addresses maintenance of smoke management systems. Also change the third paragraph completely to advise the reader that where the IFC 0 TDgefn f0 Ton p4nI2IFC 0aereprovi h maintenance(of)5.4somoke(managem)824(e)213(ntl)5.4slystem

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Comment: the terms building codes, current codes and some codes are used in the paragraph but it is unclear which codes. The statements made in the

overview can then be referred to as needed throughout all the NIST reports as necessary to address the many and varied ways in which codes, model codes, standards, building codes, building regulations and other terms are relevant to the information in the reports.

Suggestion for Revision: add similar text with respect to the requirements in the 2003 IBC.

Report Number: NCSTAR 1-7 Occupant Behavior, Egress and Emergency Communications

Page Number: 24

Paragraph/Sentence: third paragraph, first sentence

Comment: the text refers to two model building codes, one by name of the code and the other by the name of the organization sponsoring the code. It is appropriate and correct when referring to such documents to refer to them by title and publisher.

Reason for Comment: clarification and for consistency throughout all NIST reports associated with the WTC investigation

Suggestion for Revision: refer to the IBC and the ICC 2003 International Building Code (IBC) and add “ICC International Code Council” to the list of acronyms in the report.

Page Number: 34 and page 35

Paragraph/Sentence: third paragraph, last sentence

Comment: the use of the term U.S. building codes is misleading and could be misinterpreted by those unfamiliar with the U.S. system that the United States promulgates building codes. See previous comments on other portions of the NIST report that raise the same issue and propose solutions.

Reason for Comment: clarification

Suggestion for Revision: revise sentence on page 34 to read as follows: “...Escalators, which is adopted by reference in the model building codes and through adoption of those codes, or the ASME standard directly, by federal, state and local government agencies forms that basis for the design and operation of elevators.” With respect to page 35, the text must be more specific as to what is meant by U.S. building codes or cite the specific codes to which the text is intended to refer.

Page Number: 43

Paragraph/Sentence: section 2.5, second sentence

Comment: the text refers to codes adopted by local jurisdictions. While partially true it does not fully describe the U.S. situation and is therefore misleading. In some instances the adopting entity is the federal government for federal buildings. Interestingly this includes NIST with administration and compliance with the codes addressed by the NIST Plant Division. This also includes state government where states have preemptive authority over local government. Lastly, where of a non-federal nature and not preempted by state government, local government would be the adopting authority.

Reason for Comment: clarification

Suggestion for Revision: revise the sentence to read as follows: “...building codes adopted by federal, state and local government establish...”

Page Number: 44 and 45

Paragraph/Sentence: fourth paragraph, first sentence and first paragraph, third sentence

Comment: the text on page 44 is not clear as to which building codes and should either be specific as to which codes or if a more general statement than report that as well, nothing also that building codes include federal, state and local codes. On page 45 the text refers to “most current codes”. It is assumed the intended scope is building codes and as with the text on page 44, the term “most” is undefined.

Reason for Comment: clarification

Suggestion for Revision: cite the specific building codes upon which the report based the measure “some” on page 44 and change page 45 to building codes and cite the specific building codes upon which the report based the measure “most”.

Page Number: 45

Paragraph/Sentence: section 2.5.4

Comment: reference is made to the 2000 IBC. Other parts of the NIST reports reference and are based on the 2003 IBC. For consistency and based on the availability of the 2003 IBC at the time the reports were developed the reports should uniformly refer to and rely on the 2003 IBC.

Reason for Comment: uniformity and accuracy throughout the reports

Suggestion for Revision: revise the text in section 2.5.4 and other relevant portions of the report based on the 2003 IBC.

Page Number: 47

Paragraph/Sentence: section 2.5.5

section 2.5.4 references the 2000 edition, the text in this section simply refers to the IBC and then table 2-3 refers to the 2003 IBC.

Reason for Comment: technical accuracy

Suggestion for Revision: revise the comparison using the 2003 IBC as a basis and if the comparison was based on the 2003 then the report should reference the 2003 IBC throughout, not only in report 1-7 but in all the NIST WTC reports.

Report Number: NCSTAR 1-8 Emergency Response Operations

Page Number: xxxvii

Paragraph/Sentence: second bullet

Comment: the text refers to the purpose of the effort as identifying issues that need to be addressed in codes. A review of report 1-8 indicates that there is only one mention of codes on page li (see below). This leads the reader to expect to see in this report some specific items that are either not currently addressed in codes and should be addressed or are addressed but not as rigorously as the authors would like. These comments assume the term codes refers to building codes, fire codes and other regulations.

Reason for Comment: the stated purpose of the report was not completely fulfilled.

Suggestion for Revision: list out those issues that relate to emergency response operations or that rela