

**National Construction Safety Team Advisory Committee**  
National Institute of Standards and Technology

December 20, 2017

The Honorable John Thune  
Chairman  
Committee on Commerce, Science,  
and Transportation  
United States Senate  
Washington, DC 20510

Dear Mr. Chairman:

I am pleased to submit the 2017 Annual Report of the National Construction Safety Team (NCST) Advisory Committee (Committee) of the National Institute of Standards and Technology (NIST). The Committee serves as NIST's advisor on implementation of the NCST Act (P.L. 107-231; the Act), and the opinions and recommendations expressed in this letter reflect our views as an independent, Federal Advisory Committee composed of members from the private sector. The Committee met at NIST on September 28, 2017, in Gaithersburg, MD, at which time we were briefed on activities performed under the Act. In addition, because there are several new members of the Committee, we were given a lengthy briefing on the Act itself, and the expectations of the Committee.

The Committee is formed for two general purposes:

1. Evaluation of team activities.
2. Assessment of the implementation of recommendations.

**Evaluation of Activities**

The NCST is a part of the Disaster and Failure Studies Program at NIST. The program is under new leadership and the Committee applauds the renewed enthusiasm with relation to the work of NCST. A disaster resource team has been established with regular meetings, so that the related units within NIST are ready to respond as a team rather than being newly formed for each response.

The NCST has not undertaken a major investigation since the Joplin Tornado in 2011. Over the last few years, the Committee has commented that NIST may be missing opportunities to impact the built environment by performing more such investigations. Under the new leadership, the Disaster and Failure Studies Program has performed 3 preliminary reconnaissance reviews (including Hurricanes Harvey and Irma) and is considering further reviews of Irma and Maria once the safety of their investigators on the ground can be considered appropriate. Consistent with a recommendation in 2016 by the Committee that NCST review its deployment criteria, the NCST is now actively looking for investigation and learning opportunities which can help construction safety in the United States. The NCST has also, this year, chosen to review a series of chronic events (construction fires) which individually would not lead to an investigation, but as a series of events meet the intent of the Act. We applaud the staff for making the additional move.

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## **Assessment of the Implementation of Recommendations**

The Joplin Tornado investigation has led to much better understanding of the phenomenon and has also resulted in technical, sociological and operational changes in the preparation for and response to tornados. This investigation is an example of successful implementation of the Act and should motivate more such investigations (see recommendations sections). Some of the successes are:

1. A better understanding of the winds and forces generated by tornados, thereby increasing our ability to better design buildings to withstand such forces, and to write standards to address them.
2. Better reporting of actual events, with removal of biases, which allows for better preparation for future events.
3. An understanding of the risk messaging from public and private sources (alerts and warnings), and the reaction of the public to those messages. This has resulted in changes to codes and standards, and also changes in operating procedures in many tornado-prone areas.

The Committee applauds the on-going efforts and results of the NCST in this investigation. It counsels, however, that while NIST should maintain their involvement in the codes and standards process, they need to carefully balance their position as the country's technical advisor with an understanding and appreciation of the economic and design factors that may be involved.

## **Recommendations to Congress**

1. NCST Act: Proposed expansion of scope of failures to be investigated.

The NCST Act focuses exclusively on safety from building failures. NIST has investigated failures of construction that cannot be characterized properly as buildings, and should do so again in the future. A current example deserving such investigation is the failure of the power and communication systems in Puerto Rico caused by Hurricane Maria. Studies of such events are crucial to building performance, but also to improving tools to enhance community resilience, which is a current focus of research at NIST. A past example of an important NIST (then NBS) investigation of a construction failure that was not a building was the 1978 collapse of a cooling tower for the Pleasants Power Station at Willow Island, West Virginia. While investigations of failures of non-building structures have been and could be carried out under the authority granted to NIST in its Organic Act, in the National Windstorm Impact Reduction Program, and in the National Earthquake Hazards Reduction Program, it is recommended here that formal consideration be given to amending the NCST Act to emphasize the important role NIST should play in such investigations. The amendment also needs to acknowledge the important role other Federal agencies have in selected structural failures, including, for example, the Army Corps of Engineers, the Department of Transportation, the Department of Energy, and the Nuclear Regulatory Commission.

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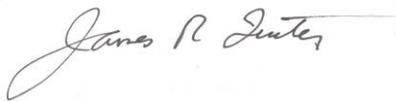
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### Recommendations Regarding NCST Activities:

1. NCST has already sent reconnaissance teams to investigate Hurricanes Harvey and Irma. Building on the success in understanding alerts, messaging, and people movement in Joplin, we recommend that NIST further study communication of alerts and warning during imminent threats. We recommend, as part of their investigations of these hurricanes, additional analysis of the presence or absence of communicator strategies to reach populations at risk, including the mechanisms and technology to help decision making about protective actions such as evacuation and sheltering.
2. We recommend that, in addition to the technical findings and recommendations from these emergencies, NIST should spend more effort looking at the cost and benefit of implementing their recommendations. The past and current recommendations are not consistently supported by sufficient economic analysis. For example, the Joplin recommendations conclude that “critical buildings and infrastructure such as hospitals and emergency operation centers are designed to remain operational in the event of a tornado.” Wind loads from tornados greatly exceed current design wind loads, so a recommendation like this should include the benefits and cost impact to construction of these facilities in tornado-prone regions.
3. We recognize and applaud the activities of NIST social and behavioral scientists to develop technical and scientific knowledge about risk. This is currently being translated into hazard maps and damage indicators. We recommend that NIST continue the effort, with consistent attention given to portraying such information in appropriate scientific terms as well as terms that can be understood by community officials and the general public. This will help reach and affect the decision making of vulnerable populations.

The Committee is honored to serve in our advisory capacity and continue to find the NCST program to be highly valuable and relevant to the security of the nation’s building stock.

Very Truly Yours,



James R. Quiter, PE, FSFPE, LEED AP  
Chair, National Construction Safety Team Advisory Committee

Identical letter sent to:

The Honorable Bill Nelson  
Ranking Minority Member

# National Construction Safety Team Advisory Committee

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## Appendix

Proposed amendments to the NCST Act:

Sec. 2, paragraph (a):

“...after events causing the failure of building(s) or ~~buildings~~ structure(s) that has resulted in substantial loss of life or that posed significant potential for substantial loss of life. Where the failure of the structure(s) is the proper subject for investigation by another Federal agency, the Director shall defer to the authority of that agency. To the maximum extent practicable...”

And Sec. 2, paragraph (b)

“(1) PURPOSE.—The purpose of investigation by Teams is to improve the safety and structural integrity of ~~buildings~~ the built environment in the United States.

And replace the term “buildings” with “the built environment” in Sec. 2 paragraph (b)(2)(D)

And replace the term “building standards, codes, and practices” with “engineering standards, practices, and building codes” at the following locations:

Sec. 8 paragraph (3)

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Sec. 14

And replace the term “building failure” with “failure” at the following locations:

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weapons facilities, and the DOT for vehicular bridges. *[Such mandates are assumed, not verified, by this Committee]*

Lastly, unrelated to the preceding, consider updating Sec. 2 paragraph (c)(1)(J) by adding a reference to the National Windstorm Impact Reduction Program.

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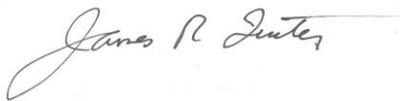
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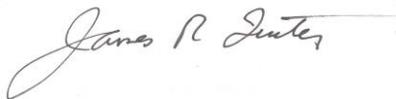
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## National Construction Safety Team Advisory Committee

National Institute of Standards and Technology

Department of Transportation, the Department of Energy, and the Nuclear Regulatory Commission.

2. As stated previously, the Committee commends the current administration for their interest and willingness to respond to and learn from recent disasters. However, funding priorities must always be considered. The Committee suggests to Congress that some means of ensuring consistent funding to such endeavors is needed. One possible consideration is to include specific allocation for investigations in the funding mechanisms that are created when a Federal disaster is declared.

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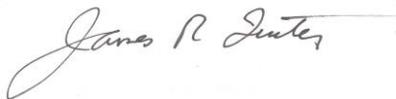
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The Committee is honored to serve in our advisory capacity and continue to find the NCST program to be highly valuable and relevant to the security of the nation’s building stock.

Very Truly Yours,



James R. Quiter, PE, FSFPE, LEED AP  
Chair, National Construction Safety Team Advisory Committee

Identical letter sent to:

The Honorable Ted Cruz  
Chairman

**National Construction Safety Team Advisory Committee**  
National Institute of Standards and Technology

Appendix

Proposed amendments to the NCST Act:

Sec. 2, paragraph (a):

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“(1) PURPOSE.—The purpose of investigation by Teams is to improve the safety and structural integrity of ~~buildings~~ the built environment in the United States.

And replace the term “buildings” with “the built environment” in Sec. 2 paragraph (b)(2)(D)

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And replace the term “building failure” with “failure” at the following locations:

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## **National Construction Safety Team Advisory Committee**

National Institute of Standards and Technology

weapons facilities, and the DOT for vehicular bridges. *[Such mandates are assumed, not verified, by this Committee]*

Lastly, unrelated to the preceding, consider updating Sec. 2 paragraph (c)(1)(J) by adding a reference to the National Windstorm Impact Reduction Program.

**National Construction Safety Team Advisory Committee**  
National Institute of Standards and Technology

December 20, 2017

The Honorable Lamar Smith  
Chairman  
Committee on Science, Space,  
and Technology  
United States House of Representatives  
Washington, DC 20515

Dear Mr. Chairman:

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The Committee is formed for two general purposes:

1. Evaluation of team activities.
2. Assessment of the implementation of recommendations.

**Evaluation of Activities**

The NCST is a part of the Disaster and Failure Studies Program at NIST. The program is under new leadership and the Committee applauds the renewed enthusiasm with relation to the work of NCST. A disaster resource team has been established with regular meetings, so that the related units within NIST are ready to respond as a team rather than being newly formed for each response.

The NCST has not undertaken a major investigation since the Joplin Tornado in 2011. Over the last few years, the Committee has commented that NIST may be missing opportunities to impact the built environment by performing more such investigations. Under the new leadership, the Disaster and Failure Studies Program has performed 3 preliminary reconnaissance reviews (including Hurricanes Harvey and Irma) and is considering further reviews of Irma and Maria once the safety of their investigators on the ground can be considered appropriate. Consistent with a recommendation in 2016 by the Committee that NCST review its deployment criteria, the NCST is now actively looking for investigation and learning opportunities which can help construction safety in the United States. The NCST has also, this year, chosen to review a series of chronic events (construction fires) which individually would not lead to an investigation, but as a series of events meet the intent of the Act. We applaud the staff for making the additional move.

# National Construction Safety Team Advisory Committee

National Institute of Standards and Technology

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## National Construction Safety Team Advisory Committee

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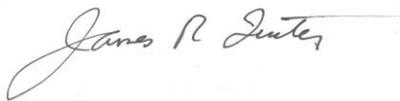
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James R. Quiter, PE, FSFPE, LEED AP  
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Identical letter sent to:

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Ranking Minority Member

**National Construction Safety Team Advisory Committee**  
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## **National Construction Safety Team Advisory Committee**

National Institute of Standards and Technology

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**National Construction Safety Team Advisory Committee**  
National Institute of Standards and Technology

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# **National Construction Safety Team Advisory Committee**

National Institute of Standards and Technology

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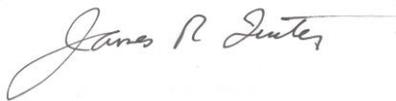
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**National Construction Safety Team Advisory Committee**  
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**National Construction Safety Team Advisory Committee**  
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December 20, 2017

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Committee on Science, Space,  
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The NCST Act focuses exclusively on safety from building failures. NIST has investigated failures of construction that cannot be characterized properly as buildings, and should do so again in the future. A current example deserving such investigation is the failure of the power and communication systems in Puerto Rico caused by Hurricane Maria. Studies of such events are crucial to building performance, but also to improving tools to enhance community resilience, which is a current focus of research at NIST. A past example of an important NIST (then NBS) investigation of a construction failure that was not a building was the 1978 collapse of a cooling tower for the Pleasants Power Station at Willow Island, West Virginia. While investigations of failures of non-building structures have been and could be carried out under the authority granted to NIST in its Organic Act, in the National Windstorm Impact Reduction Program, and in the National Earthquake Hazards Reduction Program, it is recommended here that formal consideration be given to amending the NCST Act to emphasize the important role NIST should play in such investigations. The amendment also needs to acknowledge the important role other Federal agencies have in selected structural failures, including, for example, the Army Corps of Engineers, the Department of Transportation, the Department of Energy, and the Nuclear Regulatory Commission.

## National Construction Safety Team Advisory Committee

National Institute of Standards and Technology

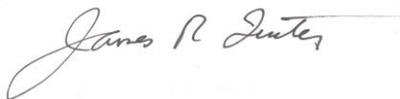
2. As stated previously, the Committee commends the current administration for their interest and willingness to respond to and learn from recent disasters. However, funding priorities must always be considered. The Committee suggests to Congress that some means of ensuring consistent funding to such endeavors is needed. One possible consideration is to include specific allocation for investigations in the funding mechanisms that are created when a Federal disaster is declared.

### Recommendations Regarding NCST Activities:

1. NCST has already sent reconnaissance teams to investigate Hurricanes Harvey and Irma. Building on the success in understanding alerts, messaging, and people movement in Joplin, we recommend that NIST further study communication of alerts and warning during imminent threats. We recommend, as part of their investigations of these hurricanes, additional analysis of the presence or absence of communicator strategies to reach populations at risk, including the mechanisms and technology to help decision making about protective actions such as evacuation and sheltering.
2. We recommend that, in addition to the technical findings and recommendations from these emergencies, NIST should spend more effort looking at the cost and benefit of implementing their recommendations. The past and current recommendations are not consistently supported by sufficient economic analysis. For example, the Joplin recommendations conclude that “critical buildings and infrastructure such as hospitals and emergency operation centers are designed to remain operational in the event of a tornado.” Wind loads from tornados greatly exceed current design wind loads, so a recommendation like this should include the benefits and cost impact to construction of these facilities in tornado-prone regions.
3. We recognize and applaud the activities of NIST social and behavioral scientists to develop technical and scientific knowledge about risk. This is currently being translated into hazard maps and damage indicators. We recommend that NIST continue the effort, with consistent attention given to portraying such information in appropriate scientific terms as well as terms that can be understood by community officials and the general public. This will help reach and affect the decision making of vulnerable populations.

The Committee is honored to serve in our advisory capacity and continue to find the NCST program to be highly valuable and relevant to the security of the nation’s building stock.

Very Truly Yours,



James R. Quiter, PE, FSFPE, LEED AP  
Chair, National Construction Safety Team Advisory Committee

Identical letter sent to:

The Honorable Daniel Lipinski  
Ranking Minority Member

**National Construction Safety Team Advisory Committee**  
National Institute of Standards and Technology

Appendix

Proposed amendments to the NCST Act:

Sec. 2, paragraph (a):

“...after events causing the failure of building(s) or ~~buildings~~ structure(s) that has resulted in substantial loss of life or that posed significant potential for substantial loss of life. Where the failure of the structure(s) is the proper subject for investigation by another Federal agency, the Director shall defer to the authority of that agency. To the maximum extent practicable...”

And Sec. 2, paragraph (b)

“(1) PURPOSE.—The purpose of investigation by Teams is to improve the safety and structural integrity of ~~buildings~~ the built environment in the United States.

And replace the term “buildings” with “the built environment” in Sec. 2 paragraph (b)(2)(D)

And replace the term “building standards, codes, and practices” with “engineering standards, practices, and building codes” at the following locations:

Sec. 8 paragraph (3)

Sec. 9, paragraph (2)

Sec. 14

And replace the term “building failure” with “failure” at the following locations:

Sec. 2, paragraph (b)(2)(a)

Sec. 2, paragraph (c)(1)(G)

Sec. 2, paragraph (c)(1)(J)

Sec. 4, paragraph (a)

Sec. 4, paragraph (a)(1) [*2 locations*]

Sec. 4, paragraph (a)(3)

Sec. 4, paragraph (b)(a)

Sec. 4, paragraph (b)(2)

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Sec. 4, paragraph (d)(3)

Sec. 4, paragraph (d)(4)

Sec. 7, paragraph (c)

Sec. 8, paragraph (1)

Sec. 8, paragraph (4)

And replace the term “building components” with “components” at the following locations:

Sec. 4, paragraph (a)(1)

Sec. 4, paragraph (a)(3)

Sec. 4, paragraph (b)(1)

And broaden Sec. 4, paragraph (d) on Interagency Priorities to include other agencies that have legislative mandates for the investigation of the failure of selected types of failures, such as the Army COE for dams and levees, the NRC for nuclear power generation, the DOE for nuclear

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weapons facilities, and the DOT for vehicular bridges. *[Such mandates are assumed, not verified, by this Committee]*

Lastly, unrelated to the preceding, consider updating Sec. 2 paragraph (c)(1)(J) by adding a reference to the National Windstorm Impact Reduction Program.

**National Construction Safety Team Advisory Committee**  
National Institute of Standards and Technology

December 20, 2017

The Honorable Daniel Lipinski  
Ranking Minority Member  
Subcommittee on Research and Technology  
Committee on Science, Space,  
and Technology  
United States House of Representatives  
Washington, DC 20515

Dear Representative Lipinski:

I am pleased to submit the 2017 Annual Report of the National Construction Safety Team (NCST) Advisory Committee (Committee) of the National Institute of Standards and Technology (NIST). The Committee serves as NIST's advisor on implementation of the NCST Act (P.L. 107-231; the Act), and the opinions and recommendations expressed in this letter reflect our views as an independent, Federal Advisory Committee composed of members from the private sector. The Committee met at NIST on September 28, 2017, in Gaithersburg, MD, at which time we were briefed on activities performed under the Act. In addition, because there are several new members of the Committee, we were given a lengthy briefing on the Act itself, and the expectations of the Committee.

The Committee is formed for two general purposes:

1. Evaluation of team activities.
2. Assessment of the implementation of recommendations.

**Evaluation of Activities**

The NCST is a part of the Disaster and Failure Studies Program at NIST. The program is under new leadership and the Committee applauds the renewed enthusiasm with relation to the work of NCST. A disaster resource team has been established with regular meetings, so that the related units within NIST are ready to respond as a team rather than being newly formed for each response.

The NCST has not undertaken a major investigation since the Joplin Tornado in 2011. Over the last few years, the Committee has commented that NIST may be missing opportunities to impact the built environment by performing more such investigations. Under the new leadership, the Disaster and Failure Studies Program has performed 3 preliminary reconnaissance reviews (including Hurricanes Harvey and Irma) and is considering further reviews of Irma and Maria once the safety of their investigators on the ground can be considered appropriate. Consistent with a recommendation in 2016 by the Committee that NCST review its deployment criteria, the NCST is now actively looking for investigation and learning opportunities which can help construction safety in the United States. The NCST has also, this year, chosen to review a series of chronic events (construction fires) which individually would not lead to an investigation, but as a series of events meet the intent of the Act. We applaud the staff for making the additional move.

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Because of the way the Act was written and implemented, there is a continual tension between priorities for NIST staff. Besides the single position of Disaster and Failure Studies Director, there is no budget, nor dedicated staff, for investigations. Therefore, any investigation pulls people and funds away from other programs. We commend the approach of the Director of the Engineering Laboratory in prioritizing these investigations, but that prioritization is not assured under future leadership. One solution to a part of the problem would be to have specific funds allocated to investigations when disasters are declared (see recommendations).

## Assessment of the Implementation of Recommendations

The Joplin Tornado investigation has led to much better understanding of the phenomenon and has also resulted in technical, sociological and operational changes in the preparation for and response to tornados. This investigation is an example of successful implementation of the Act and should motivate more such investigations (see recommendations sections). Some of the successes are:

1. A better understanding of the winds and forces generated by tornados, thereby increasing our ability to better design buildings to withstand such forces, and to write standards to address them.
2. Better reporting of actual events, with removal of biases, which allows for better preparation for future events.
3. An understanding of the risk messaging from public and private sources (alerts and warnings), and the reaction of the public to those messages. This has resulted in changes to codes and standards, and also changes in operating procedures in many tornado-prone areas.

The Committee applauds the on-going efforts and results of the NCST in this investigation. It counsels, however, that while NIST should maintain their involvement in the codes and standards process, they need to carefully balance their position as the country's technical advisor with an understanding and appreciation of the economic and design factors that may be involved.

## Recommendations to Congress

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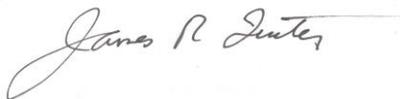
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The Honorable Barbara Comstock  
Chairwoman

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