Healthcare PC Report – 8-4-2022

Code change Number	Results	Public Comments	Section number	Topic
EB47-22	AM	AMPC	502.1.1, 1101.3	Risk category – what happens for facilities that have been kicked up in the risk category – See S74-S78
EB48-22	AS	D	502.1.1, 1101.2	Risk category – what happens for facilities that have been kicked up in the risk category – See S74-S78
EB67-22	AM	AMPC	502.12, 706.3.2	Hospital in reason
EB75-22	AS	AMPC	506.5.3, 1006.3	Risk category – what happens for facilities that have been kicked up in the risk category – See S74-S78 Hospital in reason
EB98-22	AS	D	1011.5.1, 1105.2, 804.12.2	Guards on roof
EB116-22	AM	AMPC	Appendix E	Temporary uses
S74-22	AS	3 PC – AMPC; AS; D	Table 1604.5	Nursing homes to Risk Category IV; plus issue with added description Hospital in reason
S75-22	AS	2 PC – AS; D	Table 1604.5	Jails to Risk Category IV; plus issue with added description Hospital in reason
S76-22	AM	15 PC – 2-AM; 13-D	Table 1604.5	Public utilities to Risk Category IV; plus issue with added description Hospital in reason
S77-22	D	AMPC	Table 1604.51	Group I-1 to Risk Category IV; plus issue with added description Hospital in reason
S78-22	D	AMPC	Table 1604.5	Group F and M to Risk Category IV; plus issue with added description
S116-22	AM	4 PC - AMPC	Varies	Temporary Uses Hospital in reason
G2-22	D	AMPC	202, 1604.5.1	‘life safety components’

EB47-22

IEBC: 502.1.1 (New), 1101.3 (New)

Proposed Change as Submitted

Proponents: David Bonowitz, representing FEMA-ATC Seismic Code Support Committee (dbonowitz@att.net); Kelly Cobeen, representing Federal Emergency Management Agency/Applied Technology Council - Seismic Code Support Committee (kcobeen@wje.com); Michael Mahoney, representing FEMA (mike.mahoney@fema.dhs.gov)

THIS CODE CHANGE WILL BE HEARD BY THE IBC-STRUCTURAL CODE COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THAT COMMITTEE.

2021 International Existing Building Code

Add new text as follows:

502.1.1 Risk category assignment. Where the addition and the existing building have different occupancies, the risk category of each existing and added occupancy shall be determined in accordance with Section 1604.5.1 of the *International Building Code*. Where application of that section results in a higher risk category for the existing building, such a change shall be considered a change of occupancy and shall comply with Section 506 of this code. Where application of that section results in a higher risk category for the addition, the addition and any systems in the existing building required to serve the addition shall comply with the requirements of the *International Building Code* for new construction for the higher risk category.

1101.3 Risk category assignment. Where the addition and the existing building have different occupancies, the risk category of each existing and added occupancy shall be determined in accordance with Section 1604.5.1 of the *International Building Code*. Where application of that section results in a higher risk category for the existing building, such a change shall be considered a change of occupancy and shall comply with Section 506 of this code. Where application of that section results in a higher risk category for the addition, the addition and any systems in the existing building required to serve the addition shall comply with the requirements of the *International Building Code* for new construction for the higher risk category.

Reason: This proposal clarifies how risk category should be assigned where the addition and the existing building have different uses. It creates identical provisions in the Prescriptive and Work Area methods.
IBC Section 1604.5.1 already covers conditions like this for new buildings. Generally, IEBC users would use IBC Section 1604.5 to find the risk category where any IEBC provision calls for it, but there is no general IEBC provision that explicitly points there. The case of additions, where the IEBC already requires the addition to be designed and built as new construction, is of particular interest, so this proposal provides a common sense interpretation.

As background and precedent, it is worth noting the other cases where the current codes address mismatched uses:

- IEBC Section 302.5 points to IBC Chapter 3 to assign occupancies, and Chapter 3 points in turn to Section 508 for buildings with mixed occupancies.
- IEBC Section 304.3 points to IBC Section 1604.5 to assign risk categories, and Section 1604.5.1 addresses mixed use buildings, requiring each portion of a new building to be assigned to the highest risk category of any portion on which it is structurally or functionally dependent. This proposal creates new IEBC sections to make that reference more direct and explicit for the case of additions.
- IEBC Section 1101.2 prohibits deficiencies in existing buildings from being extended into additions. (We are separately proposing a similar provision for the Prescriptive method.)
- IEBC Sections 506.5.4 and 1006.4 address operational access to RC IV facilities that might be affected by a change of occupancy project, but there is no similar provision for additions. This proposal would address that situation in a different way, by acknowledging that a dependent addition to a RC IV building must itself be assigned to RC IV, and that a RC IV addition changes the occupancy of a dependent non-RC IV existing building.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
The proposal merely provides a more explicit interpretation of the current code for the special case of additions.

Public Hearing Results

Committee Action: **As Modified**

Committee Modification:

2021 International Existing Building Code

1101.3 Risk category assignment. Where the addition and the existing building have different occupancies, the risk category of each existing and added occupancy shall be determined in accordance with Section 1604.5.1 of the *International Building Code*. Where application of that section results in a higher risk category for the existing building, such a change shall be considered a change of occupancy and shall comply with ~~Section 506~~ Chapter 10 of this code. Where application of that section results in a higher risk category for the addition, the addition and any systems in the existing building required to serve the addition shall comply with the requirements of the *International Building Code* for new construction for the higher risk category.

Committee Reason: Approved as modified as this provides consistency between the IEBC and the IBC for Risk Category assignments. The modification correctly adds a pointer to Chapter 10. (Vote: 14-0)

EB47-22

Individual Consideration Agenda

Public Comment 1:

IEBC: 502.1.1, 1101.3

Proponents: Jonathan Siu, representing Self requests As Modified by Public Comment

Further modify as follows:

2021 International Existing Building Code

502.1.1 Risk category assignment. Where the addition and the existing building have different occupancies, the risk category of each existing and added occupancy shall be determined in accordance with Section 1604.5.1 of the *International Building Code*. Where application of that section results in a higher risk category for the existing building compared with the risk category for the existing building before the addition, such a change shall be considered a change of occupancy and shall comply with Section 506 of this code. Where application of that section results in a higher risk category for the addition compared with the risk category for the addition by itself, the addition and any systems in the existing building required to serve the addition shall comply with the requirements of the *International Building Code* for new construction for the higher risk category.

1101.3 Risk category assignment. Where the addition and the existing building have different occupancies, the risk category of each existing and added occupancy shall be determined in accordance with Section 1604.5.1 of the *International Building Code*. Where application of that section results in a higher risk category for the existing building compared with the risk category for the existing building before the addition, such a change shall be considered a change of occupancy and shall comply with Chapter 10 of this code. Where application of that section results in a higher risk category for the addition compared with the risk category for the addition by itself, the addition and any systems in the existing building required to serve the addition shall comply with the requirements of the *International Building Code* for new construction for the higher risk category.

Commenter's Reason: This public comment is being submitted to clarify the application of the proposed change, in response to comments from a Structural Committee member at the Committee Action Hearings. As submitted, the text of the code will address changes to "a higher risk category," but does not establish any baseline for comparison. This begs the question, "higher than what?"
The intent of the second sentence in both sections in the code change is that if Section 1604.5.1 triggers a change to the existing portion of the building, either with or without the addition taken into consideration, the provisions for change of occupancy get applied to the existing portion of the building.

Similarly, the third sentence in both sections is intended to trigger compliance with the IBC for new construction in the addition should Section 1604.5.1 trigger a change to the risk category for the addition. This sentence also triggers changes within the existing portion of the building, should the existing portion and the addition share building systems (sprinklers, fire alarms, mechanical systems, etc.)

This public comment establishes the baselines for comparison as follows:

- For the existing portion of the building, the "end-result" risk category gets compared to the risk category of the building before the addition was proposed. If Section 1604.5.1 requires the risk category to be higher than it was previous to the addition, the existing portion of the building is subject to the change of occupancy provisions.
- For the addition, the "end-result" risk category gets compared to the risk category of the addition if it were a standalone or separated portion of the building. Again, if Section 1604.5.1 triggers the risk category of the addition to be higher than would ordinarily be required, the addition must comply with new construction requirements for the higher risk category. If any building systems are shared between the addition and

the existing portion of the building, the existing building will be required to be upgraded to meet the requirements for new construction for the higher risk category as well.

Cost Impact: The net effect of the public comment and code change proposal will not increase or decrease the cost of construction
The cost impact statement for the original proposal says there will be no change to the cost of construction, since it is merely a clarification of what is required by the existing code language. Given that this public comment is a further clarification of the original code change, it will have no effect on the original cost impact statement.

Public Comment# 3187

EB48-22

IEBC: 502.1.1 (New), 1101.2

Proposed Change as Submitted

Proponents: David Bonowitz, representing FEMA-ATC Seismic Code Support Committee (dbonowitz@att.net); Kelly Cobeen, representing Federal Emergency Management Agency/Applied Technology Council - Seismic Code Support Committee (kcobeen@wje.com); Michael Mahoney, representing FEMA (mike.mahoney@fema.dhs.gov)

2021 International Existing Building Code

Add new text as follows:

502.1.1 Creation or extension of nonconformity. An *addition* shall not create or extend any nonconformity in the *existing building* to which the *addition* is being made with regard to accessibility, structural strength, supports and attachments for nonstructural components, fire safety, means of egress or the capacity of mechanical, plumbing or electrical systems.

Exception: Nonconforming supports and attachments for nonstructural components that serve the addition from within the *existing building* need not be altered to comply with *International Building Code* Section 1613 unless the components are part of the addition's *life safety system* or are required to serve an *addition* assigned to Risk Category IV.

Revise as follows:

1101.2 Creation or extension of nonconformity. An *addition* shall not create or extend any nonconformity in the *existing building* to which the *addition* is being made with regard to accessibility, structural strength, supports and attachments for nonstructural components, fire safety, means of egress or the capacity of mechanical, plumbing or electrical systems.

Exception: Nonconforming supports and attachments for nonstructural components that serve the addition from within the *existing building* need not be altered to comply with *International Building Code* Section 1613 unless the components are part of the addition's *life safety system* or are required to serve an *addition* assigned to Risk Category IV.

Reason: This proposal clarifies the current intent of the IEBC for cases where an addition relies on the existing building for certain systems or services – or vice versa.
The code already requires that any addition should itself be designed and built as new construction. This proposal ensures that the new addition is provided with suitable support from the existing building, consistent with the code's current intent. Examples:

- An addition might get its hot water from mechanical systems in the existing building, or might rely on a stair tower in the existing building for egress. In these cases, the addition is new and ought to have mechanical systems and egress capacity that are like new as well.
- A horizontal addition will include an elevator and new HVAC equipment meant to serve both the addition and the existing building. If the existing building is assigned to Risk Category IV, then the new systems should meet requirements for RC IV buildings even if the addition itself contains only RC II uses.

We believe this is the current intent of the code, and the Work Area method Sec 1101.2 already captures this intent for critical systems -- accessibility, structural strength, fire safety, egress, and MEP systems. Section 1101.2 sensibly requires that if the addition must be built as new construction, we wouldn't allow it to be built with deficient systems as a standalone structure, so why would we allow it to be served with deficient systems just because they're in an adjacent existing building?

But the current provision is not quite clear about bracing (especially seismic) of nonstructural components. Some might read "structural strength" to include "supports and attachments for nonstructural components" since the latter are covered in IBC Chapter 16. Some might consider the current reference to MEP systems to include their bracing and support. Nevertheless, the code is not as clear as it could be regarding this issue, so this proposal clarifies it.

Why the new exception? Despite what we believe is a laudable intent, we also recognize that the reason these items get overlooked is that it can be expensive to expose, evaluate, and retrofit nonstructural systems (even those already included in the list under fire safety, egress, and MEP). So the proposal adds an exception that effectively requires retrofit only for those systems serving RC IV additions where post-earthquake functionality is inherent in the design assumptions. Similarly, *life safety systems* must be functional in the addition, so they are not eligible for the exception either. The exception refers to IBC Section 1613 because that would be the default criteria if the exception were not provided, as indicated by Section 1101.1 (not shown) or by Section 502.1 (not shown) for the Prescriptive method.

Thus, depending on how one interprets the current code, this proposal is either an extension of the requirement in current Section 1101.2, or a relaxation of it through an exception. Either way, we submit that this proposal finds the right balance and should be in both the Work Area and Prescriptive methods. Therefore, in addition to revising Sec 1101.2, this proposal copies it into the Prescriptive method, where it will clarify the similar but implicit requirement in the first sentence of Section 502.1.

Finally, it's worth observing that if you don't want to retrofit existing systems, there's an easy way out. Just design your addition to be structurally

and functionally separate from the existing building, as IBC Section 1605.4.1 and IEBC Section 1101.2 both allow. Thus, neither the current code nor this proposal actually mandates any upgrade to the existing building for an independent addition. But *without* this proposal, the incentive is to save money on the addition by relying on deficient systems in the existing building, or by having it serve the RC IV existing building while being designed itself as RC II. This proposal removes those perverse incentives.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
The proposal should not increase the cost of construction because it merely clarifies the intent of the current code, especially Section 1101.2, which prohibits the creation or extension of a deficient building system within an existing building when an addition is made. In some cases, depending on how the current code is interpreted, the proposed new Exception might actually reduce the cost of an addition.

EB48-22

Public Hearing Results

Committee Action: **As Submitted**

Committee Reason: This proposal provides the necessary guidance as to what aspects of the existing building would need to be upgraded when an addition is made to the building. (Vote: 13-0)

EB48-22

Individual Consideration Agenda

Public Comment 1:

Proponents: John Swanson, representing NFSA (swanson@nfsa.org); Jeffrey Hugo, representing NFSA (hugo@nfsa.org) requests Disapprove

Commenter's Reason: This public comment recommends the ICC membership to disapprove this code change for the following reasons:
1. The cost statement of this code change states it will not increase or decrease the cost of construction is inaccurate. When an addition occurs on an existing building, and the existing building needs to upgrade the seismic bracing for the automatic sprinkler system it will increase the cost of construction.

2. The code change proposal references "life safety system" as defined in the ICC codes. This term is extremely broad and will likely lead to confusion over which parts of a life safety system are subject to the structural requirement in IBC section 1613.

3. Since this code change will require "life safety systems" in existing building be brought up to current IBC (and NFPA 13) requirements, this code change does not clarify how far into an existing building the life safety system must be upgraded or what specific components. For example, if a system serves a new addition to an existing building, is seismic bracing required from the new addition back to the riser assembly? This change adds expensive upgrades to existing buildings with little clarity for how to apply it.

Cost Impact: The net effect of the public comment and code change proposal will increase the cost of construction
The original proposal, as submitted, will increase the cost of construction. The public comment for disapproval, decreases the cost of construction.

Public Comment# 3263

EB67-22

IEBC: [BS] 503.12, [BS] 706.3.2, [BS] C201.1

Proposed Change as Submitted

Proponents: Michael Fillion, representing National Council of Structural Engineers Associations (mrf.structure@verizon.net); Don Scott, representing ASCE 7 Wind Load Subcommittee (dscott@pcs-structural.com)

THIS CODE CHANGE WILL BE HEARD BY THE IBC-STRUCTURAL CODE COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THAT COMMITTEE.

2021 International Existing Building Code

Revise as follows:

[BS] 503.12 Roof diaphragms resisting wind loads in high-wind regions. Where the intended *alteration* requires a permit for reroofing and involves removal of roofing materials from more than 50 percent of the roof diaphragm of a building or section of a building located where the ~~ultimate design~~ basic wind speed ,V, is greater than 130 mph (58 m/s) in accordance with Figure 1609.3(1) of the International Building Code for Risk Category II, roof diaphragms, connections of the roof diaphragm to roof framing members, and roof-to-wall connections shall be evaluated for the wind loads specified in Section 1609 of the International Building Code, including wind uplift. If the diaphragms and connections in their current condition are not capable of resisting 75 percent of those wind loads, they shall be replaced or strengthened in accordance with the loads specified in Section 1609 of the International Building Code.

Exception: Buildings that have been demonstrated to comply with the wind load provisions in ASCE 7—88 or later editions.

[BS] 706.3.2 Roof diaphragms resisting wind loads in high-wind regions. Where roofing materials are removed from more than 50 percent of the roof diaphragm or section of a building located where the ~~ultimate design~~ basic wind speed, ~~V_{ult}~~ V, is greater than 130 mph (58 m/s)~~determined~~ in accordance with Figure 1609.3(1) of the International Building Code for Risk Category II, ~~is greater than 130 mph (58 m/s),~~ roof diaphragms, connections of the roof diaphragm to roof framing members, and roof-to-wall connections shall be evaluated for the wind loads specified in the *International Building Code*, including wind uplift. If the diaphragms and connections in their current condition are not capable of resisting 75 percent of those wind loads, they shall be replaced or strengthened in accordance with the loads specified in the *International Building Code.*

Exception: Buildings that have been demonstrated to comply with the wind load provisions in ASCE 7—88 or later editions.

[BS] C201.1 Purpose. This chapter provides prescriptive methods for partial structural retrofit of an *existing building* to increase its resistance to wind loads. It is intended for voluntary use where the ~~ultimate design~~ basic wind speed, ~~V_{ult}~~ V , is greater than 130 mph (58 m/s) ~~determined~~ in accordance with Figure 1609.3(1) of the International Building Code for Risk Category II,~~exceeds 130 mph (58 m/s)~~ and for reference by mitigation programs. The provisions of this chapter do not necessarily satisfy requirements for new construction. Unless specifically cited, the provisions of this chapter do not necessarily satisfy requirements for structural improvements triggered by *addition, alteration, repair, change of occupancy*, building relocation or other circumstances.

Reason: Editorial changes to align the wind speed description consistent with ASCE 7 and the *International Building Code.*

Cost Impact: The code change proposal will not increase or decrease the cost of construction
The code change proposal is editorial.

Public Hearing Results

Committee Action: **As Modified**

Committee Modification:

2021 International Existing Building Code
[BS]503.12 Roof diaphragms resisting wind loads in high-wind regions. Where the intended *alteration* requires a permit for reroofing and involves removal of roofing materials from more than 50 percent of the roof diaphragm of a building or section of a building located where the basic wind speed ,V, is greater than 130 mph (58 m/s) in accordance with Figure 1609.3(2~~1~~) of the International Building Code ~~for Risk Category II~~, roof diaphragms, connections of the roof diaphragm to roof framing members, and roof-to-wall connections shall be evaluated for the wind loads specified in Section 1609 of the International Building Code, including wind uplift. If the diaphragms and connections in their current condition are not capable of resisting 75 percent of those wind loads, they shall be replaced or strengthened in accordance with the loads specified in Section 1609 of the International Building Code.

Exception: Buildings that have been demonstrated to comply with the wind load provisions in ASCE 7—88 or later editions.

[BS]706.3.2 Roof diaphragms resisting wind loads in high-wind regions. Where roofing materials are removed from more than 50 percent of the roof diaphragm or section of a building located where the basic wind speed, V, is greater than 130 mph (58 m/s) in accordance with Figure 1609.3(2~~1~~) of the International Building Code~~for Risk Category II~~, roof diaphragms, connections of the roof diaphragm to roof framing members, and roof-to-wall connections shall be evaluated for the wind loads specified in the *International Building Code*, including wind uplift. If the diaphragms and connections in their current condition are not capable of resisting 75 percent of those wind loads, they shall be replaced or strengthened in accordance with the loads specified in the *International Building Code.*

Exception: Buildings that have been demonstrated to comply with the wind load provisions in ASCE 7—88 or later editions.

[BS]C201.1 Purpose. This chapter provides prescriptive methods for partial structural retrofit of an *existing building* to increase its resistance to wind loads. It is intended for voluntary use where the basic wind speed, V, is greater than 130 mph (58 m/s) in accordance with Figure 1609.3(2~~1~~) of the International Building Code ~~for Risk Category II~~, and for reference by mitigation programs. The provisions of this chapter do not necessarily satisfy requirements for new construction. Unless specifically cited, the provisions of this chapter do not necessarily satisfy requirements for structural improvements triggered by *addition, alteration, repair, change of occupancy*, building relocation or other circumstances.

Committee Reason: Approved as modified as a needed change to align with appropriate terminology. This provides updates to the appropriate figure while keeping the same Risk Category as existing code wording. The modification updates the reference to the correct figure and appropriately deletes the reference to a specific Risk Category. (Vote:10-4)

EB67-22

Individual Consideration Agenda

Public Comment 1:

IEBC: [BS] 503.12, [BS] 706.3.2, [BS] C201.1

Proponents: Julie Furr, representing National Council of Structural Engineers Association (jfurr@rimkus.com) requests As Modified by Public Comment

Further modify as follows:

2021 International Existing Building Code

[BS] 503.12 Roof diaphragms resisting wind loads in high-wind regions. Where the intended *alteration* requires a permit for reroofing and involves removal of roofing materials from more than 50 percent of the roof diaphragm of a building or section of a building located where the basic design wind speed,V, is greater than 130 mph (58 m/s) in accordance with ~~Figure 1609.3(2) of~~ the International Building Code, roof diaphragms, connections of the roof diaphragm to roof framing members, and roof-to-wall connections shall be evaluated for the wind loads specified in Section 1609 of the International Building Code, including wind uplift. If the diaphragms and connections in their current condition are not capable of resisting 75 percent of those wind loads, they shall be replaced or strengthened in accordance with the loads specified in Section 1609 of the International Building Code.

Exception: Buildings that have been demonstrated to comply with the wind load provisions in ASCE 7—88 or later editions.

[BS] 706.3.2 Roof diaphragms resisting wind loads in high-wind regions. Where roofing materials are removed from more than 50 percent of the roof diaphragm or section of a building located where the basic design wind speed, V, is greater than 130 mph (58 m/s) in accordance with ~~Figure 1609.3(2) of~~ the International Building Code, roof diaphragms, connections of the roof diaphragm to roof framing members, and roof-to-wall connections shall be evaluated for the wind loads specified in the *International Building Code*, including wind uplift. If the diaphragms and connections in their current condition are not capable of resisting 75 percent of those wind loads, they shall be replaced or strengthened in accordance with the loads specified in the *International Building Code.*

Exception: Buildings that have been demonstrated to comply with the wind load provisions in ASCE 7—88 or later editions.

[BS] C201.1 Purpose. This chapter provides prescriptive methods for partial structural retrofit of an *existing building* to increase its resistance to wind loads. It is intended for voluntary use where the basic design wind speed, V, is greater than 130 mph (58 m/s) in accordance with ~~Figure 1609.3(2) of~~ the International Building Code, and for reference by mitigation programs. The provisions of this chapter do not necessarily satisfy requirements for new construction. Unless specifically cited, the provisions of this chapter do not necessarily satisfy requirements for structural improvements triggered by *addition, alteration, repair, change of occupancy*, building relocation or other circumstances.

Commenter's Reason: Roof diaphragms and their connections are vulnerable to high wind pressures, which can cause considerable damage, both structural and nonstructural, when these components fail. In the field, as opposed to in a laboratory or academia, actual wind pressures that

develop on any given building or structure are a function of the wind speed, but they are not a function of that building or structure's designated Risk Category. With this understanding, a basic design wind speed of 130 mph has been identified as the appropriate threshold above which roof diaphragms and their connections should be closely evaluated.
Because the geographic areas encompassed by wind speeds greater than 130 mph are larger for Risk Category III and IV buildings and structures than they are for Risk Category II buildings and structures, this public comment would result in an increase in the number of Risk Category III and IV buildings and structures that would be required to comply with this provision. There is a societal expectation that Risk Category III and IV buildings and structures will be more robust than other buildings and structures, and these buildings and structures are required to be designed to wind pressures generated by these higher wind speeds. This increased robustness is the entire basis for the risk category system in the first place. These are storm shelters, hospitals, power-plants, large assembly areas, and the other buildings, the failure of which could pose a substantial risk to human life and/or a substantial hazard to the affected community.

On the other hand, buildings and structures in Risk Category I represent a low risk to human life in the event of failure, and because the geographic areas encompassed by wind speeds greater than 130 mph are smaller for Risk Category I buildings and structures than they are for Risk Category II buildings and structures, this public comment would result in a decrease in the number of Risk Category I buildings and structures that would be required to comply with this provision. This will reduce the net cost increase accordingly.

Cost Impact: The net effect of the public comment and code change proposal will increase the cost of construction
There will be somewhat greater costs for buildings and structures in Risk Categories III and IV as a result of the increased geographical area encompassed the the 130 mph contours; however, the costs for buildings and structures in Risk Category I would be reduced and would reduce the net cost increase accordingly.

Public Comment# 3177

EB75-22

IEBC: 506.5.3, [BS] 1006.3

Proposed Change as Submitted

Proponents: David Bonowitz, representing FEMA-ATC Seismic Code Support Committee (dbonowitz@att.net); Kelly Cobeen, representing Federal Emergency Management Agency/Applied Technology Council - Seismic Code Support Committee (kcobeen@wje.com); Michael Mahoney, representing FEMA (mike.mahoney@fema.dhs.gov)

THIS CODE CHANGE WILL BE HEARD BY THE IBC-STRUCTURAL CODE COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THAT COMMITTEE.

2021 International Existing Building Code

Revise as follows:

506.5.3 Seismic loads (seismic force-resisting system). Where a *change of occupancy* results in a building being assigned to a higher *risk category* , or where the change is from a Group S or Group U occupancy to any occupancy other than Group S or Group U, the building shall satisfy the structural requirements of Section 1613 of the International Building Code for the new *risk category* using full seismic forces. Where a change of occupancy results in a building being assigned to Risk Category IV and Seismic Design Category D or F, nonstructural components serving any portion of the building changed to Risk Category IV shall comply with the requirements of Section 1613 of the *International Building Code* or shall comply with ASCE 41 using an objective of Operational nonstructural performance with the BSE-1N earthquake hazard level.

Exceptions:

1. Where the area of the new occupancy is less than 10 percent of the building area, the occupancy is not changing from a Group S or Group U occupancy, and the new occupancy is not assigned to *Risk Category* IV, compliance with this section is not required. The cumulative effect of occupancy changes over time shall be considered.
2. Where a *change of use* results in a building being reclassified from *Risk Category* I or II to Risk Category III and the seismic coefficient, S_{DS}, is less than 0.33, compliance with this section is not required.
3. Unreinforced masonry bearing wall buildings assigned to *Risk Category* III and to Seismic Design Category A or B, shall be permitted to use Appendix Chapter A1 of this code.
4. Where the change is from a Group S or Group U occupancy and there is no change of risk category, use of reduced seismic forces shall be permitted.

[BS] 1006.3 Seismic loads. Where a *change of occupancy* results in a building being assigned to a higher *risk category*, or where the change is from a Group S or Group U occupancy to any occupancy other than Group S or Group U, the building shall satisfy the structural requirements of Section 1613 of the International Building Code for the new *risk category* using full seismic forces. Where a change of occupancy results in a building being assigned to Risk Category IV and Seismic Design Category D or F, nonstructural components serving any portion of the building changed to Risk Category IV shall comply with the requirements of Section 1613 of the *International Building Code* or shall comply with ASCE 41 using an objective of Operational nonstructural performance with the BSE-1N earthquake hazard level.

Exceptions:

1. Where a *change of use* results in a building being reclassified from *Risk Category* I or II to *Risk Category* III and the seismic coefficient, S_{DS}, is less than 0.33, compliance with this section is not required.
2. Where the area of the new occupancy is less than 10 percent of the building area, the occupancy is not changing from a Group S or Group U occupancy, and the new occupancy is not assigned to *Risk Category* IV, compliance with this section is not required. The cumulative effect of occupancy changes over time shall be considered.
3. Unreinforced masonry bearing wall buildings assigned to *Risk Category* III and to Seismic Design Category A or B shall be permitted to use Appendix Chapter A1 of this code.
4. Where the change is from a Group S or Group U occupancy and there is no change of *risk category*, use of reduced seismic forces shall be permitted.

Reason:
This proposal protects essential nonstructural systems and components in existing buildings being changed to Risk Category IV.

Fire stations, emergency operations centers, hospital emergency departments, and other facilities assigned to RC IV are especially reliant on the performance of nonstructural systems. Yet the current code, even where it triggers seismic upgrade for a change of risk category, does not require any consideration of existing nonstructural components.

This proposal provides a level of protection consistent with the tough philosophy of the IEBC for change of occupancy projects. Still, it is limited to the most crucial and cost-beneficial situations where structural retrofit is already triggered. It applies only where a change of use would create a RC IV space within an existing non-RC IV building, where the code already requires a seismic structural evaluation and possibly a retrofit. This proposal would supplement the triggered structural work by including the nonstructural systems that would make the new RC IV areas functional. In addition, consider its limited scope:

- Change of occupancy to RC III is exempt.
- RC IV buildings in areas of low seismicity are exempt. (Application to moderate and high seismicity is consistent with the IEBC's current philosophy for change of occupancy, and we believe application to all of SDC D and SDC F is appropriate to avoid a perverse incentive in the code. That said, the proposal could be made less onerous in some areas by limiting it to SDC F or to the higher seismicity parts of SDC D, say Sds > 0.5g.)
- Existing nonstructural systems that are not needed to serve the new RC IV areas are exempt.

As is normal in the IEBC, “full” seismic criteria, represented by the specified ASCE 41 objective, are applicable for change of risk category triggers. (Again, we believe this is appropriate to avoid a perverse incentive in the code. That said, the proposal could be made less onerous by relaxing the ASCE 41 objective to Position Retention with the BSE-1N hazard, which would exempt many components and remove the need for backup power and retroactive component certification if it is the design intent to use existing, possibly nonconforming, nonstructural systems to serve the new RC IV areas.)

This proposal fills a gap in the code related to the expected performance of RC IV facilities, but it is consistent with other requirements related to the performance of these buildings. For reference and as precedents, consider:

- Current IEBC requirements for operational access to RC IV facilities affected by a change of occupancy (502.6 and 1103.3)
- ICC 500 requirements for storm shelter “critical support systems,” which requires an existing building to protect mechanical and plumbing systems that support a storm shelter addition.
- IBC 1604.5.1 requirements for assigning risk category in buildings with multiple occupancies. Even if a portion of a building has no RC IV use itself, and even if it is structurally separated from any RC IV uses, it is still assigned to RC IV if it provides access, egress, or life safety systems to the RC IV portion.
- Damage to the new Olive View hospital in the Northridge earthquake. The structure did fine. Nonstructural failures shut down the hospital.
- Too many articles, white papers, and reports to name, all arguing that we need to take nonstructural systems more seriously.

The proposal makes matching edits to the Prescriptive and Work Area methods.

A notes on phrasing: The proposal applies to nonstructural systems that “serve” the new RC IV areas. This is similar to the “work area” concept, but it does not use that terminology because distributed nonstructural systems (HVAC, elevators) can be critical to the work area without actually being within it. Thus, the triggered scope might extend beyond the defined “work area” even if it does not involve the whole building.

Finally, the proposal adds the word "structural" within the current text of each revised section to clarify that the current provision applies only to structural elements (per Section 304.3). We have made a note to staff that if a separate proposal modifying the way these and other provisions reference Section 304.3 is approved, that other proposal should take precedence, and addition of the word "structural" as shown here should be ignored.

Cost Impact: The code change proposal will increase the cost of construction
And the increase will be proper, since the code should discourage the use of deficient nonstructural systems for new RC IV areas. It is consistent with the IEBC's philosophy regarding change of occupancy and change of risk category projects. That said, the proposal will increase costs only for buildings changing to RC IV in areas of significant seismicity, which are already subject to structural retrofit.

Public Hearing Results

Committee Action: **As Submitted**

Committee Reason: Approved as submitted as this addresses concerns to protect essential nonstructural systems and components in existing buildings of Risk Category IV. The committee expressed that the wording could be reviewed for clarity during the public comment period. (Vote:13-1)

Individual Consideration Agenda

Public Comment 1:

IEBC: 506.5.3, [BS] 1006.3

Proponents: Kota Wharton, representing Self (kwharton@grovecityohio.gov) requests As Modified by Public Comment

Modify as follows:

2021 International Existing Building Code

506.5.3 Seismic loads (seismic force-resisting system). Where a *change of occupancy* results in a building being assigned to a higher *risk category* , or where the change is from a Group S or Group U occupancy to any occupancy other than Group S or Group U, the building shall satisfy the structural requirements of Section 1613 of the International Building Code for the new *risk category* using full seismic forces. Where a change of occupancy results in a building being assigned to Risk Category IV and Seismic Design Category D or F, nonstructural components ~~serving any portion~~ of the building ~~changed to Risk Category IV~~ shall comply with ~~the requirements of~~ Section 1613 of the *International Building Code* or ~~shall comply with~~ ASCE 41_,_ using an objective of Operational nonstructural performance with the BSE-1N earthquake hazard level.

Exceptions:

1. Where the area of the new occupancy is less than 10 percent of the building area, the occupancy is not changing from a Group S or Group U occupancy, and the new occupancy is not assigned to *Risk Category* IV, compliance with this section is not required. The cumulative effect of occupancy changes over time shall be considered.
2. Where a *change of use* results in a building being reclassified from *Risk Category* I or II to Risk Category III and the seismic coefficient, S_{DS}, is less than 0.33, compliance with this section is not required.
3. Unreinforced masonry bearing wall buildings assigned to *Risk Category* III and to Seismic Design Category A or B, shall be permitted to use Appendix Chapter A1 of this code.
4. Where the change is from a Group S or Group U occupancy and there is no change of risk category, use of reduced seismic forces shall be permitted.

[BS] 1006.3 Seismic loads. Where a *change of occupancy* results in a building being assigned to a higher *risk category*, or where the change is from a Group S or Group U occupancy to any occupancy other than Group S or Group U, the building shall satisfy the structural requirements of Section 1613 of the International Building Code for the new *risk category* using full seismic forces. Where a change of occupancy results in a building being assigned to Risk Category IV and Seismic Design Category D or F, nonstructural components ~~serving any portion~~ of the building ~~changed to Risk Category IV~~ shall comply ~~with the requirements of~~ Section 1613 of the *International Building Code* or ~~shall comply with~~ ASCE 41_,_ using an objective of Operational nonstructural performance with the BSE-1N earthquake hazard level.

Exceptions:

1. Where a *change of use* results in a building being reclassified from *Risk Category* I or II to *Risk Category* III and the seismic coefficient, S_{DS}, is less than 0.33, compliance with this section is not required.
2. Where the area of the new occupancy is less than 10 percent of the building area, the occupancy is not changing from a Group S or Group U occupancy, and the new occupancy is not assigned to *Risk Category* IV, compliance with this section is not required. The cumulative effect of occupancy changes over time shall be considered.
3. Unreinforced masonry bearing wall buildings assigned to *Risk Category* III and to Seismic Design Category A or B shall be permitted to use Appendix Chapter A1 of this code.
4. Where the change is from a Group S or Group U occupancy and there is no change of *risk category*, use of reduced seismic forces shall be permitted.

Commenter's Reason: Changes for readability only. Reason statement the same.

Cost Impact: The net effect of the public comment and code change proposal will increase the cost of construction
See proposal reason statement. Changes for clarity only.

EB98-22

IEBC: 1011.5.1, 1011.5.2, 804.12, 804.12.1, 804.12.2

Proposed Change as Submitted

Proponents: John Williams, representing Committee on Healthcare (ahc@iccsafe.org)

2021 International Existing Building Code

Revise as follows:

1011.5.1 Means of egress for change to a higher-hazard category. Where a change of occupancy classification is made to a higher-hazard category (lower number) as shown in Table 1011.5, the means of egress shall comply with the requirements of Chapter 10 of the International Building Code.

Exceptions:

1. Stairways shall be enclosed in compliance with the applicable provisions of Section 903.1.
2. Existing stairways including handrails and guards complying with the requirements of Chapter 9 shall be permitted for continued use subject to approval of the *code official*.
3. Any stairway replacing an existing stairway within a space where the pitch or slope cannot be reduced because of existing construction shall not be required to comply with the maximum riser height and minimum tread depth requirements.
4. Existing corridor walls constructed on both sides of wood lath and plaster in good condition or $^1/_2$-inch-thick (12.7 mm) gypsum wallboard shall be permitted. Such walls shall either terminate at the underside of a ceiling of equivalent construction or extend to the underside of the floor or roof next above.
5. Existing corridor doorways, transoms and other corridor openings shall comply with the requirements in Sections 804.6.1, 804.6.2 and 804.6.3.
6. Existing dead-end corridors shall comply with the requirements in Section 804.7.
7. An operable window complying with Section 1011.5.6 shall be accepted as an *emergency escape and rescue opening*.
8. In Group I-1 and I-2 facilities, required guards enclosing the occupiable roof areas shall be permitted to be greater than 48 inches (1219 mm) above the surface of the occupiable roof where the occupants, because of clinical needs, require restraint or containment as part of a function of a psychiatric or cognitive treatment area.

1011.5.2 Means of egress for change of use to an equal or lower-hazard category. Where a change of occupancy classification is made to an equal or lesser-hazard category (higher number) as shown in Table 1011.5, existing elements of the means of egress shall comply with the requirements of Section 905 for the new occupancy classification. Newly constructed or configured means of egress shall comply with the requirements of Chapter 10 of the International Building Code.

~~**Exception**~~ **Exceptions:**

1. Any stairway replacing an existing stairway within a space where the pitch or slope cannot be reduced because of existing construction shall not be required to comply with the maximum riser height and minimum tread depth requirements.
2. In Group I-1 and I-2 facilities, required guards enclosing the occupiable roof areas shall be permitted to be greater than 48 inches (1219 mm) above the surface of the occupiable roof where the occupants, because of clinical needs, require restraint or containment as part of a function of a psychiatric or cognitive treatment area.

804.12 Guards. The requirements of Sections 804.12.1 and 804.12.2 shall apply to guards from the *work area* floor to, and including, the level of exit discharge but shall be confined to the egress path of any *work area*.

804.12.1 Minimum requirement. Every open portion of a stairway, landing, or balcony that is more than 30 inches (762 mm) above the floor or grade below and is not provided with guards, or those portions in which existing guards are judged to be in danger of collapsing, shall be provided with guards.

Revise as follows:

804.12.2 Design. Guards required in accordance with Section 804.12.1 shall be designed and installed in accordance with the *International Building Code*.

Exception: In Group I-1 and I-2 facilities, required guards enclosing the occupiable roof areas shall be permitted to be greater than 48 inches (1219 mm) above the surface of the occupiable roof where the occupants, because of clinical needs, require restraint or containment as part of

a function of a psychiatric or cognitive treatment area.

Reason: The intent of this proposal is to allow higher guards for patient safety around outdoor patient garden/exercise areas on the roof. The Healthcare committee understands the guard height limitation for low rise buildings was to allow for fire department access to the roof. However, we feel that the limitations proposed are reasonable.

Access to fresh air and getting outside is incredibly important for older adults who live in Group I-1&I-2 care facilities. These care recipients spend up to 90% of their time indoors and if the only choice of outdoor space requires staff or volunteers to take them downstairs, via an elevator, to get outside, some care recipients never get the opportunity to be outside. If a garden space or other outdoor area can be created on a roof adjacent to sleeping areas, this can make getting outside much easier.

Unfortunately, while we want care recipients to get outside, we also need to keep them safe. We know that exit seeking behavior is prevalent and a 48" barrier is not enough to protect from elopement or self harm.

Outdoor areas are important for patient mental health and wellness. Hospitals and nursing homes in a urban environment often don't have property that would allow for outdoor patient areas. The 'clinical needs' language is an attempt to balance care recipient wellness with safety. These types of facilities have extensive fire and safety evacuation plans and staff that is trained in assisting care recipients and guest for evacuation/defend-in-place during an emergency. Fire departments perform regular inspections of these buildings, to they would be very familiar with the layouts. In addition, these facilities have exceptionally good records for a small number of fire events.

There was a similar change in Group A, G105-21 that had an original intention of allowing for guards to exceed the height limitation required by IBC Section 503.1.4.1. The modification to broaden this allowance for "walls, parapets, rooftop structures (some of which are exempted in Exception 1), and wind screens" on roofs above the reach of fire departments (>75') was appropriate. However, there is still the issue with existing buildings that want to expand or add an occupied roof with the result being –

· If any structure or guard is above 48" high, this is now being considered an additional story so they could violate height limitations for the type of construction.

· If the building is less than 75' in height, you cannot have guards high enough to discourage people from jumping off the roof.

There is a suggestion for Sections 804.12.2, 1011.5.1 and 1011.5.2 for Group I-1 and I-2 where high guards are needed for patient safety. The language for the limitation of 'clinical needs' is the same as IBC Section 101.2.14 for Controlled Egress Doors.

Below are two pictures of a roof garden on a memory care facility. There are glass between the columns.

This proposal is submitted by the Committee on Healthcare (CHC). The CHC was established by the ICC Board to evaluate and assess contemporary code issues relating to healthcare facilities. This is a joint effort between ICC and the American Society for Healthcare Engineering (ASHE), a subsidiary of the American Hospital Association, to eliminate duplication and conflicts in healthcare regulation. In 2020 and 2021 of the committees as well as any interested parties, to discuss and debate the proposed changes. Information on the CHC, including: meeting agendas; minutes; reports; resource documents; presentations; and all other materials developed in conjunction with the CHC effort can be downloaded from the CHC website at https://www.iccsafe.org/products-and-services/i-codes/code-development/cs/icc-committee-on-healthcare/.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This is an optional allowance for certain facilities so will provide design flexibility. It will cost more if such barriers are constructed but that is an option for the building owner.

Public Hearing Results

Committee Action: **As Submitted**

Committee Reason: This proposal was approved as it is consistent with the allowance in the IBC for such guards through the occupiable roof requirements and is critical to allow the ability for such occupancies to provide a safe outdoor space for occupants. There was some concern as to how this allowance relates to the occupiable roof requirements in the IBC as approved in Group A where they are addressed within Chapter 5 versus Chapter 10 of the IBC. (Vote: 10-4)

EB98-22

Individual Consideration Agenda

Public Comment 1:

Proponents: David Renn, PE, SE, City and County of Denver, representing Code Change Committee of Colorado Chapter of ICC (david.renn@denvergov.org) requests Disapprove

Commenter's Reason: This public comment requests disapproval of this proposal for the following reasons:
1. The proposed new exceptions permit required guards enclosing occupiable roofs to be greater than 48". These are exceptions to complying with requirements of Chapter 10 of the IBC; however, Chapter 10 of the IBC (Section 1015.3) only has a minimum height for guards, so guards greater than 48" are allowed by Chapter 10. As a result, the new exceptions are for requirements that do not exist in Chapter 10 and have no impact on the code.

2. Section 503.1.4.1 for enclosures at occupied roofs has a requirement for elements or structures enclosing occupied roofs to not extend more than 48" above the roof surface and it appears this proposal is trying to address this. However, this proposal provides no relief for Chapter 5 requirements, so they still apply. Furthermore, 503.1.4.1 makes no mentions of guards, just elements or structures, so the language in the exceptions regarding "required guards" is incorrect as guards are not required to enclose occupiable roofs. If an occupiable roof extends to the edge of a roof, a guard would be required only at the edge of the roof, but not at interior edges of the occupied roof.

3. The 2021 IBC makes no similar allowance for enclosures at occupied roofs on new buildings, so it is not reasonable to give this allowance to existing buildings that undergo a change of occupancy or have alterations. A better spot to make this change is in the IBC - then, no change is needed in the IEBC when compliance with the IBC is required. Note that during testimony at the committee action hearings it was stated that a proposal was made in Group A for this, but we could not locate a proposal for this topic - and if there was, this IEBC proposal isn't needed since you could use the IBC allowances when directed to comply with the IBC.

4. This proposal only makes changes to the work area compliance method. If using the prescritive compliance method (IEBC Chapter 5) the proposed changes would not apply.

While we agree with the intent of this proposal, the language in the proposal does not give the desired outcome since it adds exceptions to IBC Chapter 10 requirements that do not exist and does not give relief to the relevant requirements in IBC Chapter 5. Please support disapproval with the hope that this change is made in the next Group A hearings for the IBC, instead of the IEBC.

Cost Impact: The net effect of the public comment and code change proposal will not increase or decrease the cost of construction
No change to code.

Public Comment# 3185

EB116-22

IEBC: APPENDIX E (New)

Proposed Change as Submitted

Proponents: Mike Nugent, representing Building Code Action Committee (bcac@iccsafe.org); John Williams, representing Committee on Healthcare (ahc@iccsafe.org); Robert Marshall, representing FCAC (fcac@iccsafe.org)

2021 International Existing Building Code

Add new text as follows:

User notes. About this appendix: The primary purpose for Appendix E is to provide guidance for designers, engineers, architects, fire and building code officials to allow temporary emergency uses of existing buildings or temporary structures with respect to the minimum code requirements. This appendix is intended to serve as that template or checklist for use during an emergency that references the relevant code requirement of concerns.

APPENDIX E
TEMPORARY EMERGENCY STRUCTURES AND EMERGENCY USES

SECTION E101
GENERAL

E101.1 Scope. The provisions of this appendix shall apply to the use, construction, installation, alteration, relocation and location of existing buildings or temporary structures and any service utilities or systems that serve such existing buildings or temporary structures during or based on the response to the emergency."

E101.1.1 Objectives. The objective of this Appendix is to provide flexibility for the code official to permit the temporary uses of existing buildings or temporary structures during an emergency to address unusual circumstances that temporarily overwhelms response capabilities of an entity while maintaining the level of safety intended by the code.

E101.1.2 Temporary use. Where temporary uses during emergencies exceed 180 days, judgement shall be used by the code official to allow for temporary uses and conditions to continue for the duration of the emergency based on the needs of the emergency. The code official is authorized to grant extensions for demonstrated cause.

SECTION E102
DEFINITIONS

Add new definition as follows:

EMERGENCY. Any event declared by local, state, or federal entities that temporarily overwhelms response capabilities, and that require the temporary suspension or modification of regulations, codes, or standards to facilitate response to such an event.

TEMPORARY STRUCTURES. That which is built, constructed or erected for a period of less than 180 days.

TEMPORARY USE. An activity or practice that is established at a designated location for a period of less than 180 days. Uses include, but are not limited to, those functional designations listed within the occupancy group descriptions in Section 302.1 of the International Building Code.

Add new text as follows:

SECTION E103
SUBMITTAL DOCUMENTS

E103.1 General. Submittal documents shall be of sufficient clarity to indicate the location, nature and extent of the work or use proposed and show in detail that it will conform to the provisions of this code and relevant laws, ordinances, rules and regulations, as determined by the code official.

SECTION E104
CONFORMANCE

E104.1 Conformance. Temporary use of existing buildings and temporary structures shall conform to the structural strength, fire safety, means of egress, accessibility, light, ventilation, and sanitary requirements of this code as necessary to provide a reasonable level of safety, health, and general welfare as determined by the code official. Tents and other membrane structures shall comply with Sections 3102 and 3103 of the *International Building Code*.

E104.2 Changes over time. As an emergency evolves, submittal documents shall be submitted to demonstrate that the temporary uses of the existing buildings or temporary structures are in compliance with the requirements of the *International Building Code.*

SECTION E105
PERMITS

E105.1 Emergency permits. In an emergency situation, where temporary structures are erected or an existing building undergoes a temporary change of use or occupancy, the *permit* application shall be submitted as soon as practicable to the *code official.* Permits shall be required in accordance with Sections 105.1.1 through 105.1.3.

105.1.1 Temporary structures, other than tents and membrane structures. Temporary structures, other than tents and other membrane structures, that occupy an area greater than 120 square feet (11.16 m^2), shall not be constructed, erected, or relocated for any purpose without obtaining a permit from the code official.

E105.1.2 Tents and membrane structures. Tents and membrane structures shall be permitted in accordance with the *International Fire Code.*

E105.1.3 Existing buildings. An existing buildings shall not repurposed for a purpose it was not designed for without obtaining a permit from the code official for the change of use or occupancy.

SECTION E106
GENERAL STANDARDS FOR EMERGENCY STRUCTURES

E106.1 Scope. The provisions of Sections E106.2 through E106.7 shall apply to all existing structure being repurposed or temporary structures constructed, erected or relocated to support the response to an emergency.

E106.2 Intent. The intent of this section is to provide a base level of safety in a structure built or repurposed for emergency use.

E106.3 Change of use or occupancy. Existing buildings used in a way that was not originally intended by occupancy class or use shall be allowed without formally changing the occupancy class. The previous occupancy class shall be restored upon the conclusion of the emergency. Where the temporary live load of the floor is more than that required by Section 1607 of the International Building Code for the original use, the area designated for the temporary live load shall be posted with placards for the approved live load.

E106.4 Fire Safety Provisions. Determination of the fire safety requirements by the code official shall be in accordance with Section E106.4.1 through E106.4.5 in order to make determinations of safe conditions rather than strict adherence to the provisions of the International Fire Code.

E106.4.1 Fire safety and evacuation plans. Fire safety and evacuation plans shall be provided in accordance with Section 403 and 404 of the *International Fire Code.* Submittal documents shall be updated where there are any physical changes to the layout of the structure.

E106.4.2 Training and practice drills. Training of staff and practice drills shall comply with Section 405 and 406 of the *International Fire Code.* Structures in place for longer than 30 days shall conduct evacuation drill in accordance with Section 405.3 of the International Fire Code based on the temporary use.

E106.4.3 Fire Protection. An evaluation shall be performed to decide on fire protection needed utilizing NFPA 550.

E106.4.4 Emergency Access. Emergency vehicle access roads shall be approved by the fire code official.

E106.4.5 Fire Watch. A fire watch in accordance with Section 403.11.1 of the *International Fire Code* shall be permitted to be provided in lieu of other fire protection systems.

E106.5 Means of Egress. Means of egress shall comply with Section 1011.5 in addition to Sections E106.5.1 through E106.5.3.

> **Exception:** In Group I-2 occupancies, in areas where corridors are used for movement of care recipients in beds, the clear width of ramps and corridors shall be not less than 48 inches (1219 mm).

E106.5.1 Exit Discharge. Exit discharge shall provide access to a public way, or to a safe dispersal area in accordance with Section 1028.5 of the *International Building Code*

E106.5.2 Means of Egress Lighting. The means of egress shall be illuminated when the space is occupied.

> **Exception:** Sleeping areas.

E106.5.3 Exit Signs. Exit signs shall be provided where the means of egress is not readily identifiable. Exit signs shall be permitted to be illuminated by the lighting provided in the structure.

E106.6 Accessibility. A facility that is constructed to be accessible shall be maintained accessible during occupancy.

E106.7 Temporary connection. The code official shall have the authority to authorize the temporary connection of the building or system to the utility, the source of energy, fuel, or power, or the water system or sewer system in accordance with Section 111. Water closets and lavatories shall

be either permanent plumbing fixtures installed within the structure, or temporary water closets or lavatories, such as chemical toilets or other means approved by the code official.

E106.7.1 Portable heating and cooling equipment. Portable heating and cooling equipment shall be used in accordance with their listing, and manufacturer's instructions.

SECTION E107
USE OF SPECIFIC STANDARDS

E107.1 Increased occupant load. Allowing for additional occupants in existing building shall comply with Section E107.1.1 through E107.1.3.

E107.1.1 Authorization. The code official is authorized to allow for an increase in the number of occupants or a change of use in a building or portion of a building during an emergency.

E107.1.2 Maintenance of the means of egress. The existing a means of egress shall be maintained.

E107.1.3 Sleeping areas. Where a space is used for sleeping purposes, the space shall be equipped with smoke alarms in accordance with Sections 907.2.6.2 and 907.2.11 if the International Fire Codeor be provided with a fire watch in accordance with Section 403.11.1 of the *International Fire Code*. Carbon monoxide detectors shall be installed in accordance with Section 915 of the *International Fire Code* where the structure uses any fossil fuel or wood burning appliances.

E107.2 Temporary healthcare facilities. Temporary health care facilities shall comply with Section E107.2.1 and E107.2.2.

E107.2.1 General. Temporary health care facilities shall be erected, maintained and operated to minimize the possibility of a fire emergency requiring the evacuation of occupants.

E107.2.2 Membrane structures under projections. Membrane structures of less than 100 square feet (9.3 m2) shall be permitted tobe placed under projections of a permanent building provided the permanent building is protected with an automatic sprinkler system installed in accordance with Section 903.3.1.1.

E107.3 Use of tiny houses or manufactured homes. Tiny houses or manufactured homes used for temporary housing shall comply with Section E107.3.1 through E107.3.5.

E107.3.1 Fire separation distances. Tiny houses or manufactured homes shall be separated by not less than 5 feet (1524 mm) between structures.

E107.3.2 Fire breaks. Tiny houses and manufactured homesshall not be located in groups of more than 20 units. Fire breaks of at least 20 feet (6096 mm) shall be provided between each group.

E107.3.3 Smoke alarms. Tiny houses and manufactured homes used for sleeping purposes shall be equipped with a smoke alarm complying with Section 907.2.11. of the *International Fire Code*. Smoke detectors are not required to be hard wired.

E107.3.4 Carbon monoxide detectors. Carbon monoxide detectors shall be installed in accordance with Section 915, where the tiny house or manufactured homes uses any fossil fuel or wood burning appliances.

E107.3.5 Structures located in a wildland urban interface zone. Tiny houses and manufactured homes that a relocated in a wildland urban interface area shall be provided with defensible space in accordance with the Section 603 of the International Wildland Urban Interface Code.

E107.4 Tents and membrane structures used as sleeping accommodations. Tents or membrane structures used as sleeping accommodations shall comply with the same requirements as tiny houses in Section E107.3.1 through E107.3.5 and Chapter 31 of the International Fire Code.

SECTION E108
REFERENCED STANDARDS

E108.1 General. See Table E108.1for standards that are referenced in various sections of this appendix. Standards are listed by the standard identification with the effective date, standard title, and the section or sections of this appendix referenced in the standard.

TABLE E108.1 REFERENCED STANDARDS

STANDARD ACRONYM	STANDARD NAME	SECTION REFERENCED HEREIN
NFPA 550-2017	Guide to the Fire Safety Concepts Tree	E106.5.3

Reason: This appendix was originally submitted to IBC as G201-21. Since this proposal extensively dealt with temporary use of existing buildings during an emergency, it was felt it was better suited to IEBC. We believe we have addressed concerns that we learned about during the testimony on the previous proposal and have addressed them in this proposal.
The intent of this appendix is to provide guidance when there are emergencies that exceed the emergencies that the community has planned for. Response must be immediate, so there is not time for the typical plan review and inspection. Existing buildings will be used for occupancies other than they were intended, and temporary structures may need to be erected or brought in to address immediate needs. Recent examples were the housing needs due to mass evacuations during the west coast fires and how hard Covid hit many community health care systems. The user note for this Appendix emphasizes that this is a guidance document for emergencies that exceed pre-planned emergency responses.

The code officials are the people with the experience and knowledge base to identify what can be done and still maintain public health and safety.

This idea is emphasized in Section E101.1.2 and the definition of emergency for this appendix, as well as the modification to the title.

The following revisions were incorporated based on the input received during the hearing:

· The user note states this is a guidance appendix. The idea is used in IFC appendix E and G.

· The title was modified for clarity.

· E101.1.2 – better code language

· Definition for emergency – better code language

· E104.1 was modified to mirror Section 3103.1. This is already permitted by the code. E104.1 has an added sentence clarify that tents and other membrane structures are required to comply with Section 3102 and 3103. These sections also incorporate Chapter 16.

· E104.2 – re-evaluation is not always dependent on additional resources – it could be people being able to return or moving to family.

· E106.1 – This change clarifies that this appendix is applicable to what is happening due to the emergency – not other construction that happens to be occurring at the same time that is not related.

· E106.3 – this modification allows for temporary uses with heavier loading – such as storage of emergency supplies in an office building – where the safe limits are addressed. The change to E104.1 and E106.3 are to address concerns raised by structural engineers about loads.

E106.5 – An exception was created to clarify that in I-2 Occupancies, corridors can be 48” wide in existing buildings. This is consistent with IEBC Section 804.3 for Level 2 Alterations.

· E107.1 – the modification removed ‘temporary waives for’. The criteria was not related to waivers.

· E107.2.2 – better code language

· E107.3 – use defined term for manufactured homes.

· E107.4 – change ‘tiny homes’ to ‘tiny houses’ for consistent terminology

· E107.5 and NFPA 1660 have been removed as they apply to previously anticipated emergencies. This appendix will only address where these plans are exceeded.

This proposal is submitted by the ICC Building Code Action Committee (BCAC), ICC Fire Code Action Committee (FCAC) and the Committee on Healthcare (CHC).

BCAC was established by the ICC Board of Directors in July 2011 to pursue opportunities to improve and enhance assigned International Codes or portions thereof. In 2020 and 2021 the BCAC has held several virtual meetings open to any interested party. In addition, there were numerous virtual Working Group meetings for the current code development cycle, which included members of the committee as well as interested parties. Related documents and reports are posted on the BCAC website at https://www.iccsafe.org/products-and-services/i-codes/code-development/cs/building-code-action-committee-bcac/.The FCAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance assigned

International Codes with regard to fire and life safety in new and existing buildings and facilities as well as the protection of life and property in wildland urban interface areas. In 2020 and 2021 the Fire-CAC held multiple virtual meetings that were open to any interested party. In addition, there were numerous virtual specific working group meetings that were also open to any interested parties, to develop, discuss and debate the proposed changes. Related documentation and reports are posted on the FCAC website at: https://www.iccsafe.org/products-and-services/i-codes/code-development/cs/fire-code-action-committee-fcac/

The CHC was established by the ICC Board to evaluate and assess contemporary code issues relating to healthcare facilities. This is a joint effort between ICC and the American Society for Healthcare Engineering (ASHE), a subsidiary of the American Hospital Association, to eliminate duplication and conflicts in healthcare regulation. In 2020 and 2021 of the committees as well as any interested parties, to discuss and debate the proposed changes. Information on the CHC, including: meeting agendas; minutes; reports; resource documents; presentations; and all other materials developed in conjunction with the CHC effort can be downloaded from the CHC website at https://www.iccsafe.org/products-and-services/i-codes/code-development/cs/icc-committee-on-healthcare/.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This appendix is intended to provide a tool to jurisdictions and is not applicable unless adopted. Currently, no formal code requirements provide guidance on how to address. This will provide a framework to make enforcement more consistent and aligned with the requirements of the ICC codes. It was not intended to make compliance more expensive but instead to provide a resource for these emergency situations. These options mirror established ICC codes sections and standards.

EB116-22

Public Hearing Results

Committee Action: **As Modified**

Committee Modification:

User notes.

About this appendix: The primary purpose for Appendix E is to provide guidance for designers, engineers, architects, fire and building code officials to allow temporary emergency uses of existing buildings ~~or temporary structures~~ with respect to the minimum code requirements. This appendix is intended to serve as that template or checklist for use during an emergency that references the relevant code requirement of concerns.

APPENDIX E
TEMPORARY ~~EMERGENCY STRUCTURES AND~~ EMERGENCY USES

E101.1 Scope. The provisions of this appendix shall apply to the use, ~~construction,~~ installation, alteration, relocation and location of existing buildings ~~or temporary structures~~ and any service utilities or systems that serve such existing buildings ~~or temporary structures~~ during or based on the response to the emergency."

E101.1.1 Objectives. The objective of this Appendix is to provide flexibility for the code official to permit the temporary uses of existing buildings ~~or temporary structures~~ during an emergency to address unusual circumstances that temporarily overwhelms response capabilities of an entity while maintaining the level of safety intended by the code.

~~TEMPORARY STRUCTURES. That which is built, constructed or erected for a period of less than 180 days.~~

E104.1 Conformance. Temporary use of existing buildings ~~and temporary structures~~ shall conform to the structural strength, fire safety, means of egress, accessibility, light, ventilation, and sanitary requirements of this code as necessary to provide a reasonable level of safety, health, and general welfare as determined by the code official. ~~Tents and other membrane structures shall comply with Sections 3102 and 3103 of the *International Building Code*.~~

E104.2 Changes over time. As an emergency evolves, submittal documents shall be submitted to demonstrate that the temporary uses of the existing buildings ~~or temporary structures~~ are in compliance with the requirements of the *International Existing Building Code*.

E105.1 Emergency permits. In an emergency situation, where ~~temporary structures are erected or~~ an existing building undergoes a temporary change of use or occupancy, the *permit* application shall be submitted as soon as practicable to the *code official*. Permits shall be required in accordance with Sections 105.1.1 through 105.1.3.

~~**105.1.1Temporary structures, other than tents and membrane structures.** Temporary structures, other than tents and other membrane structures, that occupy an area greater than 120 square feet (11.16 m^2), shall not be constructed, erected, or relocated for any purpose without obtaining a permit from the code official.~~

~~**E105.1.2Tents and membrane structures.** Tents and membrane structures shall be permitted in accordance with the *International Fire Code.*~~

E105.1.3 ~~Existing buildings~~ Change of use or occupancy. An existing building~~s~~ shall not repurposed for a purpose it was not designed for without obtaining a permit from the code official for the change of use or occupancy.

SECTION E106

GENERAL STANDARDS FOR EMERGENCY ~~STRUCTURES~~ USES

E106.1 Scope. The provisions of Sections E106.2 through E106.7 shall apply to all existing structure s being repurposed ~~or temporary~~ and to all structures ~~constructed, erected or~~ relocated to support the response to an emergency.

E106.2 Intent. The intent of this section is to provide a base level of safety in a structure ~~built or~~ repurposed for emergency use.
E106.7.1Portable heating, ~~and~~ cooling , and cooking equipment.
Portable heating, ~~and~~ cooling, and cooking equipment shall be used in accordance with Chapter 41 of the International Fire Code, their listing, and manufacturer's instructions.
E107.1.3Sleeping areas.
Where a space is used for sleeping purposes, the space shall be equipped with smoke alarms in accordance with Sections 907.2.6.2 and 907.2.11 if the International Fire Code or be provided with a fire watch in accordance with Section 403.11.1 of the *International Fire Code*. Carbon monoxide alarms ~~detectors~~ shall be installed in accordance with Section 915 of the *International Fire Code* where the structure uses any fossil fuel or wood burning appliances.
E107.3.3Smoke alarms.
Tiny houses and manufactured homes used for sleeping purposes shall be equipped with a smoke alarm complying with Section 907.2.11. of the *International Fire Code*. Smoke alarms ~~detectors~~ are not required to be hard wired.
E107.3.4Carbon monoxide alarms ~~detectors~~.
Carbon monoxide alarm ~~detectors~~ shall be installed in accordance with Section 915, where the tiny house or manufactured homes uses any fossil fuel or wood burning appliances.
~~**E107.4 Tents and membrane structures used as sleeping accommodations.** Tents or membrane structures used as sleeping accommodations shall comply with the same requirements as tiny houses in Section E107.3.1 through E107.3.5 and Chapter 31 of the International Fire Code.~~

Committee Reason: The proposal provides a solid framework for code officials to deal with emergency uses of existing buildings for uses they were not specifically approved such as what was seen during COVID. There was some concern that the term "emergency" may get used to push the limited of code compliance. There was a suggestion that the applicability of the new term CO source as approved for the IFC and IBC with regard to Section E107.1.3 be addressed as it may affect the application of this appendix. Additionally, it was suggested that Sections E101.1.1, E104.1 and E106.2 be reviewed to make more consistent addressing intent. Some clarity was requested as how the restoration to the original occupancy is intended to be addressed. Finally, it was suggested that the emergency permitting procedures in the base code and the relationship to this appendix be reviewed. The modifications address the following issues.

Temporary structures versus temporary uses. The language in the original proposal was revised to remove anything that should comply as a temporary structure in the IBC and IFC. The focus of this proposal is only on temporary emergency uses.

Alarm Terminology. The correct terminology of "alarm" versus "detector" was revised in several sections to address that "detectors" are associated with a system. Alarms are not monitored but instead, where multiple alarms are required, are simply interconnected. These revisions are found in E107.1, E107.3.3 and E107.3.4.

Cooking and heating. Proper reference to the newly created chapter dealing with temporary heating and cooking in Chapter 41 of the 2024 IFC is referenced in Section 106.2 to create proper correlation between the documents.

(Vote: 14-0)

EB116-22

Individual Consideration Agenda

Public Comment 1:

IEBC: , APPENDIX E, SECTION E101, E101.1, E101.1.1, E101.1.2, SECTION E102, SECTION 202, SECTION E103, E103.1, SECTION E104, E104.1, E104.2, SECTION E105, E105.1, E105.1.1, SECTION E106, E106.1, E106.2, E106.3, E106.4, E106.4.1, E106.4.2, E106.4.3, E106.4.4, E106.4.5, E106.5, E106.5.1, E106.5.2, E106.5.3, E106.6, E106.7, E106.7.1, SECTION E107, E107.1, E107.1.1, E107.1.2, E107.1.3, E107.2, E107.2.1, E107.2.2, E107.3, E107.3.1, E107.3.2, E107.3.3, E107.3.4, E107.3.5, SECTION E108, E108.1, TABLE E108.1

Proponents: Mike Nugent, representing Building Code Action Committee (bcac@iccsafe.org); John Williams, representing Committee on Healthcare (ahc@iccsafe.org) requests As Modified by Public Comment

Modify as follows:

2021 International Existing Building Code

User notes. About this appendix: The primary purpose for Appendix E is to provide guidance for designers, engineers, architects, fire and building code officials to allow temporary emergency uses of existing buildings with respect to the minimum code requirements. This appendix is intended to serve as that template or checklist for use during an emergency that references the relevant code requirement of concerns.

APPENDIX E
TEMPORARY EMERGENCY USES

SECTION E101
GENERAL

E101.1 Scope. The provisions of this appendix shall apply to the use, installation, alteration, relocation and location of existing buildings and any service utilities or systems that serve such existing buildings during or based on the response to the emergency."

E101.1.1 Objectives. The objective of this Appendix is to provide flexibility for the code official to permit the temporary uses of existing buildings during an emergency to address unusual circumstances that temporarily overwhelms response capabilities of an entity while maintaining the level of safety intended by the code.

E101.1.2 Temporary use. Where temporary uses during emergencies exceed 180 days, judgement shall be used by the code official to allow for temporary uses and conditions to continue for the duration of the emergency based on the needs of the emergency. The code official is authorized to grant extensions for demonstrated cause.

SECTION E102
DEFINITIONS

EMERGENCY. Any event declared by local, state, or federal entities that temporarily overwhelms response capabilities, and that require the temporary suspension or modification of regulations, codes, or standards to facilitate response to such an event.

TEMPORARY USE. An activity or practice that is established at a designated location for a period of less than 180 days. Uses include, but are not limited to, those functional designations listed within the occupancy group descriptions in Section 302.1 of the International Building Code.

SECTION E103
SUBMITTAL DOCUMENTS

E103.1 General. Submittal documents shall be of sufficient clarity to indicate the location, nature and extent of the work or use proposed and show in detail that it will conform to the provisions of this code and relevant laws, ordinances, rules and regulations, as determined by the code official.

SECTION E104
CONFORMANCE

E104.1 Conformance. Temporary use of existing buildings shall conform to the structural strength, fire safety, means of egress, accessibility, light, ventilation, and sanitary requirements of this code as necessary to provide a reasonable level of safety, health, and general welfare as determined by the code official.

E104.2 Changes over time. As an emergency evolves, submittal documents shall be submitted to demonstrate that the temporary uses of the existing buildings are in compliance with the requirements of the *International Existing Building Code*.

SECTION E105
PERMITS

E105.1 Emergency permits. In an emergency situation, where an existing building undergoes a temporary change of use or occupancy, the *permit* application shall be submitted as soon as practicable to the *code official*. ~~Permits shall be required in accordance with Sections 105.1.1 through 105.1.3.~~

~~**E105.1.1 Change of use or occupancy.** An existing building shall not be repurposed for a purpose it was not designed for without obtaining a permit from the code official for the change of use or occupancy.~~

SECTION E106
GENERAL STANDARDS FOR EMERGENCY USES

E106.1 Scope. The provisions of Sections E106.2 through E106.7 shall apply to all existing structures being repurposed and to all structures relocated to support the response to an emergency.

E106.2 Intent. The intent of this section is to provide a ~~base~~ reasonable level of safety in a structure repurposed for emergency use.

E106.3 Change of use or occupancy. Existing buildings used in a way that was not originally intended by the occupancy ~~class~~ or use shall be allowed without formally changing the occupancy ~~class~~. The previous occupancy and use ~~class~~ shall ~~be restored~~ resume upon the conclusion of the emergency. Where the temporary live load of the floor is more than that required by Section 1607 of the International Building Code for the original use, the area designated for the temporary live load shall be posted with placards for the approved live load.

E106.4 Fire Safety Provisions. Determination of the fire safety requirements by the code official shall be in accordance with Section E106.4.1 through E106.4.5 in order to make determinations of safe conditions rather than strict adherence to the provisions of the International Fire Code.

E106.4.1 Fire safety and evacuation plans. Fire safety and evacuation plans shall be provided in accordance with Section 403 and 404 of the *International Fire Code.* Submittal documents shall be updated where there are any physical changes to the layout of the structure.

E106.4.2 Training and practice drills. Training of staff and practice drills shall comply with Section 405 and 406 of the *International Fire Code.* Structures in place for longer than 30 days shall conduct evacuation drill in accordance with Section 405.3 of the International Fire Code based on the temporary use.

E106.4.3 Fire Protection. An evaluation shall be performed to decide on fire protection needed utilizing NFPA 550.

E106.4.4 Emergency Access. Emergency vehicle access roads shall be approved by the fire code official.

E106.4.5 Fire Watch. A fire watch in accordance with Section 403.11.1 of the *International Fire Code* shall be permitted to be provided in lieu of other fire protection systems.

E106.5 Means of Egress. Means of egress shall comply with Section 1011.5 in addition to Sections E106.5.1 through E106.5.3.

> **Exception:** In Group I-2 occupancies, in areas where corridors are used for movement of care recipients in beds, the clear width of ramps and corridors shall be not less than 48 inches (1219 mm).

E106.5.1 Exit Discharge. Exit discharge shall provide access to a public way, or to a safe dispersal area in accordance with Section 1028.5 of the *International Building Code*

E106.5.2 Means of Egress Lighting. The means of egress shall be illuminated when the space is occupied.

> **Exception:** Sleeping areas.

E106.5.3 Exit Signs. Exit signs shall be provided where the means of egress is not readily identifiable. Exit signs shall be permitted to be illuminated by the lighting provided in the structure.

E106.6 Accessibility. A facility that is constructed to be accessible shall be maintained accessible during occupancy.

E106.7 Temporary connection. The code official shall have the authority to authorize the temporary connection of the building or system to the utility, the source of energy, fuel, or power, or the water system or sewer system in accordance with Section 111. Water closets and lavatories shall be either permanent plumbing fixtures installed within the structure, or temporary water closets or lavatories, such as chemical toilets or other means approved by the code official.

E106.7.1 Portable heating, cooling and cooking equipment. Portable heating, cooling, and cooking equipment shall be used in accordance with ~~Chapter 41 of~~ the International Fire Code, their listing, and manufacturer's instructions.

SECTION E107
USE OF SPECIFIC STANDARDS

E107.1 Increased occupant load. Allowing for additional occupants in existing building shall comply with Section E107.1.1 through E107.1.3.

E107.1.1 Authorization. The code official is authorized to allow for an increase in the number of occupants or a change of use in a building or portion of a building during an emergency.

E107.1.2 Maintenance of the means of egress. The existing a means of egress shall be maintained.

E107.1.3 Sleeping areas. Where a space is used for sleeping purposes, the space shall be equipped with smoke alarms in accordance with Sections 907.2.6.2 and 907.2.11 if the International Fire Code or be provided with a fire watch in accordance with Section 403.11.1 of the *International Fire Code*. Carbon monoxide alarms shall be installed in accordance with Section 915 of the *International Fire Code* where the

structure uses any fossil fuel or wood burning appliances.

E107.2 Temporary healthcare facilities. Temporary health care facilities shall comply with Section E107.2.1 and E107.2.2.

E107.2.1 General. Temporary health care facilities shall be erected, maintained and operated to minimize the possibility of a fire emergency requiring the evacuation of occupants.

E107.2.2 Membrane structures under projections. Membrane structures of less than 100 square feet (9.3 m2) shall be permitted tobe placed under projections of a permanent building provided the permanent building is protected with an automatic sprinkler system installed in accordance with Section 903.3.1.1.

E107.3 Use of tiny houses or manufactured homes. Tiny houses or manufactured homes used for temporary housing shall comply with Section E107.3.1 through E107.3.5.

E107.3.1 Fire separation distances. Tiny houses or manufactured homes shall be separated by not less than 5 feet (1524 mm) between structures.

E107.3.2 Fire breaks. Tiny houses and manufactured homesshall not be located in groups of more than 20 units. Fire breaks of at least 20 feet (6096 mm) shall be provided between each group.

E107.3.3 Smoke alarms. Tiny houses and manufactured homes used for sleeping purposes shall be equipped with a smoke alarm complying with Section 907.2.11. of the *International Fire Code*. Smoke alarms are not required to be hard wired.

E107.3.4 Carbon monoxide alarms. Carbon monoxide alarms shall be installed in accordance with Section 915, where the tiny house or manufactured homes uses any fossil fuel or wood burning appliances.

E107.3.5 Structures located in a wildland urban interface zone. Tiny houses and manufactured homes that a relocated in a wildland urban interface area shall be provided with defensible space in accordance with the Section 603 of the International Wildland Urban Interface Code.

SECTION E108
REFERENCED STANDARDS

E108.1 General. See Table E108.1for standards that are referenced in various sections of this appendix. Standards are listed by the standard identification with the effective date, standard title, and the section or sections of this appendix referenced in the standard.

TABLE E108.1 REFERENCED STANDARDS

STANDARD ACRONYM	STANDARD NAME	SECTION REFERENCED HEREIN
NFPA 550-2017	Guide to the Fire Safety Concepts Tree	E106.5.3

Commenter's Reason: This proposal was supported overall, however there were suggestions from the committee and proponents that BCAC wishes to address.
The complete proposal is shown in the public comment so that everyone can see the modified proposal in total.

E105.1 and E105.1.1 - There was a floor modification to delete the references to tents and membrane structures. This floor modification deleted two of the three items in Section 105.1. Therefore, the reference to the three subsections needs to be deleted. The text in E105.1.1 is not needed, because a planned change of occupancy is currently addressed in the IEBC.

There was a suggestion to revise this section to be consistent with IEBC Section 105.2.1, however, since how fast someone could be prepared to submit a permit, or the building department ready to operate as usual depends a great deal on the extent of the emergency. Therefore, 'as soon as practicable' is a reasonable allowance.

E106.2 - A committee member suggested that Sections E104.1 and E106.2 use the same terminology for safety, thus the modification proposed to E106.2.E106.3 - The requirements allow for a temporary change of occupancy or use - 'class' is not a term used in the code, so it has been deleted.

E106.7.1 - The new IFC Chapter 41 (F188-21 AS) deals with temporary heating and cooking, but not cooling. Therefore a general reference to the IFC is more appropriate than a specific reference to Chapter 41.

There was a suggestion that the definition of 'emergency' was too broad. However, this is an appendix intended for guidance. Therefore, BCAC felt that this definition should be open to address any emergency that the community faces. No one thought we would ever have to deal with such large wildfires or Covid over the last couple of years. We do not know what we will face.

Cost Impact: The net effect of the public comment and code change proposal will not increase or decrease the cost of construction
This appendix is intended to provide a tool to jurisdictions and is not applicable unless adopted. Currently, no formal code requirements provide guidance on how to address. This will provide a framework to make enforcement more consistent and aligned with the requirements of the ICC codes. It was not intended to make compliance more expensive but instead to provide a resource for these emergency situations. These options mirror established ICC codes sections and standards.

Public Comment# 3043

S74-22

IBC: TABLE 1604.5

Proposed Change as Submitted

Proponents: David Bonowitz, representing FEMA-ATC Seismic Code Support Committee (dbonowitz@att.net); Kelly Cobeen, representing Federal Emergency Management Agency/Applied Technology Council - Seismic Code Support Committee (kcobeen@wje.com); Michael Mahoney, representing FEMA (mike.mahoney@fema.dhs.gov)

2021 International Building Code

Revise as follows:

TABLE 1604.5 RISK CATEGORY OF BUILDINGS AND OTHER STRUCTURES

RISK CATEGORY	NATURE OF OCCUPANCY
I	Buildings and other structures that represent a low hazard to human life in the event of failure, including but not limited to: Agricultural facilities. Certain temporary facilities. Minor storage facilities.
II	Buildings and other structures except those listed in Risk Categories I, III and IV.
III	Buildings and other structures that represent a substantial hazard to human life in the event of failure, including but not limited to: Buildings and other structures whose primary occupancy is public assembly with an occupant load greater than 300. Buildings and other structures containing one or more public assembly spaces, each having an occupant load greater than 300 and a cumulative occupant load of these public assembly spaces of greater than 2,500. Buildings and other structures containing Group E or Group I-4 occupancies or combination therof, with an occupant load greater than 250. Buildings and other structures containing educational occupancies for students above the 12th grade with an occupant load greater than 500. ~~Group I-2, Condition 1 occupancies with 50 or more care recipients.~~ ~~Group I-2, Condition 2 occupancies not having emergency surgery or emergency treatment facilities.~~ Group I-3 occupancies. Any other occupancy with an occupant load greater than 5,000.[a] Power-generating stations, water treatment facilities for potable water, wastewater treatment facilities and other public utility facilities not included in Risk Category IV. Buildings and other structures not included in Risk Category IV containing quantities of toxic or explosive materials that: Exceed maximum allowable quantities per control area as given in Table 307.1(1) or 307.1(2) or per outdoor control area in accordance with the *International Fire Code* ; and Are sufficient to pose a threat to the public if released.[b]
IV	Buildings and other structures designated as essential facilities <u>and buildings where loss of function represents a substantial hazard to occupants</u>, including but not limited to: Group I-2 <u>occupancies</u>~~, Condition 2 occupancies having emergency surgery or emergency treatment facilities.~~ Ambulatory care facilities having emergency surgery or emergency treatment facilities. Fire, rescue, ambulance and police stations and emergency vehicle garages Designated earthquake, hurricane or other emergency shelters. Designated emergency preparedness, communications and operations centers and other facilities required for emergency response. Power-generating stations and other public utility facilities required as emergency backup facilities for *Risk Category* IV structures. Buildings and other structures containing quantities of highly toxic materials that: Exceed maximum allowable quantities per control area as given in Table 307.1(2) or per outdoor control area in accordance with the *International Fire Code* ; and Are sufficient to pose a threat to the public if released.[b]

	Aviation control towers, air traffic control centers and emergency aircraft hangars. Buildings and other structures having critical national defense functions. Water storage facilities and pump structures required to maintain water pressure for fire suppression.

a. For purposes of occupant load calculation, occupancies required by Table 1004.5 to use gross floor area calculations shall be permitted to use net floor areas to determine the total occupant load.

b. Where approved by the building official, the classification of buildings and other structures as Risk Category III or IV based on their quantities of toxic, highly toxic or explosive materials is permitted to be reduced to Risk Category II, provided that it can be demonstrated by a hazard assessment in accordance with Section 1.5.3 of ASCE 7 that a release of the toxic, highly toxic or explosive materials is not sufficient to pose a threat to the public.

Reason: This proposal improves consistency in the assignment of risk categories. It applies current thinking from IBC Chapters 3 and 4 to the risk category assignments in Table 1604.5. The logic of the proposal is as follows:

1. **Risk Category IV is the IBC's main tool to provide functional facilities** soon after a natural hazard event (earthquake, flood, snow, or wind). In terms of post-event functionality, there is a wide gap between RC II-III facilities (which have identical requirements for nonstructural systems) and RC IV facilities. The difference in expected recovery time can be on the order of weeks or months.
2. The performance gap between RC II-III and RC IV is most acute for occupancies that depend on functional nonstructural systems and special design provisions to serve vulnerable users.
3. Because these facilities are rare and specially designed, their services and occupants cannot be quickly relocated to other buildings.
4. Therefore, facilities with special design features and vulnerable users should be strong candidates for Risk Category IV.

Following this logic, this proposal expands the scope of RC IV from just "essential facilities" to include "buildings where loss of function represents a substantial hazard." **This "substantial hazard" can even be life threatening** where, for example, a 24-hour medical facility, residential care facility, public water or power utility, detention center with impeded egress, or critical supply chain facility is out of service for weeks. The code defines *essential facilities* as those that need to "remain operational" through and after an "extreme" earthquake, flood, wind, or snow event. The additional facilities described by the logic above and considered in this proposal might not require continuous operation, but **prolonged downtime – which can be expected from RC II design criteria – can give rise to a similar risk for vulnerable users**, if not on Day 1 after the event, then possibly by Day 3, 10, or 30.

This proposal addresses *medical care* facilities assigned to Group I-2. Many design professionals assume all hospitals, typically assigned to Group I-2, are already assigned to RC IV, but that is only true for facilities that provide emergency surgery or emergency treatment. (Even "in-patient stabilization," which is part of what defines Group I-2 Condition 2, does not currently qualify for RC IV.) Many Group I-2 facilities, which include hospitals, nursing homes, and detoxification facilities, are assigned to RC II or RC III, even though they provide **24-hour *medical care*** for patients who are ***incapable of self-preservation***, and even though they are already required to meet special design requirements for corridors, egress plans, etc. in Section 407. Under the current code, Group I-2 facilities with fewer than 50 patients are not even assigned to RC III.

Because of the specialized nature of the care provided, the vulnerability of the patients, and the special design features, none of which would be available in typical RC II buildings, no Group I-2 facility designed under the current code could reasonably be expected to provide or relocate its normal services in a timely fashion after a design-level storm or earthquake. Therefore, this proposal reassigns all Group I-2 facilities to RC IV.

Despite this reassignment, this proposal is measured in its scope. **It does NOT affect:**

- Medical care facilities for 5 or fewer residents. Per Section 308.3, Group I-2 applies only to larger facilities.
- Any *medical care* facility eligible for design under the IRC.
- Outpatient or *ambulatory care facilities* (even those subject to Section 422), including "urgent care" businesses, dialysis centers, dentists, optometrists, or similar clinics; these are typically Group B. (Ambulatory care facilities with emergency surgery or emergency treatment facilities are already assigned to RC IV.)
- Pharmacies or drug stores, typically Group M.
- Medical office buildings, typically Group B.Medical supply or equipment manufacturers, warehouses, or stores.**This proposal is consistent with current IBC principles.** This proposal extends the current scope of Risk Category IV, but it does so consistent with the purpose, philosophy, and normative goals the IBC already represents.

Even if you think of the IBC as strictly a "life safety" code, safety is more than mere survival, and safety can be at risk even after the rain, snow, or ground shaking has stopped. If building damage affects the safety of vulnerable users in the following days or weeks, it is consistent with even a safety-based code to manage those risks through design.

But the IBC's purpose is broader than just "life safety." Section 101.3 states that the purpose of the IBC is to provide a "reasonable level of safety, **health and general welfare**." So a focus on the health and welfare of vulnerable building users, even where their building provides immediate safety, is both "reasonable" and completely consistent with the purpose of the code.

With its definition of *essential facilities* and its use of Risk Category IV to ensure they "remain operational," the IBC is already more than a safety code. It is, in fact, already a basic "functional recovery" code; the only question is which building uses, and users, we decide should qualify for a designed recovery. Where RC II or RC III is not reliable enough, it is consistent with the purpose and scope of the IBC to assign more building uses to RC IV.

Not all of the IBC's tools are perfectly nuanced. Some involve bright lines and broad categories, and it is sometimes necessary to err on the conservative side. So even if a certain use is not quite as "essential" as a fire station, RC IV might still be a more appropriate choice than RC II or RC III, and in these cases, it is consistent with the code to assign buildings to the higher category. In time, design criteria should evolve to address more specific recovery objectives (FEMA, 2020; FEMA-NIST, 2021). But those nuanced provisions are *at least* a decade away. For now, however, RC IV is the most appropriate tool we have, and we ought to use it. Adapting existing practices to new objectives is entirely consistent with the history of code development.

IBC Chapters 3 and 4 define and provide special requirements to manage fire and egress risks for particular groups of users. Table 1604.5 is meant to do the same for rare natural hazard events. But while Chapters 3 and 4 consider dozens of specific building uses and conditions, Table 1604.5 has only four categories. Changing the scope of Risk Category IV to account for specific building uses that are not adequately served by RC II or RC III criteria is consistent with the detailed, use-specific approach of Chapters 3 and 4.

Table 1604.5 represents public policy about what we desire from our buildings. As such, it has changed over time, along with public expectations. As we consider new or increasing risks related to more frequent natural hazard events, urbanization, the pandemic, or aging populations, it is both appropriate and consistent with past practice for Table 1604.5 to evolve as well.

Bibliography: Almufti, I. et al. (2016). "The resilience-based design of 181 Fremont Tower," *Structure*, June.
Bade, M. (2014). "Mission Bay Block 25 Building – An Exercise in Lean Target Value Design," Presentation to the Lean Construction Institute, Finland, April 12.

Berkowitz, R. (2021). "UCSF Center for Vision Neuroscience," 2021 EERI Annual Meeting, Session 3B, March 24.

CISA, 2020. "Guidance on the Essential Critical Infrastructure Workforce: Ensuring Community and National Resilience in COVID-19 Response (Version 2.0)." U.S. Department of Homeland Security, Cybersecurity & Infrastructure Security Agency, March 28.

FEMA (2020b). *NEHRP Recommended Seismic Provisions for New Buildings and Other Structures, Volume II: Part 3 Resource Papers*, 2020 Edition, FEMA P-2082-2, prepared by the Building Seismic Safety Council of the National Institute of Buildings Sciences for Federal Emergency Management Agency, September.

FEMA-NIST (2021). *Recommended Options for Improving the Built Environment for Post-Earthquake Reoccupancy and Functional Recovery Time*, FEMA P-2090 / NIST SP-1254, Federal Emergency Management Agency and National Institute of Standards and Technology, January.

Mar, D. (2021). "Making Resilience Affordable," 2021 EERI Annual Meeting, Session 3B, March 24.

SEFT Consulting Group (2015). "Beaverton School District Resilience Planning for High School at South Cooper Mountain and Middle School at Timberland," SEFT Consulting Group, July 10.

SFDPH, 2020. "Order of the Health Officer No. C19-07b." City and County of San Francisco, Department of Public Health, March 31, et seq.

Cost Impact: The code change proposal will increase the cost of construction
This proposal will increase the cost of construction for the buildings newly assigned to RC IV. The largest increases will likely be in high seismic areas where assignment to RC IV makes the largest changes to structural and nonstructural design criteria. This does not mean, however, that every RC IV facility will have the same unit cost as a new state-of-the-art hospital. On the contrary, case studies of voluntary RC IV-like seismic design have found a **construction cost premium ranging typically from 0% to 2%** relative to normal RC II designs. (See proposal references by Almufti, Bade, Berkowitz, Mar, and SEFT.) This estimate stands to reason: Wind, snow, and earthquake loads can already vary significantly within a jurisdiction, but the building designs and unit costs don't change wildly from one side of the county to the other. For example, the seismic design force in Berkeley is about 1.5 times that in downtown San Francisco; so with respect to the structure, any nursing home or grocery store you can build as RC II in Berkeley you can also build as RC IV in San Francisco with no change to the design. The same is likely true for snow design, for example, in Vail v. Boulder and for wind design in Galveston v. the west side of Houston. On the nonstructural side, a facility's nonstructural systems might need more bracing or support when assigned to RC IV, but the number and size of the components themselves don't suddenly look like a hospital just because the risk category has changed.

Public Hearing Results

Committee Action: **As Submitted**

Committee Reason: Approved as submitted as the proposal fills a need for Group I-2 facilities for those who are incapable of self-preservation. The committee expressed concerns on how the proposal may affect smaller facilities. (Vote: 8-6)

S74-22

Individual Consideration Agenda

Public Comment 1:

IBC: TABLE 1604.5

Proponents: David Bonowitz, representing FEMA-ATC Seismic Code Support Committee (dbonowitz@att.net); Kelly Cobeen, representing Federal Emergency Management Agency/Applied Technology Council - Seismic Code Support Committee (kcobeen@wje.com); Michael Mahoney, representing FEMA (mike.mahoney@fema.dhs.gov) requests As Modified by Public Comment

Modify as follows:

2021 International Building Code

TABLE 1604.5 RISK CATEGORY OF BUILDINGS AND OTHER STRUCTURES

RISK CATEGORY	NATURE OF OCCUPANCY
I	Buildings and other structures that represent a low hazard to human life in the event of failure, including but not limited to: Agricultural facilities. Certain temporary facilities. Minor storage facilities.
II	Buildings and other structures except those listed in Risk Categories I, III and IV.
III	Buildings and other structures that represent a substantial hazard to human life in the event of failure, including but not limited to: Buildings and other structures whose primary occupancy is public assembly with an occupant load greater than 300. Buildings and other structures containing one or more public assembly spaces, each having an occupant load greater than 300 and a cumulative occupant load of these public assembly spaces of greater than 2,500. Buildings and other structures containing Group E or Group I-4 occupancies or combination therof, with an occupant load greater than 250. Buildings and other structures containing educational occupancies for students above the 12th grade with an occupant load greater than 500. Group I-3 occupancies. Any other occupancy with an occupant load greater than 5,000.[a] Power-generating stations, water treatment facilities for potable water, wastewater treatment facilities and other public utility facilities not included in Risk Category IV. Buildings and other structures not included in Risk Category IV containing quantities of toxic or explosive materials that: Exceed maximum allowable quantities per control area as given in Table 307.1(1) or 307.1(2) or per outdoor control area in accordance with the *International Fire Code* ; and Are sufficient to pose a threat to the public if released.[b]
IV	Buildings and other structures designated as essential facilities and buildings where loss of function represents a substantial hazard to occupants, including but not limited to: <u>Group I-2, Condition 1 occupancies with 17 or more care recipients.</u> Group I-2<u>, Condition 2</u> occupancies. Ambulatory care facilities having emergency surgery or emergency treatment facilities. Fire, rescue, ambulance and police stations and emergency vehicle garages Designated earthquake, hurricane or other emergency shelters. Designated emergency preparedness, communications and operations centers and other facilities required for emergency response. Power-generating stations and other public utility facilities required as emergency backup facilities for *Risk Category* IV structures. Buildings and other structures containing quantities of highly toxic materials that: Exceed maximum allowable quantities per control area as given in Table 307.1(2) or per outdoor control area in accordance with the *International Fire Code* ; and Are sufficient to pose a threat to the public if released.[b] Aviation control towers, air traffic control centers and emergency aircraft hangars.

	Buildings and other structures having critical national defense functions. Water storage facilities and pump structures required to maintain water pressure for fire suppression.

a. For purposes of occupant load calculation, occupancies required by Table 1004.5 to use gross floor area calculations shall be permitted to use net floor areas to determine the total occupant load.

b. Where approved by the building official, the classification of buildings and other structures as Risk Category III or IV based on their quantities of toxic, highly toxic or explosive materials is permitted to be reduced to Risk Category II, provided that it can be demonstrated by a hazard assessment in accordance with Section 1.5.3 of ASCE 7 that a release of the toxic, highly toxic or explosive materials is not sufficient to pose a threat to the public.

Commenter's Reason: This comment acknowledges and responds to the committee's reason statement regarding concerns that proposal S74 could inhibit development of small facilities. It effectively undoes the effect of S74 for relatively small facilities assigned to the less critical and less specialized Condition 1.
Three notes for reference:

- By definition (IBC Sec 308.3), ALL Group I-2 occupancies, of ANY size, provide *24-hour medical care* to patients *incapable of self-preservation*, and all are subject to special design requirements for corridors, egress, smoke barriers, cooking facilities, etc. per Section 407.
- The difference between Group I-2 Condition 1 and Condition 2 is that Condition 1 facilities do NOT support emergency care, surgery, obstetrics, or in-patient stabilization, while Condition 2 facilities CAN support those uses.
- Facilities with up to 5 patients, even if they provide identical care, are assigned to Group R-3, not Group I-2, so these small facilities are not affected by proposal S74, with or without this public comment.

As proponents, we believe that the general nature of Group I-2 -- 24-hour medical care for highly vulnerable patients -- justifies assignment to Risk Category IV. The Structural Committee, by an admittedly narrow margin, agreed. Nevertheless, to accommodate the concern for small facilities, this comment would relax the approved requirement for Condition 1 facilities with up to 16 care recipients.

Why just Condition 1? Because Table 1604.5 already makes this distinction, allowing lower criteria based on the number of patients only for Condition 1. Further, the nature of Condition 2 already indicates a much higher construction budget (and building valuation) than Condition 1, so the effect of S74 should be be proportionally smaller for Condition 2 facilities of the same size.

Why "17 or more"? That might seem like an unusual number, but it follows a precedent set by the definition of Group I-1 (Section 308.2). The current code sets higher criteria for Condition 1 facilities with "50 or more" patients, but from our perspective, a Group I-2 facility with 30, 40, or more vulnerable patients is not a "small" facility whose construction would be inhibited by S74. Consistent with our persuasive testimony at the code action hearings, a facility with no more than 16 patients will be far more feasible to evacuate and relocate when the building is shut down for weeks of repair after a design event than one with up to 49 patients.

Cost Impact: The net effect of the public comment and code change proposal will increase the cost of construction
The expected cost increase will be SMALLER with this public comment, since certain Condition 1 facilities would no longer be affected.

Public Comment# 3153

Public Comment 2:

Proponents: Heidi Tremayne, representing Earthquake Engineering Research Institute (heidi@eeri.org) requests As Submitted

Commenter's Reason: I would like to express **SUPPORT** for the code change proposal S74-22 on behalf of the Earthquake Engineering Research Institute (EERI). This proposal exemplifies EERI's vision by recommending a clear and important action to improve the International Building Code. Once adopted, this code change will improve the seismic performance of new medical care facilities assigned to Occupancy Group I-2, in alignment with recommendations from EERI's published policy statements. Thank you for considering EERI's position on this important code issue.
EERI's formal letter of support can be downloaded at: https://www.cdpaccess.com/public-comment/3341/27368/files/download/3611/EERI-SUPPORT-for-ICC-Code-Change-Proposal-S74-22-final-2022-06-17.pdf

Cost Impact: The net effect of the public comment and code change proposal will increase the cost of construction
Same as original proposal.

Public Comment# 3341

Public Comment 3:

Proponents: John Williams, representing Committee on Healthcare (ahc@iccsafe.org) requests Disapprove

Commenter's Reason: This proposal has three serious problems.
The added language in the description for Risk Category IV could be read that any of the current occupancies in this list could sustain loss of function as long as that damage did not represent a substantial hazard to the occupants. These are a list of essential facilities that must be operational after an event for the safety and recovery of the entire community. Hospitals that have emergency surgery or emergency treatment facilities need to be operational after an emergency. There could be a lot of damage to the building that would not be a substantial hazard to occupants, but would stop the emergency room from functioning.

If you relocate all nursing homes and hospitals to Risk Category IV with the beginning language - how would you determine what would be a 'substantial hazard' to the occupants. Would this require protection for power and water supplies? What if the windows break? Is that a hazard in the summer or winter? That depends on the season and where in the country you are located. This language will not be uniformly understood or enforced.

This language would move all nursing homes and hospitals to Risk Category IV. Currently nursing homes with between 6 and 50 occupants currently can be Risk Category II; and nursing homes with more than 50 occupants and hospitals without emergency surgery or emergency treatment could be Risk Category III. Yes, this is a vulnerable population. However, there has been no history of issues with these facilities that justifies this increase in design for higher winds, seismic and snow loads for all such facilities. Hospitals and nursing homes already include additional safety features for residents and have a high level of oversite. It the the concern is to remain operational as expressed in the proponents reasons, there are many emergency planning options that can address this outside of a substantial increase in building construction (add cost). These facilities have staff trained in emergency care and operations. If a building has damage, the residents can be relocated to other parts of the building or to another facility. Such facilities typically have emergency generators. Operational plans for emergencies can address early evacuation plans; potable water supplies; etc.

Cost Impact: The net effect of the public comment and code change proposal will not increase or decrease the cost of construction
No change to code.

Public Comment# 3056

S75-22

IBC: TABLE 1604.5

Proposed Change as Submitted

Proponents: David Bonowitz, representing FEMA-ATC Seismic Code Support Committee (dbonowitz@att.net); Kelly Cobeen, representing Federal Emergency Management Agency/Applied Technology Council - Seismic Code Support Committee (kcobeen@wje.com); Michael Mahoney, representing FEMA (mike.mahoney@fema.dhs.gov)

2021 International Building Code

Revise as follows:

TABLE 1604.5 RISK CATEGORY OF BUILDINGS AND OTHER STRUCTURES

RISK CATEGORY	NATURE OF OCCUPANCY
I	Buildings and other structures that represent a low hazard to human life in the event of failure, including but not limited to: Agricultural facilities. Certain temporary facilities. Minor storage facilities.
II	Buildings and other structures except those listed in Risk Categories I, III and IV.
III	Buildings and other structures that represent a substantial hazard to human life in the event of failure, including but not limited to: Buildings and other structures whose primary occupancy is public assembly with an occupant load greater than 300. Buildings and other structures containing one or more public assembly spaces, each having an occupant load greater than 300 and a cumulative occupant load of these public assembly spaces of greater than 2,500. Buildings and other structures containing Group E or Group I-4 occupancies or combination therof, with an occupant load greater than 250. Buildings and other structures containing educational occupancies for students above the 12th grade with an occupant load greater than 500. Group I-2, Condition 1 occupancies with 50 or more care recipients. Group I-2, Condition 2 occupancies not having emergency surgery or emergency treatment facilities. Group I-3<u>, Condition 1</u> occupancies. Any other occupancy with an occupant load greater than 5,000.[a] Power-generating stations, water treatment facilities for potable water, wastewater treatment facilities and other public utility facilities not included in Risk Category IV. Buildings and other structures not included in Risk Category IV containing quantities of toxic or explosive materials that: Exceed maximum allowable quantities per control area as given in Table 307.1(1) or 307.1(2) or per outdoor control area in accordance with the *International Fire Code* ; and Are sufficient to pose a threat to the public if released.[b]
IV	Buildings and other structures designated as essential facilities <u>and buildings where loss of function represents a substantial hazard to occupants</u>, including but not limited to: Group I-2, Condition 2 occupancies having emergency surgery or emergency treatment facilities. Ambulatory care facilities having emergency surgery or emergency treatment facilities. <u>Group I-3 occupancies other than Condition 1.</u> Fire, rescue, ambulance and police stations and emergency vehicle garages Designated earthquake, hurricane or other emergency shelters. Designated emergency preparedness, communications and operations centers and other facilities required for emergency response. Power-generating stations and other public utility facilities required as emergency backup facilities for *Risk Category* IV structures. Buildings and other structures containing quantities of highly toxic materials that: Exceed maximum allowable quantities per control area as given in Table 307.1(2) or per outdoor control area in accordance with the *International Fire Code* ; and

	Are sufficient to pose a threat to the public if released.[b] Aviation control towers, air traffic control centers and emergency aircraft hangars. Buildings and other structures having critical national defense functions. Water storage facilities and pump structures required to maintain water pressure for fire suppression.

a. For purposes of occupant load calculation, occupancies required by Table 1004.5 to use gross floor area calculations shall be permitted to use net floor areas to determine the total occupant load.

b. Where approved by the building official, the classification of buildings and other structures as Risk Category III or IV based on their quantities of toxic, highly toxic or explosive materials is permitted to be reduced to Risk Category II, provided that it can be demonstrated by a hazard assessment in accordance with Section 1.5.3 of ASCE 7 that a release of the toxic, highly toxic or explosive materials is not sufficient to pose a threat to the public.

Reason: This proposal improves consistency in the assignment of risk categories. It applies current thinking from IBC Chapters 3 and 4 to the risk category assignments in Table 1604.5. The logic of the proposal is as follows:

1. **Risk Category IV is the IBC's main tool to provide functional facilities** soon after a natural hazard event (earthquake, flood, snow, or wind). In terms of post-event functionality, there is a wide gap between RC II-III facilities (which have identical requirements for nonstructural systems) and RC IV facilities. The difference in expected recovery time can be on the order of weeks or months.
2. The performance gap between RC II-III and RC IV is most acute for occupancies that depend on functional nonstructural systems and special design provisions to serve vulnerable users.
3. Because these facilities are rare and specially designed, their services and occupants cannot be quickly relocated to other buildings.
4. Therefore, facilities with special design features and vulnerable users should be strong candidates for Risk Category IV.

Following this logic, this proposal expands the scope of RC IV from just "essential facilities" to include "buildings where loss of function represents a substantial hazard." **This "substantial hazard" can even be life threatening** where, for example, a 24-hour medical facility, residential care facility, public water or power utility, detention center with impeded egress, or critical supply chain facility is out of service for weeks. The code defines *essential facilities* as those that need to "remain operational" through and after an "extreme" earthquake, flood, wind, or snow event. The additional facilities described by the logic above and considered in this proposal might not require continuous operation, but **prolonged downtime – which can be expected from RC II design criteria – can give rise to a similar risk for vulnerable users**, if not on Day 1 after the event, then possibly by Day 3, 10, or 30.

This proposal addresses detention facilities with special security needs, where occupants depend on facility staff for safety and habitability. Group I-3 buildings, currently assigned to RC III, include jails, prisons, and similar facilities in which six or more people are held **"under restraint [and] generally *incapable of self-preservation*."** Group I-3 facilities are also subject to special design requirements in Section 408 for means of egress, fire safety, guard stations, glazing, door mechanisms, etc., making them **essentially unique within a community**. This proposal represents the best way to use current code tools to ensure that a new detention facility will actually be available to serve the community in the days and weeks after a major storm or earthquake.

Existing jails and prisons have a record of life-threatening failures after recent hurricanes (Omorogieva, 2018). So do other old buildings, but the risk to restrained occupants is obviously higher – so much so that it can violate constitutional rights and impose liability on local governments (Jones v. San Francisco, 1997; Omorogieva, 2018). Even if the structure remains safe from collapse – the objective of both RC II and RC III – the loss of power and damage to MEP, communications, and security systems can leave the facility non-functional and, for restrained occupants, uninhabitable to the point of violation (Jones v. San Francisco, 1997). The concern has prompted a current bill in the U.S. Senate seeking information on the preparedness and damage costs in federal correctional facilities after major disasters (S.4748, 2020). The IBC should ensure that new jails and prisons are not adding to the problem.

RC III design provisions for nonstructural systems are the same as for RC II. Most jails and prisons do have emergency plans, and IBC Section 408.4.2 does require emergency power for certain doors and locks. But those strategies are focused on short-term outages or emergency response; they typically do not consider the effects of a long-term outage due to inevitable storm or earthquake damage. Many emergency plans assume feasible evacuation. But pre-event evacuation is only possible for trackable storms, not for earthquakes. Evacuation also comes with high costs and security concerns, requires a facility to evacuate to, and makes no provision for return to a damaged building. Better design can, and should, help solve this problem.

This proposal reassigns four of the five Conditions under Group I-3 to RC IV. Except for Condition 1, which this proposal leaves in RC III, all Group I-3 facilities have **egress and free movement impeded by locks**, rendering the occupants incapable of self-preservation. Because of this restraint, the uniqueness of Group I-3 facilities, and the implications of long repair times, Risk Category IV is appropriate.

Despite this reassignment, this proposal is measured in its scope. **It does NOT affect:**

- Group I-3, Condition 1. These facilities do allow free movement for occupants and are even eligible for design as residential occupancies. (One might argue that these do not even need to be assigned to RC III, but a change to RC II is outside the scope of this proposal.)
- Facilities with fewer than 6 people under restraint. Per Section 308.4, Group I-3 applies only to larger facilities. This would exempt typical holding cells in small court facilities.
- Halfway houses assigned to Group I-1 or R-4. (The difference between "halfway houses," listed in Sections 308.2 and 310.5, and "prerelease centers," listed in Section 308.4, is unclear.)

This proposal is consistent with current IBC principles. This proposal extends the current scope of Risk Category IV, but it does so consistent with the purpose, philosophy, and normative goals the IBC already represents.

Even if you think of the IBC as strictly a "life safety" code, safety is more than mere survival, and safety can be at risk even after the rain, snow, or ground shaking has stopped. If building damage affects the safety of vulnerable users in the following days or weeks, it is consistent with even a safety-based code to manage those risks through design.

But the IBC's purpose is broader than just "life safety." Section 101.3 states that the purpose of the IBC is to provide a "reasonable level of safety, **health and general welfare**." So a focus on the health and welfare of vulnerable building users, even where their building provides immediate safety, is both "reasonable" and completely consistent with the purpose of the code.

With its definition of *essential facilities* and its use of Risk Category IV to ensure they "remain operational," the IBC is already more than a safety code. It is, in fact, already a basic "functional recovery" code; the only question is which building uses, and users, we decide should qualify for a designed recovery. Where RC II or RC III is not reliable enough, it is consistent with the purpose and scope of the IBC to assign more building uses to RC IV.

Not all of the IBC's tools are perfectly nuanced. Some involve bright lines and broad categories, and it is sometimes necessary to err on the conservative side. So even if a certain use is not quite as "essential" as a fire station, RC IV might still be a more appropriate choice than RC II or RC III, and in these cases, it is consistent with the code to assign buildings to the higher category. In time, design criteria should evolve to address more specific recovery objectives (FEMA, 2020; FEMA-NIST, 2021). But those nuanced provisions are *at least* a decade away. For now, however, RC IV is the most appropriate tool we have, and we ought to use it. Adapting existing practices to new objectives is entirely consistent with the history of code development.

IBC Chapters 3 and 4 define and provide special requirements to manage fire and egress risks for particular groups of users. Table 1604.5 is meant to do the same for rare natural hazard events. But while Chapters 3 and 4 consider dozens of specific building uses and conditions, Table 1604.5 has only four categories. Changing the scope of Risk Category IV to account for specific building uses that are not adequately served by RC II or RC III criteria is consistent with the detailed, use-specific approach of Chapters 3 and 4.

Table 1604.5 represents public policy about what we desire from our buildings. As such, it has changed over time, along with public expectations. As we consider new or increasing risks related to more frequent natural hazard events, urbanization, the pandemic, or aging populations, it is both appropriate and consistent with past practice for Table 1604.5 to evolve as well.

Bibliography:
Almufti, I. et al. (2016). "The resilience-based design of 181 Fremont Tower," *Structure*, June.
Bade, M. (2014). "Mission Bay Block 25 Building – An Exercise in Lean Target Value Design," Presentation to the Lean Construction Institute, Finland, April 12.

Berkowitz, R. (2021). "UCSF Center for Vision Neuroscience," 2021 EERI Annual Meeting, Session 3B, March 24.

CISA, 2020. "Guidance on the Essential Critical Infrastructure Workforce: Ensuring Community and National Resilience in COVID-19 Response (Version 2.0)." U.S. Department of Homeland Security, Cybersecurity & Infrastructure Security Agency, March 28.

FEMA (2020b). *NEHRP Recommended Seismic Provisions for New Buildings and Other Structures, Volume II: Part 3 Resource Papers*, 2020 Edition, FEMA P-2082-2, prepared by the Building Seismic Safety Council of the National Institute of Buildings Sciences for Federal Emergency Management Agency, September.

FEMA-NIST (2021). *Recommended Options for Improving the Built Environment for Post-Earthquake Reoccupancy and Functional Recovery Time*, FEMA P-2090 / NIST SP-1254, Federal Emergency Management Agency and National Institute of Standards and Technology, January.

Jones v. San Francisco, 1997. Arnold Jones et al. v. City and County of San Francisco, et al., 976 F.Supp. 896, July 18.

Mar, D. (2021). "Making Resilience Affordable," 2021 EERI Annual Meeting, Session 3B, March 24.

Omorogieva, W., 2018. "Prison Preparedness and Legal Obligations to Protect Prisoners During Natural Disasters." Sabin Center for Climate Change Law, Columbia Law School, May.

S.4748, 2020. "Correctional Facility Disaster Preparedness Act of 2020" [S.4748].

SEFT Consulting Group (2015). “Beaverton School District Resilience Planning for High School at South Cooper Mountain and Middle School at Timberland,” SEFT Consulting Group, July 10.

SFDPH, 2020. “Order of the Health Officer No. C19-07b.” City and County of San Francisco, Department of Public Health, March 31, et seq.

Cost Impact: The code change proposal will increase the cost of construction
This proposal will increase the cost of construction for the buildings newly assigned to RC IV. The largest increases will likely be in high seismic areas where assignment to RC IV makes the largest changes to structural and nonstructural design criteria. This does not mean, however, that every RC IV facility will have the same unit cost as a new state-of-the-art hospital. On the contrary, case studies of voluntary RC IV-like seismic design have found a **construction cost premium ranging typically from 0% to 2%** relative to normal RC II designs. (See proposal references by Almufti, Bade, Berkowitz, Mar, and SEFT.) This estimate stands to reason: Wind, snow, and earthquake loads can already vary significantly within a jurisdiction, but the building designs and unit costs don’t change wildly from one side of the county to the other. For example, the seismic design force in Berkeley is about 1.5 times that in downtown San Francisco; so with respect to the structure, any nursing home or grocery store you can build as RC II in Berkeley you can also build as RC IV in San Francisco with no change to the design. The same is likely true for snow design, for example, in Vail v. Boulder and for wind design in Galveston v. the west side of Houston. On the nonstructural side, a facility’s nonstructural systems might need more bracing or support when assigned to RC IV, but the number and size of the components themselves don’t suddenly look like a hospital just because the risk category has changed.

S75-22

Public Hearing Results

Committee Action: **As Submitted**

Committee Reason: Approved as submitted as it is important to keep detention facilities with security needs operational as an essential facility. (Vote: 14-0)

S75-22

Individual Consideration Agenda

Public Comment 1:

Proponents: Heidi Tremayne, representing Earthquake Engineering Research Institute (heidi@eeri.org) requests As Submitted

Commenter's Reason: I would like to express SUPPORT for the code change proposal S75-22 on behalf of the Earthquake Engineering Research Institute (EERI). This proposal exemplifies EERI’s vision by recommending a clear and important action to improve the International Building Code. Once adopted, this code change will improve the seismic performance of new detention facilities with special security needs assigned to Occupancy Group I-3, in alignment with recommendations from EERI’s published policy statements. Thank you for considering EERI’s position on this important code issue.

EERI's formal support letter can be viewed at: https://www.cdpaccess.com/public-comment/3343/27372/files/download/3612/EERI-SUPPORT-for-ICC-Code-Change-Proposal-S75-22-final-2022-06-17.pdf

Cost Impact: The net effect of the public comment and code change proposal will increase the cost of construction
Same as original proposal.

Public Comment# 3343

Public Comment 2:

Proponents: John Williams, representing Committee on Healthcare (ahc@iccsafe.org) requests Disapprove

Commenter's Reason: The scope of the Healthcare committee is for healthcare facilities, such as ambulatory care facilities, clinics, nursing homes and hospitals. Therefore, this public comment is limited to the effect of the new language to the description of Risk Category IV and how it would effect the 1st and 2nd item in the list.

- Group I-2, Condition 2 occupancies having emergency surgery or emergency treatment facilities.
- Ambulatory care facilities having emergency surgery or emergency treatment facilities.

The added language in the description for Risk Category IV could be read that any of the current occupancies in this list could sustain loss of function as long as that damage did not represent a substantial hazard to the occupants. These are a list of essential facilities that must be operational after an event for the safety and recovery of the entire community. Hospitals that have emergency surgery or emergency treatment facilities need to be operational after an emergency. There could be a lot of damage to the building that would not be a substantial hazard to occupants, but would stop the emergency room from functioning.

Cost Impact: The net effect of the public comment and code change proposal will not increase or decrease the cost of construction
No change to code.

Public Comment# 3057

S76-22

IBC: TABLE 1604.5

Proposed Change as Submitted

Proponents: David Bonowitz, representing FEMA-ATC Seismic Code Support Committee (dbonowitz@att.net); Kelly Cobeen, representing Federal Emergency Management Agency/Applied Technology Council - Seismic Code Support Committee (kcobeen@wje.com); Michael Mahoney, representing FEMA (mike.mahoney@fema.dhs.gov)

2021 International Building Code

Revise as follows:

TABLE 1604.5 RISK CATEGORY OF BUILDINGS AND OTHER STRUCTURES

RISK CATEGORY	NATURE OF OCCUPANCY
I	Buildings and other structures that represent a low hazard to human life in the event of failure, including but not limited to: Agricultural facilities. Certain temporary facilities. Minor storage facilities.
II	Buildings and other structures except those listed in Risk Categories I, III and IV.
III	Buildings and other structures that represent a substantial hazard to human life in the event of failure, including but not limited to: Buildings and other structures whose primary occupancy is public assembly with an occupant load greater than 300. Buildings and other structures containing one or more public assembly spaces, each having an occupant load greater than 300 and a cumulative occupant load of these public assembly spaces of greater than 2,500. Buildings and other structures containing Group E or Group I-4 occupancies or combination therof, with an occupant load greater than 250. Buildings and other structures containing educational occupancies for students above the 12th grade with an occupant load greater than 500. Group I-2, Condition 1 occupancies with 50 or more care recipients. Group I-2, Condition 2 occupancies not having emergency surgery or emergency treatment facilities. Group I-3 occupancies. Any other occupancy with an occupant load greater than 5,000.[a] ~~Power-generating stations, water treatment facilities for potable water, wastewater treatment facilities and other public~~ Public utility facilities not included in Risk Category IV. Buildings and other structures not included in Risk Category IV containing quantities of toxic or explosive materials that: Exceed maximum allowable quantities per control area as given in Table 307.1(1) or 307.1(2) or per outdoor control area in accordance with the *International Fire Code* ; and Are sufficient to pose a threat to the public if released.[b]
IV	Buildings and other structures designated as essential facilities and buildings where loss of function represents a substantial hazard to occupants or users, including but not limited to: Group I-2, Condition 2 occupancies having emergency surgery or emergency treatment facilities. Ambulatory care facilities having emergency surgery or emergency treatment facilities. Fire, rescue, ambulance and police stations and emergency vehicle garages Designated earthquake, hurricane or other emergency shelters. Designated emergency preparedness, communications and operations centers and other facilities required for emergency response. Public utility facilities providing power generation, potable water treatment, or wastewater treatment. Power-generating stations and other public utility facilities required as emergency backup facilities for *Risk Category* IV structures. Buildings and other structures containing quantities of highly toxic materials that: Exceed maximum allowable quantities per control area as given in Table 307.1(2) or per outdoor control area in accordance with the *International Fire Code* ; and

	Are sufficient to pose a threat to the public if released.[b]
	Aviation control towers, air traffic control centers and emergency aircraft hangars.
	Buildings and other structures having critical national defense functions.
	Water storage facilities and pump structures required to maintain water pressure for fire suppression.

a. For purposes of occupant load calculation, occupancies required by Table 1004.5 to use gross floor area calculations shall be permitted to use net floor areas to determine the total occupant load.

b. Where approved by the building official, the classification of buildings and other structures as Risk Category III or IV based on their quantities of toxic, highly toxic or explosive materials is permitted to be reduced to Risk Category II, provided that it can be demonstrated by a hazard assessment in accordance with Section 1.5.3 of ASCE 7 that a release of the toxic, highly toxic or explosive materials is not sufficient to pose a threat to the public.

Reason: This proposal improves consistency in the assignment of risk categories. It applies current thinking from IBC Chapters 3 and 4 to the risk category assignments in Table 1604.5. The logic of the proposal is as follows:

1. **Risk Category IV is the IBC's main tool to provide functional facilities** soon after a natural hazard event (earthquake, flood, snow, or wind). In terms of post-event functionality, there is a wide gap between RC II-III facilities (which have identical requirements for nonstructural systems) and RC IV facilities. The difference in expected recovery time can be on the order of weeks or months.
2. The performance gap between RC II-III and RC IV is most acute for occupancies that depend on functional nonstructural systems and special design provisions to serve vulnerable users.
3. Because these facilities are rare and specially designed, their services and occupants cannot be quickly relocated to other buildings.
4. Therefore, facilities with special design features and vulnerable users should be strong candidates for Risk Category IV.

Following this logic, this proposal expands the scope of RC IV from just "essential facilities" to include "buildings where loss of function represents a substantial hazard." **This "substantial hazard" can even be life threatening** where, for example, a 24-hour medical facility, residential care facility, public water or power utility, detention center with impeded egress, or critical supply chain facility is out of service for weeks. The code defines *essential facilities* as those that need to "remain operational" through and after an "extreme" earthquake, flood, wind, or snow event. The additional facilities described by the logic above and considered in this proposal might not require continuous operation, but **prolonged downtime – which can be expected from RC II design criteria – can give rise to a similar risk for vulnerable users**, if not on Day 1 after the event, then possibly by Day 3, 10, or 30.

This proposal addresses buildings that support the operations of public utilities. Under the current code, utility buildings that support power generation and water treatment are mostly assigned to RC III even though their value and function is closely linked to the performance of specialized nonstructural components. Only those that provide "emergency backup facilities" for other RC IV facilities are themselves assigned to RC IV.

Instead of drawing a line between normal operations and "emergency backup," this proposal makes the distinction between public utilities (typically designated not by the code but by a state or local commission) and other utilities. If housing, schools, offices, shops, and all the other normal buildings assigned to RC II are to be unusable for prolonged periods after a major storm or earthquake, it should not be because of a failure at a public water or power utility. On the contrary, a policy that expects people to "shelter in place" for weeks or longer in damaged but occupiable buildings should, at the very least, supply those buildings with water and power within at most a few days.

Further, those who would argue that RC IV design for more buildings should be voluntary must acknowledge that no developer would do that voluntary work until reliable utility services are in place. Otherwise, the voluntary work would be wasted as long as a utility outage continues.

Therefore, this proposal makes the key distinction between public water and power utilities and other utilities as follows:

- It maintains the "emergency backup" utilities in RC IV, with no change to the current code.
- It moves public utility facilities for power generation, potable water, and wastewater from RC III to RC IV.
- It maintains the broad assignment of the remaining public utilities to RC III, essentially as in the current code. In some jurisdictions, these "other public utilities" (in the current code's phrasing) might include communications or public transit facilities, but it is the fact that they are designated as public utilities that qualifies them for design consideration beyond RC II.

Despite this reassignment, this proposal is measured in its scope. **It does NOT affect** any non-public utility or any utility supply chain facility not already included in the current RC III provision.

(The current wording of Table 1604.5 regarding utilities is unclear in several ways, but clarifying or correcting it is outside the scope of this proposal. Examples of unclear wording include: Is it assumed that all power generation and water treatment facilities *are* public utilities? Is a solar installation that returns power to the grid considered "power generation"? Are power distribution facilities included with "power generating stations"? What "other" utility functions does the code expect to be assigned to RC III? Why would public utilities be considered *backup* for private facilities, rather

than the primary service? And if there is no backup, shouldn't the primary service be assigned to RC IV as well? How many public utilities serve only RC IV facilities, but not the broader community? Etc.)

This proposal is consistent with current IBC principles. This proposal extends the current scope of Risk Category IV, but it does so consistent with the purpose, philosophy, and normative goals the IBC already represents.

Even if you think of the IBC as strictly a "life safety" code, safety is more than mere survival, and safety can be at risk even after the rain, snow, or ground shaking has stopped. If building damage affects the safety of vulnerable users in the following days or weeks, it is consistent with even a safety-based code to manage those risks through design.

But the IBC's purpose is broader than just "life safety." Section 101.3 states that the purpose of the IBC is to provide a "reasonable level of safety, **health and general welfare**." So a focus on the health and welfare of vulnerable building users, even where their building provides immediate safety, is both "reasonable" and completely consistent with the purpose of the code.

With its definition of *essential facilities* and its use of Risk Category IV to ensure they "remain operational," the IBC is already more than a safety code. It is, in fact, already a basic "functional recovery" code; the only question is which building uses, and users, we decide should qualify for a designed recovery. Where RC II or RC III is not reliable enough, it is consistent with the purpose and scope of the IBC to assign more building uses to RC IV.

Not all of the IBC's tools are perfectly nuanced. Some involve bright lines and broad categories, and it is sometimes necessary to err on the conservative side. So even if a certain use is not quite as "essential" as a fire station, RC IV might still be a more appropriate choice than RC II or RC III, and in these cases, it is consistent with the code to assign buildings to the higher category. In time, design criteria should evolve to address more specific recovery objectives (FEMA, 2020; FEMA-NIST, 2021). But those nuanced provisions are *at least* a decade away. For now, however, RC IV is the most appropriate tool we have, and we ought to use it. Adapting existing practices to new objectives is entirely consistent with the history of code development.

IBC Chapters 3 and 4 define and provide special requirements to manage fire and egress risks for particular groups of users. Table 1604.5 is meant to do the same for rare natural hazard events. But while Chapters 3 and 4 consider dozens of specific building uses and conditions, Table 1604.5 has only four categories. Changing the scope of Risk Category IV to account for specific building uses that are not adequately served by RC II or RC III criteria is consistent with the detailed, use-specific approach of Chapters 3 and 4.

Table 1604.5 represents public policy about what we desire from our buildings. As such, it has changed over time, along with public expectations. As we consider new or increasing risks related to more frequent natural hazard events, urbanization, the pandemic, or aging populations, it is both appropriate and consistent with past practice for Table 1604.5 to evolve as well.

Bibliography: Almufti, I. et al. (2016). "The resilience-based design of 181 Fremont Tower," *Structure*, June.
Bade, M. (2014). "Mission Bay Block 25 Building – An Exercise in Lean Target Value Design," Presentation to the Lean Construction Institute, Finland, April 12.

Berkowitz, R. (2021). "UCSF Center for Vision Neuroscience," 2021 EERI Annual Meeting, Session 3B, March 24.

CISA, 2020. "Guidance on the Essential Critical Infrastructure Workforce: Ensuring Community and National Resilience in COVID-19 Response (Version 2.0)." U.S. Department of Homeland Security, Cybersecurity & Infrastructure Security Agency, March 28.

FEMA (2020b). *NEHRP Recommended Seismic Provisions for New Buildings and Other Structures, Volume II: Part 3 Resource Papers*, 2020 Edition, FEMA P-2082-2, prepared by the Building Seismic Safety Council of the National Institute of Buildings Sciences for Federal Emergency Management Agency, September.

FEMA-NIST (2021). *Recommended Options for Improving the Built Environment for Post-Earthquake Reoccupancy and Functional Recovery Time*, FEMA P-2090 / NIST SP-1254, Federal Emergency Management Agency and National Institute of Standards and Technology, January.

Mar, D. (2021). "Making Resilience Affordable," 2021 EERI Annual Meeting, Session 3B, March 24.

SEFT Consulting Group (2015). "Beaverton School District Resilience Planning for High School at South Cooper Mountain and Middle School at Timberland," SEFT Consulting Group, July 10.

SFDPH, 2020. "Order of the Health Officer No. C19-07b." City and County of San Francisco, Department of Public Health, March 31, et seq.

Cost Impact: The code change proposal will increase the cost of construction
This proposal will increase the cost of construction for the buildings newly assigned to RC IV. The largest increases will likely be in high seismic areas where assignment to RC IV makes the largest changes to structural and nonstructural design criteria. This does not mean, however, that every RC IV facility will have the same unit cost as a new state-of-the-art hospital. On the contrary, case studies of voluntary RC IV-like seismic design have found a **construction cost premium ranging typically from 0% to 2%** relative to normal RC II designs. (See proposal references by

Almufti, Bade, Berkowitz, Mar, and SEFT.) This estimate stands to reason: Wind, snow, and earthquake loads can already vary significantly within a jurisdiction, but the building designs and unit costs don't change wildly from one side of the county to the other. For example, the seismic design force in Berkeley is about 1.5 times that in downtown San Francisco; so with respect to the structure, any nursing home or grocery store you can build as RC II in Berkeley you can also build as RC IV in San Francisco with no change to the design. The same is likely true for snow design, for example, in Vail v. Boulder and for wind design in Galveston v. the west side of Houston. On the nonstructural side, a facility's nonstructural systems might need more bracing or support when assigned to RC IV, but the number and size of the components themselves don't suddenly look like a hospital just because the risk category has changed.

Public Hearing Results

Committee Action: **As Modified**

Committee Modification:

TABLE 1604.5 RISK CATEGORY OF BUILDINGS AND OTHER STRUCTURES

Portions of table not shown remain unchanged.

RISK CATEGORY	NATURE OF OCCUPANCY
I	Buildings and other structures that represent a low hazard to human life in the event of failure, including but not limited to: Agricultural facilities. Certain temporary facilities. Minor storage facilities.
II	Buildings and other structures except those listed in Risk Categories I, III and IV.
III	Buildings and other structures that represent a substantial hazard to human life in the event of failure, including but not limited to: Buildings and other structures whose primary occupancy is public assembly with an occupant load greater than 300. Buildings and other structures containing one or more public assembly spaces, each having an occupant load greater than 300 and a cumulative occupant load of these public assembly spaces of greater than 2,500. Buildings and other structures containing Group E or Group I-4 occupancies or combination therof, with an occupant load greater than 250. Buildings and other structures containing educational occupancies for students above the 12th grade with an occupant load greater than 500. Group I-2, Condition 1 occupancies with 50 or more care recipients. Group I-2, Condition 2 occupancies not having emergency surgery or emergency treatment facilities. Group I-3 occupancies. Any other occupancy with an occupant load greater than 5,000.[a] <u>Power-generating stations, water treatment facilities for potable water, wastewater treatment facilities and other public</u> ~~Public~~ utility facilities not included in Risk Category IV. Buildings and other structures not included in Risk Category IV containing quantities of toxic or explosive materials that: Exceed maximum allowable quantities per control area as given in Table 307.1(1) or 307.1(2) or per outdoor control area in accordance with the *International Fire Code* ; and Are sufficient to pose a threat to the public if released.[b]

IV	Buildings and other structures designated as essential facilities and buildings where loss of function represents a substantial hazard to occupants or users, including but not limited to: Group I-2, Condition 2 occupancies having emergency surgery or emergency treatment facilities. Ambulatory care facilities having emergency surgery or emergency treatment facilities. Fire, rescue, ambulance and police stations and emergency vehicle garages Designated earthquake, hurricane or other emergency shelters. Designated emergency preparedness, communications and operations centers and other facilities required for emergency response. Public utility facilities providing power generation, potable water treatment, or wastewater treatment. Power-generating stations and other public utility facilities required as emergency backup facilities for *Risk Category* IV structures. Buildings and other structures containing quantities of highly toxic materials that: Exceed maximum allowable quantities per control area as given in Table 307.1(2) or per outdoor control area in accordance with the *International Fire Code* ; and Are sufficient to pose a threat to the public if released.[b] Aviation control towers, air traffic control centers and emergency aircraft hangars. Buildings and other structures having critical national defense functions. ~~Water storage facilities and pump structures required to maintain water pressure for fire suppression.~~

a. For purposes of occupant load calculation, occupancies required by Table 1004.5 to use gross floor area calculations shall be permitted to use net floor areas to determine the total occupant load.

b. Where approved by the building official, the classification of buildings and other structures as Risk Category III or IV based on their quantities of toxic, highly toxic or explosive materials is permitted to be reduced to Risk Category II, provided that it can be demonstrated by a hazard assessment in accordance with Section 1.5.3 of ASCE 7 that a release of the toxic, highly toxic or explosive materials is not sufficient to pose a threat to the public.

Committee Reason: Approved as modified as the proposal makes the appropriate distinction between facilities for Risk Category III and IV. For lucidity, the modification restores the current wording for Risk Category III. (Vote: 10-4)

S76-22

Individual Consideration Agenda

Public Comment 1:

Proponents: David Bonowitz, representing Self (dbonowitz@att.net) requests As Modified by Committee

Commenter's Reason: The argument in support of S76 is simple and self-evident: Water and power are vitally important in the hours and days following a damaging earthquake, hurricane, or winter storm. The facilities that provide these services to the public are therefore *essential* and should be assigned to Risk Category IV.
To this obvious truth, the opposition has no response. Instead, they make a number of claims, which we rebut in brief below.

Opposition claim: S76 should be disapproved because it doesn't define "public utility."

Rebuttal in support:

-- "Public utility" is already used in the IBC, and S76 uses it with exactly the same meaning and context.

-- It is a simple exercise for any code user or building official to learn that “public utility” means a provider of certain basic products or services – like water and power – for sale to the general public. But the code cannot, and need not, provide a definition, because it is already defined in state and federal statutes. See the supplemental information in the attached file.

-- At the committee action hearings, opposition to S76 showed a surprising misunderstanding of this quite common term. ICC members and voters can avoid that confusion by reviewing the attached supplemental information.

Opposition claim: S76 should be disapproved because it doesn’t define “power-generating station.”

Rebuttal in support:

-- “Power-generating station” is already used in the IBC, and S76 uses it with exactly the same meaning and context. S76 makes no change at all regarding the meaning of “power-generating station,” so this argument is a red herring.

-- At the committee action hearings, the opposition asked whether certain small PV installations qualify as “power-generating stations,” but that question is moot because S76 applies only to “public utilities.”

-- Proposal S81 can, and does, clarify conditions where PV systems that are *not* public utilities might be properly assigned to RC I or II, making this opposition to S76 moot.

-- The lead opposition to S76 is also the proponent of S79 and S81. As noted in the reason statements for S79 and S81, ASCE 7-16 Section 15.5.4.1 states, “Electrical power-generating facilities are power plants that generate electricity by steam turbines, combustion turbines, diesel generators, or similar turbo machinery.” The S79 and S81 proponents argue that based on this ASCE 7 provision, the term “power-generating stations” as used in Table 1604.5 (and S76) “was never intended to apply to individual PV panel systems.” If this is correct, then S76 will not affect solar, and the opposition disproves its own claim.

Opposition claim: Most PV is designed as RC I and most wind turbines are designed as RC II, so assignment to RC IV is a huge change.

Rebuttal in support:

-- Public utility facilities – that is, the only facilities affected by S76 – are already assigned to RC III, not RC I or II. See the supporting information regarding the use and definition of “public utility”.

-- The fact that PV vendors have convinced building officials to allow RC I based on safety alone (i.e. because ground mounted or short elevated PV systems can’t kill you by falling on you) shows why S76 is needed, because without it, code users completely ignore the public service nature of a public utility that the current RC III assignment is meant to reflect.

-- Proposal S81 can, and does, clarify conditions where safety – as opposed to service to the public – is an appropriate basis for design. So S81 resolves any confusion about the intent of either the current code or S76.

Opposition claim: Even “utility scale” PV is designed as RC I, so S76 emphasis on “public utility” will change that or is at least confusing.

Rebuttal in support:

-- "Public utility” is the term already used in the IBC. S76 doesn’t change that.

-- “Utility scale” is NOT a term used in either the IBC or S76, so this claim is a red herring.

-- “Utility scale” does not imply “public utility.” See the attached supporting information about the meaning of “public utility.” It has nothing to do with scale. In fact, many large power utilities (including many wind and solar installations) are not public utilities at all.

Opposition claim: S76 disproportionately hurts solar and wind, which use the building code for design, and has less effect on older technologies (steam and combustion turbines), which do not.

Rebuttal in support:

-- S76 does not target any specific industries. Rather, it recognizes the importance of post-event water and power, regardless of fuel source. Neither the current Table 1604.5 nor S76 makes a distinction by fuel source.

-- PV and wind installations that routinely use the building code and are permitted by the local building departments are generally NOT public utilities affected by S76. Rather, they are typically private facilities or municipal utilities; see the supporting information.

-- It is FALSE that older power plant types don't use the building code. If they are owned by government agencies or independent authorities, they might not receive building permits through the local building official, but they do use the building code and its reference standards (like ASCE 7) as technical design guidance for their buildings and non-building structures. Thus, S76 will influence the design of these facilities as well.

-- At the committee action hearings, the opposition also claimed that public utilities do not use the building code. This is plainly false, likely revealing the opponents' misunderstanding of the term "public utility" – a term already used in the building code, as discussed above and in the supporting information.

-- As noted above, the opposition disproves its own claim by citing (in its reason statements for S79 and S81) a provision from ASCE 7 suggesting that "power-generating stations" excludes PV.

Opposition claim: The design requirements that come with RC IV will increase PV and/or wind system costs so much that they will make those systems impossible or infeasible to build.

Rebuttal in support:

-- This is a far-fetched claim belied by the opponent's own arguments. In testimony on S76 and S81, opponents acknowledged that some PV installations are already assigned to RC III or IV per the current IBC, proving that the RC III and RC IV design criteria is feasible.

-- Outside the code hearings, opponents have claimed that RC IV design criteria will make wind turbine towers so large that they cannot be transported to the site. This, too, is belied by the fact that installations do exist in regions with some of the highest wind and seismic design criteria in the country. If you can transport to these (typically coastal) areas under the current code, then you can transport to any location where RC IV criteria under S76 would still be less than current RC IV criteria in the high-demand locations (such as the Great Plains states).

-- S76 affects only public utility facilities, which the current code already assigns to RC III. Therefore, the appropriate comparison is not between RC I and RC IV but between RC III and RC IV. Our analysis of the IBC and ASCE 7 criteria shows that in high seismic areas, the general increase in design forces would be only 20% (1.5/1.25=1.2). In high wind areas, the increase in design wind pressure would be only 9% throughout the Great Plains states where wind power is most common; in coastal areas, the increase would range from 0% in much of Florida to 14% off the North Carolina coast. In none of these cases is the increase infeasible or impossible.

-- Every industry or user group whose facilities have been assigned to RC IV has made the same objection ... and then has moved forward to develop design criteria and to innovate structural solutions to satisfy the policy goals of Table 1604.5. We have full confidence that the PV and wind energy industries, as well as other power and water infrastructure organizations, can and will do the same.

Opposition claim: Risk Category assignment will not improve grid reliability, which is as much about redundancy and network effects as it is about design of individual components.

Rebuttal in support:

-- Table 1604.5 already addresses these utilities and infrastructure with respect to structural design. S76 does not change that.

-- Table 1604.5 is a policy statement, not a technical provision. It is the one place in the IBC where the *purpose* of a proposed building or structure is considered with respect to severe natural hazards. As such, it is entirely appropriate to set policy guidance in Table 1604.5, with the understanding that technical criteria needed to satisfy the policy goals are set elsewhere.

-- At the committee action hearings, opponents referenced the North American Electric Reliability Corporation (NERC) as the appropriate body to set standards for grid reliability. That's great, as Table 1604.5 and the IBC rely on the existence and maintenance of consensus design standards, such as ASCE 7 and those promulgated by NERC. But those standards are not cited from Section 1604.5. A NERC standard for wind and seismic design would be a great contribution, but its performance goals with respect to extreme wind and seismic events should come from the policy guidance in the building code. Even without such a standard, NERC can (and should) develop a consensus statement about the expected reliability and recovery of existing grids and current PV and wind power designs. By doing so, they might even show that current designs are adequate to the purpose of RC IV and should be deemed to comply with S76. If that's the consensus, NERC should be able to produce such a statement even before the 2024 IBC becomes effective in a couple of years.

Opposition claim: S76 should be disapproved because it was proposed by seismic experts, not energy experts.

Rebuttal in support:

-- The FEMA-ATC committee does include seismic design experts, but it also includes structural experts, experts in nonstructural systems and non-building structures, and building code experts generally.

-- Table 1604.5 is within the scope of the structural committee, not the energy committee.-- S76 is largely a policy statement and will be decided,

appropriately, by the ICC Structural Committee, which has already approved it, and by building officials considering the needs of their communities.

https://www.cdpaccess.com/public-comment/3432/27577/files/download/3625/S76%20Public%20Utility%20notes.pdf

Cost Impact: The net effect of the public comment and code change proposal will increase the cost of construction
Same as the original proposal as modified by committee.

Public Comment# 3432

Public Comment 2:

Proponents: Heidi Tremayne, representing Earthquake Engineering Research Institute (heidi@eeri.org) requests As Modified by Committee

Commenter's Reason: I would like to express SUPPORT for the code change proposal S76-22 on behalf of the Earthquake Engineering Research Institute (EERI). This proposal exemplifies EERI's vision by recommending a clear and important action to improve the International Building Code. Once adopted, this code change will improve the seismic performance of new buildings that support operations of public utilities that provide power generation, potable water treatment and wastewater treatment, in alignment with recommendations from EERI's published policy statements. Thank you for considering EERI's position on this important code issue.
EERI's formal support letter can be viewed at: https://www.cdpaccess.com/public-comment/3348/27380/files/download/3613/EERI-SUPPORT-for-ICC-Code-Change-Proposal-S76-22-final-2022-06-17.pdf

Cost Impact: The net effect of the public comment and code change proposal will increase the cost of construction
Same as original proposal.

Public Comment# 3348

Public Comment 3:

Proponents: David Banks, representing CPP Inc (dbanks@cppwind.com) requests Disapprove

Commenter's Reason: I do not believe that requiring most solar to be RC IV will result in improved overall grid resilience, which I believe is the underlying goal of this proposed change, given the proposal's emphasis on electricity availability soon after a natural hazard event. I certainly support this objective, but this proposal is the wrong approach. This is like increasing airplane safety by requiring all planes be too heavily reinforced to take flight. This would have extinguished the industry.
Instead, the aerospace industry ensures high reliability because parts and materials are subject to stringent quality control and strict preventative maintenance schedules, and all failures are subject to intense scrutiny. We should similarly tailor resilience solutions for solar. As an author of SEAOC PV2 and the draft ASCE Solar Manual of Practice, I know it takes time, effort and expertise to ensure resilient design is promoted. More support for such targeted efforts is needed.

As a Principal at CPP wind engineering, I have consulted on hundreds of solar products and projects. I've spent the last 14 years working to understand the risk of wind damage to solar. Using RCIV would not have prevented most of the wind-related failures I have seen. If designers are unaware of a load effect (such as aeroelastic instability or certain companion loads), increasing the magnitude of all the other design loads will, at best, fix the problem by accident.

In the absence of SB76-22 there is nothing to prevent local AHJs and others from requiring RCIII or RCIV speeds as needed for specific solar projects, particularly in places where other electricity sources are very expensive or the impact of a failure is unusually high. This is being done in Puerto Rico right now. Only a small subset of the available racking systems can be built there as a result, though. Unless S81-22 passes, S76-22 would eliminate many current racking systems from consideration and reduce the adoption of solar across the country.

If we are to accept such a cost, the necessity should be a clearly explained as part of the grid reliability guidance from FERC and NERC. I sincerely doubt that requirements in the IBC are the best way to implement their electricity resilience policy. But if IBC changes are indeed the only way, such provisions should reflect consultation with stakeholders to craft something with consideration for potential unintended consequences. I don't expect the transition will be smooth if this proposal passes.

It would be sadly ironic if a measure intended to reduce the impact of ever-increasing natural hazards significantly reduces adoption of solar energy. I recommend this heavy-handed proposal be disapproved.

Bibliography: None.

Cost Impact: The net effect of the public comment and code change proposal will not increase or decrease the cost of construction

As my comment advocates disapproving the code change proposal, there would be no cost impacts if my recommendation was put into effect.

Public Comment# 3269

Public Comment 4:

Proponents: Michael Bergey, representing Distributed Wind Energy Association (mbergey@bergey.com) requests Disapprove

Commenter's Reason: S76-22-BONOWITZ-3 would mandate that “Public utility facilities providing power generation …” be designed under Risk Category IV. The Distributed Wind Energy Association (DWEA) opposes this proposal and recommends that it be disapproved.
Rationale:

· DWEA represents the industry that provides wind turbines for “behind-the-meter” applications. This might be a 5-kW turbine for a rural residence or a 2-MW turbine for an industrial facility. Our members installations require building permits and are typically required to meet the IBC or one of its derivatives.

· DWEA recognizes the beneficial intent of S76 and does not disagree with the proponents that the structures related to critical public services should be designed to more robust standards as a compliment to the more robust standards for critical structures.

· The proponent’s intent, as expressed in documents and testimony, is to subject only public utilities to the upgrade to RC IV.

· The term “Public utility facilities”, however, is not adequately defined to avoid overly conservative interpretation by code officials. For example:

o Since even a small residential wind turbine will transmit excess power generation to the grid and receive compensation for it, it would be difficult for a homeowner to prove that they were not some form of a public utility.

· Most distributed wind systems are evaluated under RC II and upgrading to RC IV would increase foundation costs significantly (see below) and prohibit the use of standard towers in many coastal zones.

· In the case where a distributed wind system is part of a microgrid system (including energy storage) that serves an RC IV facility we believe the application of RC IV to the wind turbine support structure and foundation is appropriate.

Note: DWEA supports the comments and edits submitted on S79 by the American Clean Power Association (ACPA), which we believe would meet the intent of the S76 proponents without disadvantaging the vast majority of the distributed wind projects.Note: DWEA evaluated residential-scale towers and foundations for self-supporting lattice towers for RC II and RC IV for 110, 120 and 140 mph basic wind speeds per TIA 222-H using the industry standard tnxTower analysis tool. We found that loads increased by an average of 16% and total installed turbine costs increased by an average of 6%. It’s worth noting that manufacturers will spend years of research and hundreds of thousands of dollars to shave installed costs a few percent, so a 6% increase is significant. Also, since there has not been a history of tower and foundation failures, the value of stronger foundations to the customer is diminimus. More importantly, our analyses revealed that standard RC II towers would not satisfy TIA-222-H in coastal areas under RC IV. We estimate that the “heavy-duty” towers required would add a further 7% to the installed cost.

Cost Impact: The net effect of the public comment and code change proposal will not increase or decrease the cost of construction
No change to the code.

Public Comment# 3363

Public Comment 5:

Proponents: Joseph Cain, representing Solar Energy Industries Association (SEIA) (joecainpe@gmail.com) requests Disapprove

Commenter's Reason: The Solar Energy Industries Association (SEIA) is seeking Disapproval of Proposal S76-22 by FEMA-ATC SCSC for multiple reasons.
1. Proposal S76-22 does not solve the problem the proponents are attempting to solve.

2. S76-22 has flawed language that is undefined, ambiguous, and conflicting.

3. S76-22 amplifies the undefined and ambiguous terms “power generating station” and “public utility facility” in a way that many AHJs will be unable to interpret, so many will likely just choose the most restrictive interpretation and require Risk Category IV.

4. S76-22 selectively and disproportionately disadvantages clean, renewable energy.

5. S76-22 could have the opposite effect for the grid – slowing gains in grid reliability.

6. The structural behavior of renewable energy facilities is very different from “conventional” turbine-based power generating stations for which the Risk Category table was written.

7. Reliability of the grid is not within the Scope of the IBC, nor within the responsibility of Structural Engineers or developers of the IBC.

8. The U.S. Department of Energy has spent over a decade working on driving down the cost of renewable energy, along with improving performance; S76-22 by FEMA threatens to drive the cost of renewable energy right back up without improving performance.

Proposal S76-22 does not solve the problem the proponents are attempting to solve.

The proponents of S76-22 seem primarily interested in functional recovery of building structures. We should all be able to agree that we want buildings and communities with greater resilience, and we should all be able to agree that we want our grid to be more reliable.

Proposal S76-22 does not solve or even contribute to any of these goals. It does not solve the problem the proponents are trying to solve. The proponents and supporters mentioned power outages in Texas, California, and from SuperStorm Sandy. The root causes of these power outages have been studied and identified. None of these events would have benefited -- none of these power outages would have been prevented -- by simply imposing the additional cost of higher Risk Categories.

The proponents seem to believe that increasing the risk category – and therefore seismic, wind, snow, ice, and flood loads – of power generators supplying electrons to the grid will have a direct return of a more-reliable supply of electrons to the building structures they are interested in for functional recovery. It will not. As substations, step-up transformers, transmissions towers and high-voltage lines are outside the scope of the IBC, none of these elements will be improved by changes to the RC table.

If the proponents want building structures to have electrical power to remain operational in the event of extreme environmental events or grid outages, the proponents could be much more direct and much more successful advocating for on-site renewable energy systems paired with on-site battery energy storage systems, with equipment and logic to allow these systems to disconnect from the grid and power the building during periods of grid outages. This would be a direct and smart approach to solving the problem.

S76-22 has flawed language that is undefined, ambiguous, and conflicting.

The proponents have elevated the undefined term “public utility facility” as the primary characteristic for assigning RC IV or RC III. The proponents offer no definition in this proposal. In verbal testimony, one proponent offered a verbal suggestion that if a particular facility is under the control of a public utilities commission, then it is a public utility facility. At a different point in testimony, that same proponent offered a different verbal definition, suggesting that "if it serves the public," then it is a public utility facility. Issues of assigning risk category to a project are far too important – and far too impactful – to be left to conflicting verbal “definitions” by one proponent at a code hearing.

In fact, in the As Modified version of S76-22 as approved by the Structural Committee, there is ambiguity and confusion in the language itself. In the As Modified version:

RC III includes: “Power-generating stations … and other public utility facilities … ”

RC IV includes: “Public utility facilities providing power generation …”

How are these different? The language is flawed and must be disapproved.

S76-22 selectively and disproportionately disadvantages clean, renewable energy.

Many renewable energy projects such as solar and wind are developed and constructed by private interests that must apply for permits through a local County building department. County building departments adopt the IBC, so those private developers and their investors must follow the IBC.

However, Investor-Owned Utilities (IOUs) are not subject to County jurisdiction and do not use the IBC or the National Electrical Code. They use the National Electrical Safety Code (NESC), which is not adopted by building departments. Therefore, while renewable energy facilities would be held to using greatly increased structural loads and associated additional expense, the IOUs would not be held to using higher loads for their “conventional” facilities or for their renewable energy development.

The result is that private developers – and their investors – would be selectively disadvantaged, slowing development of renewable energy facilities.

S76-22 could have the opposite effect for the grid – slowing gains in grid reliability.

Distributed renewable energy sources are spread out and less concentrated in one geographic area. By adding these smaller resources at multiple locations, the reliability of the grid is improved. Many smaller distributed facilities are highly unlikely to experience the same extreme environmental loads at the same time. Disadvantaging renewable energy resources will slow deployment and slow these improvements in reliability.

The structural behavior of renewable energy facilities is very different from "conventional" turbine-based power generating stations for which the Risk Category table was written.

ASCE 7-22 Section 15.5.4 states: "Electrical power-generating facilities are power plants that generate electricity by steam turbines, combustion turbines, diesel generators, or similar turbomachinery." The Risk Category table was written for these very large generators, where a power outage represents a major loss of power generating capacity. For example, Diablo Canyon in California has two reactors with total output of 2.55 GigaWatts. If one or both reactors are shut down, that is a massive loss of power generation.

Renewable energy facilities do not behave this way. Where structural damage has occurred the damage has been localized and did not result in the loss of all power production. These facilities are not "switched on" and "switched off" when there is an environmental event. Damage causing the shut-down of one inverter or one wind turbine does not shut down the entire facility. A very recent anecdote was a photo of a missile strike on a ground-mounted PV system in Ukraine. The photo showed localized damage in the vicinity of the crater, and the rest of the PV facility was still standing.

Reliability of the grid is not within the Scope of the IBC, nor within the responsibility of Structural Engineers or developers of the IBC.

Reliability of the grid is the responsibility of the grid experts at the North American Electric Reliability Corporation, which in turn answers to the United States of America Federal Energy Regulatory Commission. There we find grid experts continually working on reliability of the U.S. grid. There is ongoing work on smart grids, microgrids and other strategies for resilience. We are unaware of any study or document from any of these grid experts that suggest a need for increases in RC of renewable power generation.

The U.S. Department of Energy has spent over a decade working on driving down the cost of renewable energy, along with improving performance; S76-22 by FEMA threatens to drive the cost of renewable energy right back up without improving performance.

The DOE has been funding research projects for over a decade to improve performance, lower cost, and increase deployment of clean, renewable energy systems. As PV modules (such as panels) and inverters are the two highest-cost items, much of this research work has been for driving down the "Balance of System" (BOS) cost, which includes rack systems, trackers, and foundations.

The S76-22 proposal by FEMA threatens to counteract the work of the U.S. DOE by driving cost back up without any increase in performance, and without any substantiating study relating to any need for higher risk categories for solar and wind projects. This is not a smart approach or a targeted approach, and it is not supported by any specific research study. It takes only minutes to write a sentence or two in a code change proposal to work against over a decade of progress by the DOE in research partnerships with industry and other experts, including experts from our national laboratories such as the National Renewable Energy Laboratory (NREL).

No problems are solved by simply increasing all seismic loads, wind loads, and snow loads without any consideration of a targeted approach to solving real problems that are known identified risks. For example, if PV modules have come loose, that means we need to focus on module attachment methods – it does not mean we need bigger and deeper foundations.

We respectfully request disapproval of S76-22. It increases cost, slows deployment, and does not solve any problems.

Cost Impact: The net effect of the public comment and code change proposal will not increase or decrease the cost of construction
No change to code.

Public Comment# 3512

Public Comment 6:

Proponents: Gregory Cooper, representing Renewable Energy (gregory.cooper@ge.com) requests Disapprove

Commenter's Reason: On behalf of the GE team working on Department of Energy (DOE) cooperative agreement DE-EE0009059 we oppose the proposal S76-22 due to the unintended consequences on wind turbine tower and foundation designs. We strongly encourage the rejection of the S76-22 proposal.
Background & Justification;

GE has been awarded a grant from the DOE – EERE under DOE cooperative agreement DE-EE0009059, this award funds the development of a new tower technology to economically increase hub height. This proposed change to the IBC risk category for wind turbines would be a significant setback to our goal of improving wind turbine economics and expanding wind markets in the US.

The DOE funding opportunity (A) associated with DE-EE0009059 has two specific objectives;

1. Reduce the levelized cost of energy (LCOE) of land-based wind power by enabling validation of taller tower technology and capturing stronger wind resources
2. Increase wind turbine deployment opportunities in lower wind speed regions across the country where wind energy has previously been more expensive to deploy.

The DOE funding opportunity (A) also references the current economics stating that under current market conditions, technical innovations will be required for land-based tower heights beyond 120 meters to be economical, since the installed cost increases faster than the increased energy production for most sites.

The impact of the changes proposed in S76-22 would be;

1. Reduction in the max economical hub height from 120m to 100m using existing tower technologies on current wind turbines in the market.
2. Increased program cost and development cycle time for the technology development program under DE-EE0009059 due to this change in requirements.
3. Increase in the cost of the commercial tower technology and reducing the economic benefit being developed under DE-EE0009059.
4. Reduced potential market size in the US where this new technology was considered to be a benefit.

Overall this S76-22 proposal would hinder progress of the wind industry and slow the energy transition in the US. We would encourage the proponents to revisit other means to increase the resilience of our energy systems. We are also confident that other energy system integration improvements could meet or exceed the objectives of this proposal without increasing the cost of wind turbine structures.

Thanks for your consideration.

Greg Cooper – GE Technology Integration Leader

Principal Investigator on DE-EE0009059

Bibliography: (A) EERE Funding Opportunity, DE-FOA-0002071 Area of Interest 4 Tall Towers for U.S. Wind Power https://eere-exchange.energy.gov/Default.aspx?Search=DE-FOA-0002071&SearchType=

Cost Impact: The net effect of the public comment and code change proposal will not increase or decrease the cost of construction
No change to code.

Public Comment# 3229

Public Comment 7:

Proponents: Michael Faraone, representing TerraSmart; James Cormican, representing Terrasmart, Inc. (jcormican@terrasmart.com); Michael Slack, representing Terrasmart (mslack@terrasmart.com) requests Disapprove

Commenter's Reason: My name is Michael Faraone and I disagree with S76-22's proposal which would result in increasing the Risk Category requirement for ground-mounted photovoltaic, PV, arrays. I am the Director of Engineering for TerraSmart, one of the largest PV mounting system manufactures for ground mounted solar in the United States. I have personally worked on almost 4 Gigawatts of PV projects where 97% of them were designed to Risk Category 1. Additionally, my company has worked on a total of 19 Gigawatts of PV arrays where majority are designed to Risk Category 1. The proposed requirement of increasing the Risk Category would result in ground mounts needing to be designed with larger steel structural members, increasing the size and number of foundations. This would result in cost increases to the structure of up to 30% in some cases. For the vast majority of cases, large ground mounted solar PV arrays, Risk Category 1 is appropriate. This can be attributed to design life of the structure, 20-35 years, and the redundant nature of the power arrays having individual strings of solar PV modules spread over acres of land. Most ground mounted solar PV arrays are behind fencing with access only for qualified persons, and no staff on site, representing low risk to human life in the event of a failure. Increasing Risk Category would change the loading calculations, but would not change the solar PV modules themselves, as many would not be rated for higher loading scenarios as required by increased Risk Category, nor would it change the common methods for fastening solar PV modules to the mounting systems. This proposal would add costs that do not improve safety, system reliability, or grid resilience. There are Department of Energy programs working in conjunction with national laboratories such as NREL and others that are specifically targeting solar PV fastener & bolted joint connection performance and reliability. This program and others from ASCE are seeking to improve solar PV safety, reliability, and resilience with targeted efforts involving industry stakeholders. We do not support proposal S76-22 because it is not targeted specifically to ground mounted solar PV, does not involve the input of solar PV industry stakeholders, and ultimately will not achieve the added safety, reliability, and resiliency that I believe the proponents are seeking.

In conclusion myself and TerraSmart oppose S76-22, as this proposal would be detrimental to cost and future viability of PV arrays. Instead of increasing safety, system reliability and grid resiliency, increasing Risk Category would add costs without improving any of those things, reducing new system construction and reducing the number of PV modules available for use in large scale ground mounted solar PV arrays because of significantly higher loading requirements. We oppose this proposal because it would result in the unnecessary overbuilding of the vast majority of ground mounted solar PV arrays, which would mean fewer new arrays being built, and no appreciable improvements to reliability and safety to show for it.

Michael Faraone PH.D., P.E.

Cost Impact: The net effect of the public comment and code change proposal will not increase or decrease the cost of construction
No change to code.

Public Comment# 3463

Public Comment 8:

Proponents: Daniel Fisher, representing Orie2 Engineering requests Disapprove

Commenter's Reason: Ground mount solar should be considered low risk to human life, Risk Category I. For several reasons, the proposal to increase the risk category of ground mount solar systems should not be approved:

1. Solar panel manufacturer's do not manufacture solar panels that provide sufficient wind pressure capacity to meet the required wind demands caused by increasing the risk category. This, at minimum, should cause the code committee to pause consideration of modifying the risk category until it can be confirmed that it can be implemented into the panel itself. If solar panels cannot resist the demand loads, it could pause the entire industry and would not help with building more sustainable energy system and thus would not be helpful in improving the reliability of the power grid.

2. Structural systems of ground mounted solar fields are inherently redundant: a) Larger fields of solar have thousands to hundreds of thousands of pile (or other types) foundations. It is expected that, in reality, the high, rarely occurring wind gust events prescribed by code will be localized and would not happen to the entire site over tens or hundreds of acres. b) if an area of solar were to be damaged, it would not necessarily cause the entire solar field to go down. A study of how solar would be impacted by localized failure should be considered before voting on a general code requirement such as this. Intelligent electrical design of the solar system could allow the remaining undamaged portion of the site to continue operating when localized failure occurs.

3. An increased risk category could have unintended consequences (i.e. electrical, fire, structural, etc. code impacts). A vote on this topic should be considered to be delayed to study all possible impacts.

4. Risk category of the solar field facility itself should be considered low. The typical installation is fenced in with little to no access by the public and considered a low risk to human life. One argument for an increased risk category is that the power may serve essential facilities, however, the solar power itself is not able to be supplied when the sun is not out (at night) and output is lessened when it is cloudy. One could argue that a better strategy to increasing the reliability of power to the grid is to provide additional solar rather than increasing costs and barriers to installing solar that would be associated with higher risk categories. Power outages that we experience in our area of San Diego are typically associated with high winds and fire dangers, which would occur regardless of the source of power.

5. For battery storage, those facilities (battery containers, etc) could be designed at an increased risk category and sometimes are, but not the solar ground mount system. Neither solar nor battery storage should be considered as a constant supply of power, that is not impacted by weather conditions. At night, solar does not generate power. Therefore, power cannot be fed to the battery from the solar at night, directly or indirectly.

6. A more in-depth study of cost impacts should be considered. Based on feedback from other engineers, most engineers disagree with this proposal, yet the proposal has a significant impact on project cost. Structural costs alone could increase more than 10 to 20% making these projects less economically feasible.

7. Any proposals to directly assign risk category to solar, for the reasons above, should be assigning a risk category of RC=I to the ground mount solar.

Cost Impact: The net effect of the public comment and code change proposal will not increase or decrease the cost of construction
No change to code.

Public Comment# 3412

Public Comment 9:

Proponents: Karl Schadlich, representing Signal Energy requests Disapprove

Commenter's Reason: In response to proposal S76-22 I am seeking disapproval for the proposed change for Power-generating station and public utility facilities to be required to be designed to Risk Category IV. As a contractor in the renewable energy industry this proposed change does not consider industry specific applications, uses or implications which results in an inaccurate representation towards the intent of the building risk category structure, and impacts the mission and intent what renewable energy facilities are.

1. Proposal S76-22 presents the argument that increasing the risk categories will bolster recovery time "on the order of weeks to months". It is not clear on what basis this claim is made. Sure, the design would be more conservative and the Mean Recurrence Interval for events will increase, but that doesn't mean that damage won't be sustained, and when damage is sustained, the materials are all sourced from common areas and subject to the same manufacturing timelines (if not longer) than the rest of the industry undergoing new construction.

a. Utility Solar and Wind projects take up very large footprints (+1000 acres) compared to their base load generator counterparts and adverse events that cause damage tend to do so in isolated areas meaning that the entire facility is not necessarily brought offline in the instance of an adverse weather event.

2. Renewable energy facilities rely on the resources they are designed for (i.e., sun, wind) and fundamentally those resources are not constant. This means that renewable energy resources are designed and operated as asynchronous/discontinuous power generators that dispatch power over intermittent periods, and further cannot generate power over a continuous 24-hour period.

a. Power generation facilities are further classified into base load plant and peak load classifications. Peak load facilities are intended to supplement base load generation on an electrical grid, and are not intended, modeled, or capable of the support a base load generator provides.

b. Peak load facilities do not support the total capacity that a base load facility would hold so more are required over any given region to balance the base load facilities capacity.

i. To note 1 a above, with the likelihood of isolated damage and a demand on peak generators capacity to be equivalent to the base load, the probability of not having a renewable energy facility online to support some grid demand is highly unlikely considering adverse events cover relatively smaller areas when compared to the size of the transmission network they support.

3. Solar and Wind facilities are non-occupied facilities designed to be operated by a small handful of operations and maintenance personnel that are only present on-site during periods of maintenance and testing. Therefore, renewable energy facilities do not require 24/7 operations support or facilities and can be operated and controlled remotely. Further, the facilities are designed with security fencing which prevents public access, and they are commonly located in remote areas. In instances where renewable energy facilities are located closer to public areas, the security measures are increased and building risk categories are also generally increased to enhance public safety in extreme events.

a. Solar and Wind facilities are mechanical structures not designed or capable or hosting occupants

b. Solar and Wind facilities do not have operations centers and are commonly controlled remotely via independent power provider or Public Utility operations facilities regionally located.

4. Proposal S76-22 indicates that the proposal would result in cost increases to construction. While the cost of construction would be a definite it's important to note the residual impacts that result from the primary increase to the cost of construction. From a historical project in CA analyzed approximately 2 years ago my team investigated an increase from risk category 1 to risk category 3 resulting in a 40%+ increase to the solar panel racking structure foundation sizing for W6 galvanized I-beams alone. For context, on a 100MW solar project the result was an approximate 1100 ton increase in foundation steel alone. This means that mandating an increase in the building risk category requirements will contribute to:

a. An accelerated increase in carbon emissions

b. An increased burden on public infrastructure, maintenance and reduced overall design life of such public infrastructure (most notably roads and highways).

c. An accelerated depletion in raw materials.A substantial portion to the increase in adverse events correlates directly to global warming, and all the factors described in this section above directly contribute to global warming. It's unreasonable to approach a problem resulting from climate change that will increase contribution to climate change.

The proposed code change would effect the cost of construction through:

1. increased structural material sizing
2. reduction in overall renewable energy projects since products may not support the design requirements by region.
    1. This will likely increase overall cost of energy
3. increase in major equipment pricing
4. increased logistics and transportation pricing
5. increased duration of construction and operation of equipment for larger structures and components (more fasteners, thicker framing, more

concrete, heavier steel all taking longer to install)

Cost Impact: The net effect of the public comment and code change proposal will not increase or decrease the cost of construction
No change to code.

Public Comment# 3420

Public Comment 10:

Proponents: Brian Skourup, representing EVS, Inc. (bskourup@evs-eng.com) requests Disapprove

Commenter's Reason: The proposed change could re-assign ground-mounted PV panel systems (GMPVPS) to Risk Category III or Risk Category IV, increasing cost, reducing the total amount of solar generation deployed, and thereby reduce power-generation reliability. The following argument demonstrates that GMPVPS are adequately designed on a risk-targeted basis as Risk Category I structures.
GMPVPS should remain assigned to Risk Category I to maintain the most accurate relationship to existing building code-defined target reliabilities and to avoid excessive conservatism and financial penalties commensurate with assignment to Risk Category II. The risk category selection assigns structures to a defined target reliability/probability of failure also accounting for a failure "basis", i.e. – ductile, brittle, or brittle with progressive collapse (Table 1). For seismic design, Risk Category I and II are equivalent in all respects under current code provisions. For wind design, each risk category corresponds to a different reference period (service life) with a targeted constant design event exceedance probability across all risk categories and reference periods.

Table 1. (Reproduced from ASCE/SEI 7-16, p. 2)

Table 1.3-1 Target Reliability (Annual Probability of Failure, P_F) and Associated Reliability Indices (β)[1] for Load Conditions That Do Not Include Earthquake, Tsunami, or Extraordinary Events[2]

	Risk Category			
Basis	**I**	**II**	**III**	**IV**
Failure that is not sudden and does not lead to widespread progression of damage	$P_F = 1.25 \times 10^{-4}$/yr $\beta = 2.5$	$P_F = 3.0 \times 10^{-5}$/yr $\beta = 3.0$	$P_F = 1.25 \times 10^{-5}$/yr $\beta = 3.25$	$P_F = 5.0 \times 10^{-6}$/yr $\beta = 3.5$
Failure that is either sudden or leads to widespread progression of damage	$P_F = 3.0 \times 10^{-5}$/yr $\beta = 3.0$	$P_F = 5.0 \times 10^{-6}$/yr $\beta = 3.5$	$P_F = 2.0 \times 10^{-6}$/yr $\beta = 3.75$	$P_F = 7.0 \times 10^{-7}$/yr $\beta = 4.0$
Failure that is sudden and results in widespread progression of damage	$P_F = 5.0 \times 10^{-6}$/yr $\beta = 3.5$	$P_F = 7.0 \times 10^{-7}$/yr $\beta = 4.0$	$P_F = 2.5 \times 10^{-7}$/yr $\beta = 4.25$	$P_F = 1.0 \times 10^{-7}$/yr $\beta = 4.5$

[1]The target reliability indices are provided for a 50-year reference period, and the probabilities of failure have been annualized. The equations presented in Section 2.3.6 are based on reliability indices for 50 years because the load combination requirements in Section 2.3.2 are based on the maximum loads for the 50-year reference period.
[2]Commentary to Section 2.5 includes references to publications that describe the historic development of these target reliabilities.

The cumulative probability of exceedance for environmental loads is the basis for structural safety. The formal relationship between the probability of failure, and the probability of exceedance is given below. If *F* is a failure event and *A* is the probability that the design event occurs, the probability of failure, P_f, due to event *A* is given by:

$Pf = P(F|A)P(A)$

Where *P(F|A)* is the conditional probability of structural failure and *P(A)* is the probability of exceedance for the design event. See ASCE/SEI 7-16 **C2.5 LOAD COMBINATIONS FOR EXTRAORDINARY EVENTS** (p. 422) for additional commentary. It is clear that $P(F|A) \leq 1.0$ and the upper limit for $P_F = P(A)$. Accordingly, the probability of structural failure cannot exceed the probability of occurrence/exceedance for the design event.For seismic design, the risk-targeted Maximum Considered Earthquake (MCE_R) Ground Motion is defined as, in part, an event with a 2% probability of exceedance within a 50-year period (p. 206 ASCE 7-16). This event corresponds to a mean recurrence interval (MRI) = 2,475 years. The risk category assignment dictates prescriptive detailing requirements and amplified design forces for Risk Categories III and IV. Structures assigned to Risk Categories I and II are treated equivalently under current code provisions.

The risk-targeted design wind speeds are similarly based on a target probability of exceedance within a fixed reference period. However, the reference period and wind speeds vary according to each of the four risk categories. Table 2 illustrates the relationship between risk category, annual probability of exceedance, MRI, and the cumulative probability of exceedance for a structure for each reference period.

The probability of a wind speed exceeding the basic mapped wind speed at least once during the reference period is illustrated below the *Reference Period* title. It should be clear that the target cumulative probability of exceedance is between 5% and 8%, which is relatively constant across the four risk categories and reference periods. These values are presented in **bold** font within the table. However, note that the probability of failure in most cases is less than this value as was previously discussed.

Table 2. Probabilities of Exceeding Wind Loads[1]

			Reference Period (years)			
Risk Category	Annual Probability	MRI (yrs)	25	50	100	156
I	0.003330	300	**8.0%**	15.4%	28.4%	40.6%
III	0.001430	699	3.5%	**6.9%**	13.3%	20.0%
III	0.000588	1701	1.5%	2.9%	**5.7%**	8.8%
IV	0.000333	3003	0.8%	1.7%	3.3%	**5.1%**

1. Expanded form of Table G3.1 in Guide to the Wind Load Provisions of ASCE 7-16.

GMPVPS are typically designed for a 25-year service life based on the PV panel productive life and manufacturer performance warranty. The current design wind speed and target reliability for structures assigned to Risk Category I correspond to a 25-year reference period. Some manufacturers are already extending panel service lives beyond 25 years, but in no case do warranties or service lives meet or exceed 50 years.

GMPVPS with service lives greater than 25 years should be designed for wind speeds corresponding to their expected service life. These design wind speeds can be obtained following the procedure used by the ASCE 7 Wind Load Task Committee described by Vickery, et al (2010). The resulting values for several reference periods are tabulated here (Table 3) for reference. The coefficients in the "V_{ULT}/V_{50}" column can be applied to any MRI 50-year wind speed (V_{50}) obtained from a design map or other reference, such as the ATC Hazards web tool, to obtain risk-targeted design wind speeds at any location for the reference periods shown. Additionally, the risk-targeted design wind speeds can be computed for any reference period and are not limited to the periods shown here.

Table 3. Design Wind Speeds for Several Reference Periods

Risk Category	Reference Period (yrs)	MRI (yrs)	V_{ULT}/V_{50}	V_{ULT} (mph)*
I	**25**	**300**	1.179	**106**
	30	371	1.200	108
	35	451	1.220	110
	40	533	1.236	111
II	**50**	**700**	1.264	**114**
III	**100**	**1700**	1.352	**122**
IV	**156**	**3000**	1.409	**127**
				*V_{50} = 90 mph

Table 4 recreates the first three columns of Table 3 but shows the percent error in design wind force for each reference period relative to both Risk Category I and Risk Category II. In the former case, the percentage indicates how much the risk-targeted design wind force is understated for a structure with reference period greater than 25 years while the latter case indicates how much this quantity is overstated. For example, a structure with a 35-year service life assigned to Risk Category I would be under-designed for the risk-targeted wind force by 6.6% while the same structure assigned to Risk Category II would be over-designed for the risk-targeted wind force by 7.4%. In this case, the percentage over-design is also a first-order approximation for the structural cost penalty associated with assigning GMPVPS to Risk Category II.

Table 4. Risk-targeted Wind Forces for Several Reference Periods

			Percentage increase in wind force	
Risk Category	Reference Period (yrs)	MRI (yrs)	Risk Category I*	Risk Category II**
I	**25**	**300**	0.0%	14.9%
	30	371	3.5%	10.9%
	35	451	6.6%	7.4%
	40	533	9.1%	4.4%
II	**50**	**700**	13.0%	0.0%
			*RC I forces result in understating risk-targeted wind force	**RC II forces result in overstating risk-targeted wind force

There is no risk-targeted basis for moving GMPVPS to risk category II, but the change imposes unnecessary inefficiencies and increased costs on all GMPVPS. GMPVPS with extended performance warranties and service lives can either be electively assigned to RC II or designed for wind loads adjusted to the correct reference period. It would be an error to assign all GMPVPS to RC II as the structures are penalized with the burden of excessive design wind forces and increased cost without commensurate benefit. The conclusion being that GMPVPS belong to Risk Category I with the recognition that service lives exceeding 25 years can and should be designed for a risk-targeted wind speed corresponding to an identical reference period.

Bibliography: ASCE. (2016). "Minimum Design Loads for Buildings and Other Structures." *ASCE 7-16*. Reston, VA.
Coulbourne, W. L., and Stafford, T. E. (2020). "Wind Loads - Guide to the Wind Load Provisions of ASCE 7-16." *ASCE Press*. Reston, VA.

Vickery, P. J, Wadhera, D., Galsworthy, J., Peterka, J. A., Irwin P. A., and Griffis, L. A. (2010). “Ultimate Wind Load Design Gust Wind Speeds in the United States for Use in ASCE-7.” *J. Struct. Eng.*, 136(5), 613-625.

Cost Impact: The net effect of the public comment and code change proposal will not increase or decrease the cost of construction
No change to code.

Public Comment# 3429

Public Comment 11:

Proponents: Trevor Taylor, representing Vestas American Wind Technology (trtay@vestas.com); Christof Dittmar, Siemens Gamesa Renewable Energy, representing Siemens Gamesa Renewable Energy; Toby Gillespie, representing GE Renewables North America, LLC (toby.gillespie@ge.com) requests Disapprove

Commenter's Reason: S76-22 proposes to increase the risk category for “public utility facilities providing power generation” to Risk Category IV (RC-IV). Whether “public utility” is locally defined or not, the proposed modifications could readily be interpreted to encompass wind turbine support structures, which introduces significant, unnecessary, and unjustifiable long-term development and permitting risks to future new and repower (turbine upgrade) renewable wind energy projects across the United States. Delays and cancellations of wind energy projects will unfortunately undermine, not enhance, proponent efforts to bolster resiliency and achieve community functional recovery objectives. Accordingly, GE Renewables North America, LLC., Vestas American Wind Technology, and Siemens Gamesa Renewable Energy (collectively, “OEMs”), representing the three largest manufacturers of onshore wind turbines and towers installed in the United States, recommend that S76-22 be disapproved.The primary purpose of this public comment is to provide specialized background information that explains 1) why S76-22 introduces significant but unnecessary risk into the wind energy permitting process, and 2) emphasizes how RC-IV design load levels cannot in most situations be reconciled by OEMs against existing onerous transportation infrastructure restrictions to develop economically viable towers required for projects.

Justification Statement:

WIND TURBINE SUPPORT STRUCTURE PERMITTING

Wind turbine tower and foundation support structures for U.S. wind energy projects are, in virtually all cases, permitted by local building departments and local Authorities Having Jurisdiction (AHJ) in accordance with International Building Code (IBC) and ASCE/SEI 7 load levels corresponding to Risk Category II (RC-II). This standard wind industry practice extends even before December 2011, when a joint committee of interested parties of diverse stakeholders developed through a consensus process *ASCE/AWEA RP2011, Recommended Practice for Compliance of Large Land-based Wind Turbine Support Structures* (RP2011). Section 4.4 of RP2011 provides justification for standard classification under Occupancy Category II of ASCE 7. Although the term “Occupancy Category” has evolved into “Risk Category” in ASCE 7 and the IBC to encompass a broader definition of risks associated with structural failure since RP2011 was published, the general classification and associated “normal/standard structure” building code design load importance factors have remained the same. Wind tower and foundation engineering practitioners and wind energy project permitting AHJ’s continue to reference RC-II load levels for design/verification today as standard industry practice.

It is reasonable and logical under closer scrutiny for wind energy engineering stakeholders to continue referencing RC-II load levels in the future.

Unfortunately, proposed S76-22 introduces uncertainty in wind turbine support structure Risk Category classification for which reasonable and expeditious project permitting depends. S76-22 attempts to establish a well-intended but insufficiently detailed policy declaration that all “public utility facilities providing power generation” shall be considered Risk Category IV. This declaration appears without underlying study that makes any attempt to distinguish critical and highly consequential differences in failure risk profiles between individual renewable energy “power generation” structures that provide incrementally beneficial contributions to the electric grid, and conventional large-scale power plants.

MAJOR WIND PROJECT VIABILITY RISKS ASSOCIATED WITH S76-22

Current and future wind energy development depends on use of increasingly larger turbine rotors with longer blades (to capture a larger windswept area) and taller towers to not only accommodate the longer blades, but to best position the rotor to capture faster moving (higher energy) and less-turbulent (more predictable) wind. The overall economic objective is typically to maximize energy production value against wind turbine support structure costs, both of which tend to increase with height.

Unfortunately, existing transportation infrastructure currently restricts full optimization of conventional tubular steel wind towers, even under current RC-II code design loads. Tower engineers from every OEM are routinely challenged to design cost-effective tower sections that can be fabricated at the factory and transported by ship, rail and/or road to installation site, while respecting onerous transportation constraints such as roadway weight limits, road and rail height clearances from overpasses and tunnels that effectively limit external tower diameters, and road & rail curves that restrict tower section lengths. The segmenting of towers into additional tower sections to accommodate transport restrictions must be balanced against the high cost of additional splice flanges and bolts and additional erection costs. In some cases, an economical solution simply does not

exist.

Unlike building structures and many industrial facilities, wind turbine towers are not readily scalable to accommodate increased design loads due to the transportation infrastructure restrictions. With S76-22 classifying wind turbine support structures as RC-IV, building code extreme wind design loads would increase a minimum of 22% compared to standard RC-II load levels across the continental U.S. This does not account for local tornado design loads, which will be required to be factored into the design load envelope for RC-IV and RC-III structures upon adoption of ASCE/SEI 7-22. The only plausible support structure solution that could accommodate the technical demand of such a large design load increase would not only entail a significant cost increase to the tower and foundation (roughly estimated at a combined +30%), but would necessitate a major reduction in tower height. The associated loss in energy value itself due to the reduced height is easily enough to render such projects economically unviable. This would have major implications for wind energy projects across all regions of the United States.

As for projects in regions of high seismic hazard where RC-II seismic design loads govern contemporary wind turbine support structure design, the 50% increase in seismic design loads attributable to RC-IV load levels preclude the technical development of any suitable tower from any OEM. This would have profound adverse implications for plans to replace or repower any of the thousands of existing obsolete wind turbines in dense wind energy sites in California like Altamont Pass, Riverside County/Palm Springs, and Tehachapi/Mojave.

Other public comments also in opposition to S76-22, and particularly the comment from the American Clean Power Association (ACP), provide detail on key points, including:

1) Electrical grid reliability and resiliency are inherently enhanced by policies that support the installation of multiple structurally independent and geographically distributed wind turbines,

2) Hypothetical failure of one or even multiple wind turbine support structures in a major disaster will not cause the adverse community impacts for which RC-IV categorization is intended to avoid,

3) Structural failures following actual extreme wind and seismic events due to perceived lack of structural integrity associated with RC-II level building code design loads for wind turbine tower and foundation support structures have been exceptionally rare, and

4) There is a lack of evidence that increasing building code design loads on individual wind turbine support structures commensurate with RC-IV levels would minimize power outages or avoid other adverse post-disaster community impacts.

The OEMs support these points.

The change in assignment of Risk Category for wind turbines as proposed by S76-22 will be cost and logistically prohibitive for wind energy in many cases without providing any measurable benefits in terms of resilience and recovery. The OEMs recommend that S76-22 be disapproved.

Bibliography: *ASCE/AWEA Recommended Practice for Compliance of Large Land-based Wind Turbine Support Structures* (ASCE/AWEA RP2011), American Wind Energy Association, December 2011.

Cost Impact: The net effect of the public comment and code change proposal will not increase or decrease the cost of construction
No change to code.

Public Comment# 3458

Public Comment 12:

Proponents: Jeroen van Dam, representing NREL (jeroen.van.dam@nrel.gov) requests Disapprove

Commenter's Reason: The National Renewable Energy Laboratory (NREL) opposes S-76-22 for the following reasons:

- The proposed change though simple in its implementation has broad impacts that are not well thought through. This includes significant impacts on the deployment of renewable energy.
- The proposed change is made with the argument of increasing grid resilience: it will not accomplish this and may in fact have the opposite effect.
- This proposal will increase costs and thus reduce the implementation of renewables on the grid. Renewables like Wind and PV solar are distributed in nature and deploying them on the grid will have a positive effect on grid reliability as it is less likely that an entire plant or all plants in an area will be impacted by a natural disaster. This was demonstrated in the case of hurricane Maria where the Punta Lima wind plant was impacted by the hurricane, yet the Santa Isabel wind plant located within 50 miles survived.
- Renewable Energy power plants are much smaller in capacity in comparison to traditional thermal plants and have built-in redundancy (PV plants have multiple strings with individual inverters, wind power plants consist of many individual wind turbines).
- Studies have shown that new generation needs to be built to keep up with increasing demands on the grid to maintain reliability. Renewables

like PV and Wind have both shown to be quickly deployable in comparison to coal, natural gas and nuclear plants. This proposal will reduce the implementation of wind energy as the relative cost increase due to the move from RC II to RC IV is more significant for wind energy as compared to other power generation.

- NREL is not aware of existing data that show that if wind plants would have been designed to Risk Category IV the grid would have stayed on line or recovered quicker in the wake of natural disasters. There are several articles showing no damage to wind turbines as a result of the hurricane Sandy: https://www.windpowermonthly.com/article/1158013/wind-farm-withstood-hurricane-sandy
- https://cleanenergy.org/blog/sandy-is-gone-wind-power-is-on/
- The proposal will negatively impact grid reliability as the proposal will drive developers to procuring less but more expensive wind turbines designed to RC IV instead of more, but less expensive, wind turbines designed to RC II. More wind turbines by definition provide more grid resilience and reliability through redundancy.
- A cursory cost analysis shows that the impact of the proposed change will increase the cost of Wind energy substantially more than the 2% listed by FEMA. This will significantly impact the economic viability of wind projects in earthquake, hurricane or tornado-prone regions. NREL plans to perform a more detailed independent cost analysis.
- The increase in costs will inadvertently jeopardize the renewable energy deployment goals of our federal government.
- Renewable energy is crucial in curbing climate change and its resulting increase in extreme weather events.

Jeroen van Dam

Principal Engineer

National Wind Technology

National Renewable Energy Laboratory

IEC TC 88 (Wind Energy Generation System) Chair

Cost Impact: The net effect of the public comment and code change proposal will not increase or decrease the cost of construction
This comment opposes the proposed change S76-22 which would increase the cost of wind energy beyond the stated "<2%" impact. By opposing S76-22 we can maintain the status quo and further help reduce the cost of energy for the public through deployment of renewable energy technology.

Public Comment# 3309

Public Comment 13:

Proponents: Scott Van Pelt, representing myself (scott.vanpelt@gamechangesolar.com) requests Disapprove

Commenter's Reason: The reason statement dictates that power generation facilities are "mostly assigned to RC III". This is not true for utility scale solar power plants. In excess of 90% of the utility scale solar power plants installed in the U.S. today are designed to RC I. S76-22 does not sufficiently address the dramatic effect of changing the required assignment of utility solar power plants from RC I to RC IV. The proposed change will cause climatic loads in many jurisdictions to exceed the mechanical ratings of most PV modules currently commercially available and therefore cause projects in these jurisdictions to be technically infeasible.

Cost Impact: The net effect of the public comment and code change proposal will not increase or decrease the cost of construction
No change to code.

Public Comment# 3294

Public Comment 14:

Proponents: Tom Vinson, representing American Clean Power Association (tvinson@cleanpower.org) requests Disapprove

Commenter's Reason: Summary:
S76-22 proposes to increase the risk category (RC) for power generation, including wind turbines, to RC IV. The American Clean Power Association (ACP) recommends S76-22 be disapproved. In summary, ACP's concerns are:S76-22 is based on two faulty premises:

(1) Power outages are caused by inadequate structural integrity of power generation facilities and, therefore, vastly increasing the minimum design load criteria will solve the problem.

However, per reports from grid reliability regulators and peer review studies: (1) outages are generally driven by transmission and distribution damage, not wind and solar generation facility damage and (2) wind and solar energy facilities have largely not suffered significant damage because of natural disasters.

Further, tens of thousands of wind turbines approved by authorities having jurisdiction (AHJs) under a RC II rating for wind turbines pursuant to ASCE/AWEA 2011 *Recommended Practice for Compliance of Large Land-based Wind Turbine Support Structures* have been structurally sound and available to generate power for communities during and after natural disasters, so the increase to RC IV as proposed in S76-22 is unnecessary and burdensome.

(2) Communities have power generation dedicated to serving their load and that power generation needs to be structurally stronger to support resilience recovery.

Except in communities that are electrically isolated from the broader power grid (such as villages in Alaska), the electrons from power generation of all types flows through the bulk electric system down to the distribution level based on physics. Generation is not dedicated to a particular community. Rather, grid operators instantaneously balance generation from various generation facilities in their region to match demand, including ramping up other generation in response to generator outages.

In that context, geographically dispersed power generation like wind and solar energy improve grid resilience, reliability, and functional recovery because (1) If an entire wind farm or solar facility ceases operation, which is rare, geographically diverse wind and solar farms elsewhere across the state or region are still putting electrons on the grid for delivery to homes and businesses and (2) even with a failure at an individual wind turbine(s) or solar panel section(s), the rest of the facility can continue to generate power.

Therefore, S76-22, which will make it more difficult to impossible to build additional facilities in at least some regions will inadvertently undermine reliability and resilience.

ACP also recommends disapproval of S76-22 because:

- By increasing the minimum building code design load criteria by up to 50% for wind turbines, S76-22 will be cost and logistically prohibitive to deploy wind energy in many cases without providing any measurable benefits in terms of resilience and recovery.
- By potentially making wind energy development impossible at least in certain regions and, at a minimum, more expensive everywhere, thus slowing deployment, S76-22 will inadvertently undermine reliability and safety.

Reason Statement:

While ACP understands the sponsor's concerns about power outages and supports the intent to make communities more resilient, adding utility-scale power generation to Risk Category IV (RC IV) in Table 1604.5 as proposed in S76-22 will not have the effect intended by its authors. And, in fact, by potentially making renewable energy development impossible at least in certain regions and, at a minimum, more expensive everywhere, thus slowing deployment, S76-22 will inadvertently undermine grid reliability and recovery and, therefore, public health and safety. Further, the fact that S76-22 is drafted as applying to only "public utility facilities" does not materially change ACP's concerns about the proposal given the uncertainty about how it will be interpreted in thousands of individual jurisdictions.

For more than a decade, wind turbine generators have been classified as Occupancy Category II, per the *Recommended Practice for Compliance of Large Land-based Wind Turbine Support Structures* (ASCE/AWEA RP2011). This document was co-designated by the American Society of Civil Engineers (ASCE) and the American Wind Energy Association (AWEA), and is used when classifying wind turbines. In 2012 the ICC changed from using Occupancy Category to Risk Category. Classifying a wind turbine as Risk Category II is now equivalent to the previous classification as Occupancy Category II.

AHJs have approved the construction of tens of thousands of wind turbines using this standard over the last eleven years. ACP is not aware of any increase in grid failure rates, including related to natural disasters and extreme weather, which would justify the significant change in the ratings for grid-connected wind turbines from RC II to RC IV. No specific evidence is presented by the proponents of S76-22 on wind turbines that explains why the existing RC II rating is inadequate to support resilience and functional recovery.

Moreover, S76-22 will make the transportation of wind towers potentially impossible in many parts of the country, given the added steel, weight, and size necessary to meet the new load requirements. Such significant changes to the design as proposed by S76-22 will mean the larger wind turbine tower sections will exceed many road, rail, and bridge height, weight and/or turn radii limits in the U.S.

The premise of S76-22 appears to be that power outages are caused by inadequate structural integrity of power generation facilities and, therefore, vastly increasing the minimum building code design load criteria by up to 50% will solve the problem. This premise is incorrect.

Various reports on generation outages over the last two decades by grid reliability regulators, the Federal Energy Regulatory Commission (FERC) and the North American Electric Reliability Corporation (NERC), have not identified the structural integrity of power generation as important factors.

- The U.S.-Canada Power Outage System Task Force Final Report on the August 14, 2003, Blackout in the Eastern United States and Canada identified four major causes all related to improper operation and maintenance of the transmission system by a utility in Ohio.
- A joint FERC-NERC staff report on blackouts in Arizona and Southern California on September 8, 2011, found the grid operator failed to maintain the transmission system within its system operation limits, which contributed to cascading outages.
- NERC's report on Hurricane Sandy, which made landfall on October 29, 2012, indicated "no damage was reported" to wind turbines in the impact area.
- NERC's report on Hurricane Harvey, which made landfall on August 25, 2017, found "only minimal damage" was reported at wind energy facilities and facilities other than one that were offline came back online on the next day or the day after on August 26 or 27.
- More recently, FERC-NERC issued a joint report on the February 2021 extreme cold and freeze event that led to multiple days of outages in Texas and more limited challenges in other states that identified two major causes: (1) power generation and natural gas pipelines were not adequately winterized which led to frozen equipment and systems and (2) inadequate supplies of natural gas meant there was insufficient gas for power generation as it was being used for home heating.

In response to all the above cases, FERC and NERC have adopted various federal rules and reliability standards to address the concerns that were identified.

Even the longest power outage in U.S. history in Puerto Rico after Hurricanes Irma and Maria in September 2017 was due primarily to 80% of the transmission and distribution network being inoperable and difficult to repair given mountainous topography, rather than power generation facilities being inoperable. As a peer reviewed article in the February 2019 *IEEE Power and Energy Technology Systems Journal* found, "damage to the conventional electric power generation infrastructure was relatively minor…". A 95 MW wind farm, Puerto Rico's largest, suffered "no damage" while at the other wind farm, located near Maria's landfall, the turbine blades were damaged, but only one turbine support structure failed. Of the five utility-scale solar facilities operating at the time, one was "practically undamaged," three experienced only "light to moderate" damage, and only one, in certain sections of the facility near Maria's landfall, suffered more significant damage.

S76-22 is essentially a proposed solution to a problem – inadequate structural integrity of power generation facilities – that largely does not exist and is not contributing to blackouts.

Geographically dispersed power generation like wind and solar energy improve grid resilience, reliability, and functional recovery. If an entire wind farm or solar facility ceases operation, which is rare, geographically diverse wind and solar farms elsewhere across the state or region are still putting electrons on the grid for delivery to homes and businesses.

Further, the failure at an individual wind turbine does not mean an entire wind farm stops operating. The remaining turbines can continue to generate power if the substation and transmission to the grid remains up and running. The same feature is true with respect to solar generation.

A premise of S76-22 also appears to be that communities have power generation dedicated to serving their load and that power generation needs to be structurally stronger. That also is largely incorrect.

Except in communities that are electrically isolated from the broader power grid (such as villages in Alaska), the electrons from power generation of all types flows through the grid based on physics, the generation is not dedicated to a particular community. Rather, grid operators instantaneously balance generation from various power facilities in their area to match demand. As a part of this balancing, the grid operators account for generation or transmission that is offline for maintenance, intermittent by design, or forced offline by a component or system failure or weather. In the U.S., the grid is largely operated on a regional basis, meaning grid operators ramp up and down generation over a geographically diverse area that is not impacted by a weather system the same way. Adding the geographic diversity of wind and solar, with the broad operating areas of the grid operators, supports resilience and recovery.

Further, grid operators require excess generation capacity that is well-beyond (15% or more) demand peaks (i.e. "reserve margins") to facilitate the ability to ramp up generation to meet demand and to address generator outages (both planned an unplanned).Finally, modern utility-scale wind and solar facilities support reliability, resilience, and recovery through providing essential reliability services to the power grid like frequency support, ramping, and voltage control as documented by the U.S. Department of Energy and other grid experts.

Cost Impact: The net effect of the public comment and code change proposal will not increase or decrease the cost of construction Disapproving S76-22 as ACP recommends will retain the status quo for construction costs.

The proponents of S76-22 estimated an increase in construction costs of only 0-2%. However, this estimate significantly underestimates the cost for wind and solar energy compliance, and potential other facilities. FEMA acknowledges as much in their January 2021 joint report with NIST (FEMA P-2090/NIST SP-1254). Table 7-4 (page 70) in the report identifies the cost of Recommendation 4 to "mandate the Design of New and Upgrade of Existing Lifeline Infrastructure Systems to Meet Recovery-Based Objectives" is "high" with feasibility rated as "difficult" and the implementation timeline identified as "intermediate to long." Recommendation 4 is conceptually like S76-22. Yet, S76-22 seeks to impose this requirement now. The proponents do not acknowledge the "high" cost impact of S76-22 to the construction of wind and solar facilities.

The 0-2% cost increase estimated by proponents is based on the increase in design load for a building frame. A building frame is a smaller percentage of the overall cost of a building than the foundation and tower are for a wind turbine which are directly impacted by S76-22.

The change in assignment of Risk Category for wind turbines as proposed by S76-22 will hence be cost and logistically prohibitive for wind energy in many cases without providing any measurable benefits in terms of resilience and recovery.

Public Comment# 3292

Public Comment 15:

Proponents: John Williams, representing Committee on Healthcare (ahc@iccsafe.org) requests Disapprove

Commenter's Reason: The scope of the Healthcare committee is for healthcare facilities, such as ambulatory care facilities, clinics, nursing homes and hospitals. Therefore, this public comment is limited to the effect of the new language to the description of Risk Category IV and how it would effect the 1st and 2nd item in the list.

- Group I-2, Condition 2 occupancies having emergency surgery or emergency treatment facilities.
- Ambulatory care facilities having emergency surgery or emergency treatment facilities.

The added language in the description for Risk Category IV could be read that any of the current occupancies in this list could sustain loss of function as long as that damage did not represent a substantial hazard to the occupants. These are a list of essential facilities that must be operational after an event for the safety and recovery of the entire community. Hospitals that have emergency surgery or emergency treatment facilities need to be operational after an emergency. There could be a lot of damage to the building that would not be a substantial hazard to occupants, but would stop the emergency room from functioning.

Cost Impact: The net effect of the public comment and code change proposal will not increase or decrease the cost of construction
No change to code.

Public Comment# 3058

S77-22

IBC: TABLE 1604.5

Proposed Change as Submitted

Proponents: David Bonowitz, representing Self (dbonowitz@att.net)

2021 International Building Code

Revise as follows:

TABLE 1604.5 RISK CATEGORY OF BUILDINGS AND OTHER STRUCTURES

RISK CATEGORY	NATURE OF OCCUPANCY
I	Buildings and other structures that represent a low hazard to human life in the event of failure, including but not limited to: Agricultural facilities. Certain temporary facilities. Minor storage facilities.
II	Buildings and other structures except those listed in Risk Categories I, III and IV.
III	Buildings and other structures that represent a substantial hazard to human life in the event of failure, including but not limited to: Buildings and other structures whose primary occupancy is public assembly with an occupant load greater than 300. Buildings and other structures containing one or more public assembly spaces, each having an occupant load greater than 300 and a cumulative occupant load of these public assembly spaces of greater than 2,500. Buildings and other structures containing Group E or Group I-4 occupancies or combination therof, with an occupant load greater than 250. Buildings and other structures containing educational occupancies for students above the 12th grade with an occupant load greater than 500. Group I-2, Condition 1 occupancies with 50 or more care recipients. Group I-2, Condition 2 occupancies not having emergency surgery or emergency treatment facilities. Group I-3 occupancies. Any other occupancy with an occupant load greater than 5,000.[a] Power-generating stations, water treatment facilities for potable water, wastewater treatment facilities and other public utility facilities not included in Risk Category IV. Buildings and other structures not included in Risk Category IV containing quantities of toxic or explosive materials that: Exceed maximum allowable quantities per control area as given in Table 307.1(1) or 307.1(2) or per outdoor control area in accordance with the *International Fire Code* ; and Are sufficient to pose a threat to the public if released.[b]
IV	Buildings and other structures designated as essential facilities <u>and buildings where loss of function represents a substantial hazard to occupants</u>, including but not limited to: <u>Group I-1 occupancies in which at least half of the Group I-1 care recipients qualify as Group I-1, Condition 2</u> Group I-2, Condition 2 occupancies having emergency surgery or emergency treatment facilities. Ambulatory care facilities having emergency surgery or emergency treatment facilities. Fire, rescue, ambulance and police stations and emergency vehicle garages Designated earthquake, hurricane or other emergency shelters. Designated emergency preparedness, communications and operations centers and other facilities required for emergency response. Power-generating stations and other public utility facilities required as emergency backup facilities for *Risk Category* IV structures. Buildings and other structures containing quantities of highly toxic materials that: Exceed maximum allowable quantities per control area as given in Table 307.1(2) or per outdoor control area in accordance with the *International Fire Code* ; and

	International Fire Code , and Are sufficient to pose a threat to the public if released.[b] Aviation control towers, air traffic control centers and emergency aircraft hangars. Buildings and other structures having critical national defense functions. Water storage facilities and pump structures required to maintain water pressure for fire suppression.

a. For purposes of occupant load calculation, occupancies required by Table 1004.5 to use gross floor area calculations shall be permitted to use net floor areas to determine the total occupant load.

b. Where approved by the building official, the classification of buildings and other structures as Risk Category III or IV based on their quantities of toxic, highly toxic or explosive materials is permitted to be reduced to Risk Category II, provided that it can be demonstrated by a hazard assessment in accordance with Section 1.5.3 of ASCE 7 that a release of the toxic, highly toxic or explosive materials is not sufficient to pose a threat to the public.

Reason: This proposal improves consistency in the assignment of risk categories. It applies current thinking from IBC Chapters 3 and 4 to the risk category assignments in Table 1604.5. The logic of the proposal is as follows:

1. **Risk Category IV is the IBC's main tool to provide functional facilities** soon after a natural hazard event (earthquake, flood, snow, or wind). In terms of post-event functionality, there is a wide gap between RC II-III facilities (which have identical requirements for nonstructural systems) and RC IV facilities. The difference in expected recovery time can be on the order of weeks or months.
2. The performance gap between RC II-III and RC IV is most acute for occupancies that depend on functional nonstructural systems and special design provisions to serve vulnerable users.
3. Because these facilities are rare and specially designed, their services and occupants cannot be quickly relocated to other buildings.
4. Therefore, facilities with special design features and vulnerable users should be strong candidates for Risk Category IV.

Following this logic, this proposal expands the scope of RC IV from just "essential facilities" to include "buildings where loss of function represents a substantial hazard." **This "substantial hazard" can even be life threatening** where, for example, a 24-hour medical facility, residential care facility, public water or power utility, detention center with impeded egress, or critical supply chain facility is out of service for weeks. The code defines *essential facilities* as those that need to "remain operational" through and after an "extreme" earthquake, flood, wind, or snow event. The additional facilities described by the logic above and considered in this proposal might not require continuous operation, but **prolonged downtime – which can be expected from RC II design criteria – can give rise to a similar risk for vulnerable users**, if not on Day 1 after the event, then possibly by Day 3, 10, or 30.

This proposal addresses custodial care facilities that provide housing for vulnerable residents. Group I-1 buildings, currently assigned to RC II, provide **24-hour supervised housing** for residents receiving ***custodial care***, a defined term meaning assistance with day-to-day tasks, including bathing, cooking, and taking medication. This proposal reassigns certain Group I-1, Condition 2 facilities to RC IV.

Condition 2 occupancies include assisted living facilities (this is the term used in Sections 308.2 and 420.7) and similar care facilities. Residents in these facilities require assistance with daily tasks as well as **assistance with emergency egress** in or after natural hazard events. These facilities are already required to meet special design requirements in IBC Section 420, and specifically Section 420.7, regarding sprinklers, alarms, refuge areas, and cooking facilities. These requirements are not met by normal market housing. Further, the staffs that provide supervision and assist residents with their daily tasks have facility-specific training and resources. Therefore, residents of these facilities cannot be simply relocated to market housing.

Because Group I-1 facilities can sometimes combine Condition 1 and Condition 2, the proposal assigns to RC IV only those that are majority Condition 2. Since Group I-1 includes only facilities with at least 17 residents, only facilities with at least 9 residents qualified as Condition 2 are covered by this proposal.

Despite this reassignment, this proposal is measured in its scope. **It does NOT affect:**

- Custodial care facilities for 16 or fewer residents. Per Section 308.2, Group I-1 applies only to larger facilities.
- Group I-1, Condition 1 facilities, whose residents are more capable of self-preservation than those in Condition 2. For example, alcohol and drug centers, halfway houses, and other care facilities are included in Group I-1 but are likely Condition 1.
- Group I-1 facilities that are majority Condition 1.
- Other small residential facilities assigned to Group R, even if subject to Section 420.
- Any residential or care facility eligible for design under the IRC.
- Daycare facilities (child or adult), typically in Group I-4.

This proposal is consistent with current IBC principles. This proposal extends the current scope of Risk Category IV, but it does so consistent with the purpose, philosophy, and normative goals the IBC already represents.

Even if you think of the IBC as strictly a “life safety” code, safety is more than mere survival, and safety can be at risk even after the rain, snow, or ground shaking has stopped. If building damage affects the safety of vulnerable users in the following days or weeks, it is consistent with even a safety-based code to manage those risks through design.

But the IBC’s purpose is broader than just “life safety.” Section 101.3 states that the purpose of the IBC is to provide a “reasonable level of safety, **health and general welfare**.” So a focus on the health and welfare of vulnerable building users, even where their building provides immediate safety, is both “reasonable” and completely consistent with the purpose of the code.

With its definition of *essential facilities* and its use of Risk Category IV to ensure they “remain operational,” the IBC is already more than a safety code. It is, in fact, already a basic “functional recovery” code; the only question is which building uses, and users, we decide should qualify for a designed recovery. Where RC II or RC III is not reliable enough, it is consistent with the purpose and scope of the IBC to assign more building uses to RC IV.

Not all of the IBC’s tools are perfectly nuanced. Some involve bright lines and broad categories, and it is sometimes necessary to err on the conservative side. So even if a certain use is not quite as “essential” as a fire station, RC IV might still be a more appropriate choice than RC II or RC III, and in these cases, it is consistent with the code to assign buildings to the higher category. In time, design criteria should evolve to address more specific recovery objectives (FEMA, 2020; FEMA-NIST, 2021). But those nuanced provisions are *at least* a decade away. For now, however, RC IV is the most appropriate tool we have, and we ought to use it. Adapting existing practices to new objectives is entirely consistent with the history of code development.

IBC Chapters 3 and 4 define and provide special requirements to manage fire and egress risks for particular groups of users. Table 1604.5 is meant to do the same for rare natural hazard events. But while Chapters 3 and 4 consider dozens of specific building uses and conditions, Table 1604.5 has only four categories. Changing the scope of Risk Category IV to account for specific building uses that are not adequately served by RC II or RC III criteria is consistent with the detailed, use-specific approach of Chapters 3 and 4.

Table 1604.5 represents public policy about what we desire from our buildings. As such, it has changed over time, along with public expectations. As we consider new or increasing risks related to more frequent natural hazard events, urbanization, the pandemic, or aging populations, it is both appropriate and consistent with past practice for Table 1604.5 to evolve as well.

Bibliography: Almufti, I. et al. (2016). “The resilience-based design of 181 Fremont Tower,” *Structure*, June.
Bade, M. (2014). “Mission Bay Block 25 Building – An Exercise in Lean Target Value Design,” Presentation to the Lean Construction Institute, Finland, April 12.

Berkowitz, R. (2021). “UCSF Center for Vision Neuroscience,” 2021 EERI Annual Meeting, Session 3B, March 24.

CISA, 2020. “Guidance on the Essential Critical Infrastructure Workforce: Ensuring Community and National Resilience in COVID-19 Response (Version 2.0).” U.S. Department of Homeland Security, Cybersecurity & Infrastructure Security Agency, March 28.

FEMA (2020b). *NEHRP Recommended Seismic Provisions for New Buildings and Other Structures, Volume II: Part 3 Resource Papers*, 2020 Edition, FEMA P-2082-2, prepared by the Building Seismic Safety Council of the National Institute of Buildings Sciences for Federal Emergency Management Agency, September.

FEMA-NIST (2021). *Recommended Options for Improving the Built Environment for Post-Earthquake Reoccupancy and Functional Recovery Time*, FEMA P-2090 / NIST SP-1254, Federal Emergency Management Agency and National Institute of Standards and Technology, January.

Mar, D. (2021). “Making Resilience Affordable,” 2021 EERI Annual Meeting, Session 3B, March 24.

SEFT Consulting Group (2015). “Beaverton School District Resilience Planning for High School at South Cooper Mountain and Middle School at Timberland,” SEFT Consulting Group, July 10.

SFDPH, 2020. “Order of the Health Officer No. C19-07b.” City and County of San Francisco, Department of Public Health, March 31, et seq.

Cost Impact: The code change proposal will increase the cost of construction
This proposal will increase the cost of construction for the buildings newly assigned to RC IV. The largest increases will likely be in high seismic areas where assignment to RC IV makes the largest changes to structural and nonstructural design criteria. This does not mean, however, that every RC IV facility will have the same unit cost as a new state-of-the-art hospital. On the contrary, case studies of voluntary RC IV-like seismic design have found a **construction cost premium ranging typically from 0% to 2%** relative to normal RC II designs. (See proposal references by Almufti, Bade, Berkowitz, Mar, and SEFT.) This estimate stands to reason: Wind, snow, and earthquake loads can already vary significantly within a jurisdiction, but the building designs and unit costs don’t change wildly from one side of the county to the other. For example, the seismic design force in Berkeley is about 1.5 times that in downtown San Francisco; so with respect to the structure, any nursing home or grocery store you can build as RC II in Berkeley you can also build as RC IV in San Francisco with no change to the design. The same is likely true for snow design, for example, in Vail v. Boulder and for wind design in Galveston v. the west side of Houston. On the nonstructural side, a facility’s nonstructural systems might need more bracing or support when assigned to RC IV, but the number and size of the components themselves don’t suddenly look

like a hospital just because the risk category has changed.

S77-22

Public Hearing Results

Committee Action: **Disapproved**

Committee Reason: Disapproved as the broad definition of I-1 condition 2 could be extended beyond the intent and could have the unintended result of less I-2 condition 2 facilities. The committee noted that the 'half' could be hard to enforce as the type of facilities addressed tend to regularly change number of vulnerable residents. (Vote: 12-2)

S77-22

Individual Consideration Agenda

Public Comment 1:

IBC: TABLE 1604.5

Proponents: David Bonowitz, representing Self (dbonowitz@att.net) requests As Modified by Public Comment

Modify as follows:

2021 International Building Code

TABLE 1604.5 RISK CATEGORY OF BUILDINGS AND OTHER STRUCTURES

RISK CATEGORY	NATURE OF OCCUPANCY
I	Buildings and other structures that represent a low hazard to human life in the event of failure, including but not limited to: Agricultural facilities. Certain temporary facilities. Minor storage facilities.
II	Buildings and other structures except those listed in Risk Categories I, III and IV.
III	Buildings and other structures that represent a substantial hazard to human life in the event of failure, including but not limited to: Buildings and other structures whose primary occupancy is public assembly with an occupant load greater than 300. Buildings and other structures containing one or more public assembly spaces, each having an occupant load greater than 300 and a cumulative occupant load of these public assembly spaces of greater than 2,500. Buildings and other structures containing Group E or Group I-4 occupancies or combination therof, with an occupant load greater than 250. Buildings and other structures containing educational occupancies for students above the 12th grade with an occupant load greater than 500. Group I-2, Condition 1 occupancies with 50 or more care recipients. Group I-2, Condition 2 occupancies not having emergency surgery or emergency treatment facilities. Group I-3 occupancies. Any other occupancy with an occupant load greater than 5,000.[a] Power-generating stations, water treatment facilities for potable water, wastewater treatment facilities and other public utility facilities not included in Risk Category IV. Buildings and other structures not included in Risk Category IV containing quantities of toxic or explosive materials that: Exceed maximum allowable quantities per control area as given in Table 307.1(1) or 307.1(2) or per outdoor control area in accordance with the *International Fire Code* ; and Are sufficient to pose a threat to the public if released.[b]
IV	Buildings and other structures designated as essential facilities and buildings where loss of function represents a substantial hazard to occupants, including but not limited to: Group I-1 ~~occupancies in which at least half of the Group I-1 care recipients qualify as Group I-1~~, Condition 2 <u>assisted living facilities.</u> Group I-2, Condition 2 occupancies having emergency surgery or emergency treatment facilities. Ambulatory care facilities having emergency surgery or emergency treatment facilities. Fire, rescue, ambulance and police stations and emergency vehicle garages Designated earthquake, hurricane or other emergency shelters. Designated emergency preparedness, communications and operations centers and other facilities required for emergency response. Power-generating stations and other public utility facilities required as emergency backup facilities for *Risk Category* IV structures. Buildings and other structures containing quantities of highly toxic materials that: Exceed maximum allowable quantities per control area as given in Table 307.1(2) or per outdoor control area in accordance with the *International Fire Code* ; and

	International Fire Code , and Are sufficient to pose a threat to the public if released.[b] Aviation control towers, air traffic control centers and emergency aircraft hangars. Buildings and other structures having critical national defense functions. Water storage facilities and pump structures required to maintain water pressure for fire suppression.

a. For purposes of occupant load calculation, occupancies required by Table 1004.5 to use gross floor area calculations shall be permitted to use net floor areas to determine the total occupant load.

b. Where approved by the building official, the classification of buildings and other structures as Risk Category III or IV based on their quantities of toxic, highly toxic or explosive materials is permitted to be reduced to Risk Category II, provided that it can be demonstrated by a hazard assessment in accordance with Section 1.5.3 of ASCE 7 that a release of the toxic, highly toxic or explosive materials is not sufficient to pose a threat to the public.

Commenter's Reason: This public comment responds to concerns raised at the committee action hearings.

- Wayne Jewell correctly noted that the proposal as submitted, by trying to parse combinations of Group I-1 Condition 1 and Condition 2, creates an unnecessary enforcement headache and is dismissive of facilities with fewer assisted living units. This comment fixes that problem by simply focusing on Group I-1 Condition 2 in any form. This change makes proposal S77 consistent in implementation and enforcement with IBC Section 420 (especially 420.6 through 420.9) which already rely on the building official to identify Condition 1 v. Condition 2 without specific provisions for all the possible combinations. If the building official can enforce current Section 420, he or she can enforce S77 as modified by this public comment.
- Jonathan Flannery, on behalf of the ICC Healthcare Committee, correctly noted that Condition 2 still encompasses a wide range of uses. This comment fixes that problem by narrowing the scope to "assisted living facilities," a specific facility type and a term already used in IBC Sections 308.2 and 420.7.

As with the original proposal (see the bullet list there) and with the current code, S77 as modified by this comment still would not affect any facility with up to 16 care recipients.

Importantly, **nobody at the hearings argued that assisted living facilities and their occupants should *not* have the protections provided by Risk Category IV**. On the contrary, the speakers in opposition both noted how important these facilities are and the unacceptable costs imposed on the community when they are forced to shut their doors for any reason.

There was one comment at the hearings about the possibility that increased construction costs resulting from this change could discourage the development of I-1 facilities, but a) that is acknowledged in the cost impact statement, and the question, as always, is whether the benefits exceed the costs (I believe they do), b) the same argument can be made for any use assigned to RC IV, and if dispositive, it would mean that Table 1604.5 can never be changed, and c) the fast-growing market for senior and memory care facilities has already found its own efficiencies and has demonstrated that development in this sector is not going to be easily inhibited by small cost increases. On the contrary, it's a growth industry.

And that last point raises a topic rarely heard at ICC hearings: Private equity. As shown in the MEDPAC and Seniors Housing Business references (see bibliography), private equity is increasingly buying and building assisted living (I-1) and nursing home (I-2) facilities. These facilities have long been for-profit businesses, but Gupta et al. show that the nature of private equity (PE) is different and is likely to lead to an even greater shift of owner interest from patient care to investor profit, with increased mortality already observed. They write that nursing homes and assisted living facilities are especially vulnerable to these new market conditions:

"The past two decades have seen a rapid increase in Private Equity (PE) investment in healthcare, a sector in which intensive government subsidy and market frictions could lead high-powered **for-profit incentives to be misaligned with the social goal of affordable, quality care**. ... PE's success in other sectors may not be relevant to healthcare, which suffers from unique market frictions. For example, patients cannot accurately assess provider quality, they typically do not pay for services directly, and a web of government agencies act as both payers and regulators (Cutler, 2011; Skinner, 2011). **These features weaken the natural ability of a market to align firm incentives with consumer welfare and could mean that high-powered incentives to maximize profits have detrimental implications for consumer welfare** (Hansmann, 1980; Hart et al., 1997; Chandra et al., 2016)." [Emphasis added.]
If the owners of these vital facilities are now more willing than ever to cut costs, cut care, and walk away from losses -- at the direct expense of the vulnerable occupants and at the indirect expense of the community -- the least the building code can do is ensure that a major earthquake, hurricane, or winter storm does not add to the problem by giving them yet another excuse. The building code provides essentially one tool to express the importance of natural hazard resistance and recovery through design, and that tool is assignment to Risk Category IV.

Bibliography: Gupta, A., et al., 2021. "Does Private Equity Investment in Healthcare Benefit Patients? Evidence from Nursing Homes." NBER Working Paper 28474, February. Available at https://www.nber.org/papers/w28474.
Medicare Payment Advisory Commission (MEDPAC), 2021. "Congressional request: Private equity and Medicare." June. Available at

https://www.medpac.gov/wp-content/uploads/import_data/scrape_files/docs/default-source/default-document-library/jun21_ch3_medpac_report_to_congress_sec.pdf

Seniors Housing Business, 2021. "IRA Capital Buys 160-Unit Portfolio in Northern California for $106.5M." January 21. Available at https://seniorshousingbusiness.com/ira-capital-buys-160-unit-portfolio-in-northern-california-for-106-5m/

Cost Impact: The net effect of the public comment and code change proposal will increase the cost of construction
Same as the original proposal.

Public Comment# 3466

S78-22

IBC: TABLE 1604.5

Proposed Change as Submitted

Proponents: David Bonowitz, representing Self (dbonowitz@att.net)

2021 International Building Code

Revise as follows:

TABLE 1604.5 RISK CATEGORY OF BUILDINGS AND OTHER STRUCTURES

RISK CATEGORY	NATURE OF OCCUPANCY
I	Buildings and other structures that represent a low hazard to human life in the event of failure, including but not limited to: Agricultural facilities. Certain temporary facilities. Minor storage facilities.
II	Buildings and other structures except those listed in Risk Categories I, III and IV.
III	Buildings and other structures that represent a substantial hazard to human life in the event of failure, including but not limited to: Buildings and other structures whose primary occupancy is public assembly with an occupant load greater than 300. Buildings and other structures containing one or more public assembly spaces, each having an occupant load greater than 300 and a cumulative occupant load of these public assembly spaces of greater than 2,500. Buildings and other structures containing Group E or Group I-4 occupancies or combination therof, with an occupant load greater than 250. Buildings and other structures containing educational occupancies for students above the 12th grade with an occupant load greater than 500. Group I-2, Condition 1 occupancies with 50 or more care recipients. Group I-2, Condition 2 occupancies not having emergency surgery or emergency treatment facilities. Group I-3 occupancies. Any other occupancy with an occupant load greater than 5,000.[a] Power-generating stations, water treatment facilities for potable water, wastewater treatment facilities and other public utility facilities not included in Risk Category IV. Buildings and other structures not included in Risk Category IV containing quantities of toxic or explosive materials that: Exceed maximum allowable quantities per control area as given in Table 307.1(1) or 307.1(2) or per outdoor control area in accordance with the *International Fire Code* ; and Are sufficient to pose a threat to the public if released.[b]
IV	Buildings and other structures designated as essential facilities <u>and buildings where loss of function represents a substantial hazard to occupants or users</u>, including but not limited to: Group I-2, Condition 2 occupancies having emergency surgery or emergency treatment facilities. Ambulatory care facilities having emergency surgery or emergency treatment facilities. <u>Group F-1 food processing establishments or commercial kitchens, not primarily associated with dining facilities, with *gross floor area* exceeding 30,000 square feet.</u> <u>Group M retail or wholesale stores with *gross floor area* exceeding 30,000 square feet in which at least half of the usable floor area is used for the sale of food or beverages.</u> Fire, rescue, ambulance and police stations and emergency vehicle garages Designated earthquake, hurricane or other emergency shelters. Designated emergency preparedness, communications and operations centers and other facilities required for emergency response. Power-generating stations and other public utility facilities required as emergency backup facilities for *Risk Category* IV structures. Buildings and other structures containing quantities of highly toxic materials that:

	Buildings and other structures containing quantities of highly toxic materials that: Exceed maximum allowable quantities per control area as given in Table 307.1(2) or per outdoor control area in accordance with the *International Fire Code* ; and Are sufficient to pose a threat to the public if released.[b] Aviation control towers, air traffic control centers and emergency aircraft hangars. Buildings and other structures having critical national defense functions. Water storage facilities and pump structures required to maintain water pressure for fire suppression.

a. For purposes of occupant load calculation, occupancies required by Table 1004.5 to use gross floor area calculations shall be permitted to use net floor areas to determine the total occupant load.

b. Where approved by the building official, the classification of buildings and other structures as Risk Category III or IV based on their quantities of toxic, highly toxic or explosive materials is permitted to be reduced to Risk Category II, provided that it can be demonstrated by a hazard assessment in accordance with Section 1.5.3 of ASCE 7 that a release of the toxic, highly toxic or explosive materials is not sufficient to pose a threat to the public.

Reason: This proposal improves consistency in the assignment of risk categories. It applies current thinking from IBC Chapters 3 and 4 to the risk category assignments in Table 1604.5. The logic of the proposal is as follows:

1. **Risk Category IV is the IBC's main tool to provide functional facilities** soon after a natural hazard event (earthquake, flood, snow, or wind). In terms of post-event functionality, there is a wide gap between RC II-III facilities (which have identical requirements for nonstructural systems) and RC IV facilities. The difference in expected recovery time can be on the order of weeks or months.
2. The performance gap between RC II-III and RC IV is most acute for occupancies that depend on functional nonstructural systems and special design provisions to serve vulnerable users.
3. Because these facilities are rare and specially designed, their services and occupants cannot be quickly relocated to other buildings.
4. Therefore, facilities with special design features and vulnerable users should be strong candidates for Risk Category IV.

Following this logic, this proposal expands the scope of RC IV from just "essential facilities" to include "buildings where loss of function represents a substantial hazard." **This "substantial hazard" can even be life threatening** where, for example, a 24-hour medical facility, residential care facility, public water or power utility, detention center with impeded egress, or critical supply chain facility is out of service for weeks. The code defines *essential facilities* as those that need to "remain operational" through and after an "extreme" earthquake, flood, wind, or snow event. The additional facilities described by the logic above and considered in this proposal might not require continuous operation, but **prolonged downtime – which can be expected from RC II design criteria – can give rise to a similar risk for vulnerable users**, if not on Day 1 after the event, then possibly by Day 3, 10, or 30.

This proposal addresses large facilities that are essential to a stable food supply chain. "Food and Agriculture" has been designated a "critical infrastructure sector" by the federal government since 2003 and as such, is addressed in the National Infrastructure Protection Plan (NIPP). The mission of the sector is "to protect against a disruption anywhere in the food system that would pose a serious threat to public health, safety, welfare, or to the national economy," and to achieve that mission, the NIPP relies explicitly on "the support and action of the private sector." (FDA et al., 2015)

No doubt that reliance includes the government's general adoption of ICC's model codes. Indeed, while the NIPP lays out an extensive sector taxonomy including categories for "Processing, Packaging, and Production" and "Agricultural and Food Product Distribution," it says almost nothing about the design of these critical facilities as buildings. For that, **the NIPP is relying on the IBC**, which labels these facilities as "food processing establishments," "commercial kitchens," and "retail or wholesale stores" – and currently assigns them all to Risk Category II, just like any other factory or shop.

More recently, as cities and states took actions against the COVID pandemic, nearly all immediately recognized grocery stores, food banks, and other establishments on the food supply chain as **"essential businesses"** (For example, SFDPH, 2020), and the federal government issued an advisory identifying grocery and food manufacturing employees as **"essential critical infrastructure workers"** (CISA, 2020). This recognition not only reflected an obvious need – one that arises after every natural hazard event as ell – but was also consistent with the NIPP's emphasis on public health and the economy, not just building-specific safety.

Food processing facilities, commercial kitchens, and large grocery stores have mechanical, electrical, and plumbing systems unlike those in other RC II commercial buildings. Only Risk Category IV design provisions address the post-event functionality of these nonstructural systems.

For these reasons, this proposal considers certain Group F-1 and Group M uses currently assigned to RC II. The proposal reassigns the largest of these, with gross floor areas exceeding 30,000 square feet, to RC IV. The 30,000 square foot criterion is meant to **exempt minor processing facilities and small stores that are less likely to disrupt the local food supply chain if damaged**. In the larger facilities, the per-building costs

of a Risk Category IV design (such as the seismic certification of designated equipment, discussed below) are also less significant. The 30,000 square foot criterion is based on an in-progress inventory of existing grocery stores in San Francisco, where buildings of this size are all standalone supermarkets serving large customer bases, as opposed to specialty stores within larger buildings. The proposed cutoff size is somewhat arbitrary, but no more so than that other arbitrary measures of size or occupant load used by the current code to assign occupancy or risk category. The exercise of assigning occupancies and risk categories has always involved drawing lines based on judgment, so this is no departure from past code development practices.

The two uses proposed for RC IV are:

- Large Group F-1 food processing establishments or commercial kitchens. Consistent with Section 306.2, this proposal includes only those facilities not associated with specific dining facilities. Also, Section 306.2 applies to these uses in buildings larger than just 2500 square feet, so the proposed 30,000 square foot criterion is far more selective.
- Large Group M supermarkets. As described above, the 30,000 square foot criterion is meant to capture only the type of store that serves a large area and could represent a large portion of the local food distribution system. Because many of these larger facilities sell a variety of items, the proposal includes only those where at least half the floor space is dedicated to food supply.

Despite this reassignment, this proposal is measured in its scope. **It does NOT affect:**

- Processing facilities or markets smaller than 30,000 square feet.
- Multi-purpose stores selling non-food items where less than half the area is for food.
- Facilities primarily associated with specific restaurants or dining establishments.
- Food warehouses, trucking facilities, or other distribution facilities along the food supply chain, even if associated with the RC IV processing facility or supermarket.

This proposal is consistent with current IBC principles. This proposal extends the current scope of Risk Category IV, but it does so consistent with the purpose, philosophy, and normative goals the IBC already represents.

Even if you think of the IBC as strictly a “life safety” code, safety is more than mere survival, and safety can be at risk even after the rain, snow, or ground shaking has stopped. If building damage affects the safety of vulnerable users in the following days or weeks, it is consistent with even a safety-based code to manage those risks through design.

But the IBC’s purpose is broader than just “life safety.” Section 101.3 states that the purpose of the IBC is to provide a “reasonable level of safety, **health and general welfare**.” So a focus on the health and welfare of vulnerable building users, even where their building provides immediate safety, is both “reasonable” and completely consistent with the purpose of the code.

With its definition of *essential facilities* and its use of Risk Category IV to ensure they “remain operational,” the IBC is already more than a safety code. It is, in fact, already a basic “functional recovery” code; the only question is which building uses, and users, we decide should qualify for a designed recovery. Where RC II or RC III is not reliable enough, it is consistent with the purpose and scope of the IBC to assign more building uses to RC IV.

Not all of the IBC’s tools are perfectly nuanced. Some involve bright lines and broad categories, and it is sometimes necessary to err on the conservative side. So even if a certain use is not quite as “essential” as a fire station, RC IV might still be a more appropriate choice than RC II or RC III, and in these cases, it is consistent with the code to assign buildings to the higher category. In time, design criteria should evolve to address more specific recovery objectives (FEMA, 2020; FEMA-NIST, 2021). But those nuanced provisions are *at least* a decade away. For now, however, RC IV is the most appropriate tool we have, and we ought to use it. Adapting existing practices to new objectives is entirely consistent with the history of code development.

IBC Chapters 3 and 4 define and provide special requirements to manage fire and egress risks for particular groups of users. Table 1604.5 is meant to do the same for rare natural hazard events. But while Chapters 3 and 4 consider dozens of specific building uses and conditions, Table 1604.5 has only four categories. Changing the scope of Risk Category IV to account for specific building uses that are not adequately served by RC II or RC III criteria is consistent with the detailed, use-specific approach of Chapters 3 and 4.

Table 1604.5 represents public policy about what we desire from our buildings. As such, it has changed over time, along with public expectations. As we consider new or increasing risks related to more frequent natural hazard events, urbanization, the pandemic, or aging populations, it is both appropriate and consistent with past practice for Table 1604.5 to evolve as well.

Bibliography: Almufti, I. et al. (2016). “The resilience-based design of 181 Fremont Tower,” *Structure*, June.
Bade, M. (2014). “Mission Bay Block 25 Building – An Exercise in Lean Target Value Design,” Presentation to the Lean Construction Institute, Finland, April 12.

Berkowitz, R. (2021). “UCSF Center for Vision Neuroscience,” 2021 EERI Annual Meeting, Session 3B, March 24.

CISA, 2020. “Guidance on the Essential Critical Infrastructure Workforce: Ensuring Community and National Resilience in COVID-19 Response

(Version 2.0)." U.S. Department of Homeland Security, Cybersecurity & Infrastructure Security Agency, March 28.

FDA et al., 2015. *Food and Agriculture Sector-Specific Plan*. Jointly authored and published by the Food and Drug Administration, the U.S. Department of Agriculture, and the U.S. Department of Homeland Security. Available at https://www.cisa.gov/sites/default/files/publications/nipp-ssp-food-ag-2015-508.pdf

FEMA (2020b). *NEHRP Recommended Seismic Provisions for New Buildings and Other Structures, Volume II: Part 3 Resource Papers*, 2020 Edition, FEMA P-2082-2, prepared by the Building Seismic Safety Council of the National Institute of Buildings Sciences for Federal Emergency Management Agency, September.

FEMA-NIST (2021). *Recommended Options for Improving the Built Environment for Post-Earthquake Reoccupancy and Functional Recovery Time*, FEMA P-2090 / NIST SP-1254, Federal Emergency Management Agency and National Institute of Standards and Technology, January.

Mar, D. (2021). "Making Resilience Affordable," 2021 EERI Annual Meeting, Session 3B, March 24.

SEFT Consulting Group (2015). "Beaverton School District Resilience Planning for High School at South Cooper Mountain and Middle School at Timberland," SEFT Consulting Group, July 10.

SFDPH, 2020. "Order of the Health Officer No. C19-07b." City and County of San Francisco, Department of Public Health, March 31, et seq.

Cost Impact: The code change proposal will increase the cost of construction
This proposal will increase the cost of construction for the buildings newly assigned to RC IV. The largest increases will likely be in high seismic areas where assignment to RC IV makes the largest changes to structural and nonstructural design criteria. This does not mean, however, that every RC IV facility will have the same unit cost as a new state-of-the-art hospital. On the contrary, case studies of voluntary RC IV-like seismic design have found a **construction cost premium ranging typically from 0% to 2%** relative to normal RC II designs. (See proposal references by Almufti, Bade, Berkowitz, Mar, and SEFT.) This estimate stands to reason: Wind, snow, and earthquake loads can already vary significantly within a jurisdiction, but the building designs and unit costs don't change wildly from one side of the county to the other. For example, the seismic design force in Berkeley is about 1.5 times that in downtown San Francisco; so with respect to the structure, any nursing home or grocery store you can build as RC II in Berkeley you can also build as RC IV in San Francisco with no change to the design. The same is likely true for snow design, for example, in Vail v. Boulder and for wind design in Galveston v. the west side of Houston. On the nonstructural side, a facility's nonstructural systems might need more bracing or support when assigned to RC IV, but the number and size of the components themselves don't suddenly look like a hospital just because the risk category has changed.

Public Hearing Results

Committee Action: **Disapproved**

Committee Reason: Disapproved as the the concept should be a local jurisdiction decision for the Risk Category IV for Group F-1 food processing establishments and Group M retail/wholesale stores. (Vote: 13-1)

Individual Consideration Agenda

Public Comment 1:

IBC: TABLE 1604.5

Proponents: David Bonowitz, representing Self (dbonowitz@att.net) requests As Modified by Public Comment

Modify as follows:

2021 International Building Code

TABLE 1604.5 RISK CATEGORY OF BUILDINGS AND OTHER STRUCTURES

RISK CATEGORY	NATURE OF OCCUPANCY
I	Buildings and other structures that represent a low hazard to human life in the event of failure, including but not limited to: Agricultural facilities. Certain temporary facilities. Minor storage facilities.
II	Buildings and other structures except those listed in Risk Categories I, III and IV.
III	Buildings and other structures that represent a substantial hazard to human life in the event of failure, including but not limited to: Buildings and other structures whose primary occupancy is public assembly with an occupant load greater than 300. Buildings and other structures containing one or more public assembly spaces, each having an occupant load greater than 300 and a cumulative occupant load of these public assembly spaces of greater than 2,500. Buildings and other structures containing Group E or Group I-4 occupancies or combination therof, with an occupant load greater than 250. Buildings and other structures containing educational occupancies for students above the 12th grade with an occupant load greater than 500. Group I-2, Condition 1 occupancies with 50 or more care recipients. Group I-2, Condition 2 occupancies not having emergency surgery or emergency treatment facilities. Group I-3 occupancies. Any other occupancy with an occupant load greater than 5,000.[a] Power-generating stations, water treatment facilities for potable water, wastewater treatment facilities and other public utility facilities not included in Risk Category IV. Buildings and other structures not included in Risk Category IV containing quantities of toxic or explosive materials that: Exceed maximum allowable quantities per control area as given in Table 307.1(1) or 307.1(2) or per outdoor control area in accordance with the *International Fire Code* ; and Are sufficient to pose a threat to the public if released.[b]
IV	Buildings and other structures designated as essential facilities and buildings where loss of function represents a substantial hazard to occupants or users, including but not limited to: Group I-2, Condition 2 occupancies having emergency surgery or emergency treatment facilities. Ambulatory care facilities having emergency surgery or emergency treatment facilities. Group F-1 food processing establishments or commercial kitchens, not primarily associated with dining facilities, with *gross floor area* exceeding 30,000 square feet. ~~Group M retail or wholesale stores with *gross floor area* exceeding 30,000 square feet in which at least half of the usable floor area is used for the sale of food or beverages.~~ Fire, rescue, ambulance and police stations and emergency vehicle garages Designated earthquake, hurricane or other emergency shelters. Designated emergency preparedness, communications and operations centers and other facilities required for emergency response. Power-generating stations and other public utility facilities required as emergency backup facilities for *Risk Category* IV structures. Buildings and other structures containing quantities of highly toxic materials that:

	Buildings and other structures containing quantities of highly toxic materials that: Exceed maximum allowable quantities per control area as given in Table 307.1(2) or per outdoor control area in accordance with the *International Fire Code* ; and Are sufficient to pose a threat to the public if released.[b] Aviation control towers, air traffic control centers and emergency aircraft hangars. Buildings and other structures having critical national defense functions. Water storage facilities and pump structures required to maintain water pressure for fire suppression.

a. For purposes of occupant load calculation, occupancies required by Table 1004.5 to use gross floor area calculations shall be permitted to use net floor areas to determine the total occupant load.

b. Where approved by the building official, the classification of buildings and other structures as Risk Category III or IV based on their quantities of toxic, highly toxic or explosive materials is permitted to be reduced to Risk Category II, provided that it can be demonstrated by a hazard assessment in accordance with Section 1.5.3 of ASCE 7 that a release of the toxic, highly toxic or explosive materials is not sufficient to pose a threat to the public.

Commenter's Reason: Two words you don't often hear in an ICC code hearing: Baby formula.
In February 2022, a single food processing facility in Michigan shut down because of a bacterial contamination, leading to a nationwide shortage of baby formula that required a national response, including a rare use of the Defense Production Act. The plant remained out of production for 4 months -- and then shut down again two weeks after reopening, this time due to flood damage. (NPR, 2022).

So with respect to the Structural Committee (see its reason for disapproval above) and those who testified in opposition to S78 at the committee action hearings, the stability of a hyper-optimized, just-in-time food supply chain can NOT be left to each local community. On the contrary, the potential effects of breakage to critical supply chains (see the original S78 reason statement) shows why certain facilities traditionally assigned to Risk Category II -- like large food processing plants with multi-jurisdictional reach -- actually need to be assigned by the national model code to RC IV.

Lots of things can hamper a food supply chain -- product recalls, labor actions, war, pandemic -- but the building code gives us a tool to help ensure that damage from an earthquake, hurricane, or winter storm is not on that list. The least we can do as design professionals and building officials is to assign facilities proven to be critical to RC IV.

In fact, at the hearings, several speakers and committee members recognized that the portion of proposal S78 regarding Group F-1 food processing facilities is actually a good idea and appears workable.

By contrast, the portion of S78 regarding Group M grocery stores, admittedly, does pose implementation and enforcement challenges, as I acknowledged at the hearings. Therefore, to fix that problem and preserve the most critical part of the proposal, this public comment removes the Group M item and retains the Group F-1 item.

Bibliography: NPR, 2022. "Abbott's baby formula plant closes again after severe storms and flooding." June 16.
https://www.npr.org/2022/06/16/1105488061/baby-formula-plant-abbott-closed-flooding

Cost Impact: The net effect of the public comment and code change proposal will increase the cost of construction
Similar to the original proposal, but with a smaller effect because the public comment retains only one of the two building groups originally proposed.

S116-22

IBC: CHAPTER 1, SECTION 108, [A] 108.1, CHAPTER 2, SECTION 202, SECTION 202 (New), CHAPTER 16, SECTION 1608, 1608.1, SECTION 1609, 1609.1.1, SECTION 1612, 1612.2, SECTION 1613, 1613.1, SECTION 1614, 1614.1, SECTION 1615, 1615.1, CHAPTER 31, SECTION 3103, 3103.1, 3103.1.1 (New), 3103.1.1, 3103.1.2, 3103.5 (New), 3103.5.1 (New), TABLE 3103.5.1 (New), 3103.5.1.1 (New), 3103.5.1.2 (New), 3103.5.1.3 (New), 3103.5.1.4 (New), 3103.5.1.5 (New), 3103.5.1.6 (New), 3103.5.1.7 (New), 3103.5.1.8 (New), 3103.5.2 (New), TABLE 3103.5.2 (New), 3103.5.3 (New), 3103.5.4 (New), 3103.5.5 (New), 3103.6 (New), 3103.7 (New), 3103.7.1 (New), 3103.7.2 (New), 3103.7.3 (New), CHAPTER 35, ANSI Chapter 35 (New)

Proposed Change as Submitted

Proponents: Jennifer Goupil, representing Structural Engineering Institute of ASCE (jgoupil@asce.org); Don Scott, representing ASCE 7 Wind Load Subcommittee (dscott@pcs-structural.com); John Grenier, representing National Council of Structural Engineers Associations (NCSEA) (jgrenier@greniereng.com); Ali Fattah, representing City of San Diego Development Services Department (afattah@sandiego.gov)

2021 International Building Code

CHAPTER 1
SCOPE AND ADMINISTRATION

SECTION 108
TEMPORARY STRUCTURES AND USES

Revise as follows:

[A] 108.1 General. The *building official* is authorized to issue a *permit* for temporary structures and temporary uses. Such *permits* shall be limited as to time of service, but shall not be permitted for more than 180 days. The *building official* is authorized to grant extensions for demonstrated cause. Structures designed to comply with Section 3103.5 shall not be in service for a period of more than 1-year unless an extension of time is granted.

CHAPTER 2
DEFINITIONS

SECTION 202
DEFINITIONS

Add new definition as follows:

PUBLIC-OCCUPANCY TEMPORARY STRUCTURE. Any building or structure erected for a period of one year or less *that support public or private assemblies*, or that provide human shelter, protection, or safety. Public-occupancy temporary structures within the confines of another existing structure (such as convention booths) are exempted from Section 3103.5.

SERVICE LIFE. The period of time that a structure serves its intended purpose. For temporary structures, this shall be the cumulative time of service for sequential temporary events which may occur in multiple locations. For *public-occupancy temporary structures* this is assumed to be a minimum of 10 years.

TEMPORARY EVENT. A single use during the service life of a *public-occupancy temporary structure* at a given location which includes its installation, inspection, use and occupancy, and dismantling.

TEMPORARY STRUCTURE. Any building or structure erected for a period of 180 days or less to support *temporary events. Tempo*rary structures include a range of structure types (*public-occupancy temporary structures*, temporary *special event structures*, tents, umbrella and other membrane structures, *relocatable buildings, temporary bleachers, etc.)* for a range of purposes (storage, equipment protection, dining, workspace, assembly, etc.).

CHAPTER 16
STRUCTURAL DESIGN

SECTION 1608
SNOW LOADS

Revise as follows:

1608.1 General. Design snow *loads* shall be determined in accordance with Chapter 7 of ASCE 7, but the design roof *load* shall be not less than that

determined by Section 1607.

Exception: *Temporary structures* complying with Section 3103.5.1.3.

SECTION 1609
WIND LOADS

Revise as follows:

1609.1.1 Determination of wind loads. Wind *loads* on every building or structure shall be determined in accordance with Chapters 26 to 30 of ASCE 7. The type of opening protection required, the basic design *wind speed*, *V*, and the exposure category for a site is permitted to be determined in accordance with Section 1609 or ASCE 7. Wind shall be assumed to come from any horizontal direction and wind pressures shall be assumed to act normal to the surface considered.

Exceptions:

1. Subject to the limitations of Section 1609.1.1.1, the provisions of ICC 600 shall be permitted for applicable Group R-2 and R-3 buildings.
2. Subject to the limitations of Section 1609.1.1.1, residential structures using the provisions of AWC WFCM.
3. Subject to the limitations of Section 1609.1.1.1, residential structures using the provisions of AISI S230.
4. Designs using NAAMM FP 1001.
5. Designs using TIA-222 for antenna-supporting structures and antennas, provided that the horizontal extent of Topographic Category 2 escarpments in Section 2.6.6.2 of TIA-222 shall be 16 times the height of the escarpment.
6. Wind tunnel tests in accordance with ASCE 49 and Sections 31.4 and 31.5 of ASCE 7.
7. *Temporary structures* complying with Section 3103.5.1.4.

The wind speeds in Figures 1609.3(1) through 1609.3(12) are basic design wind speeds, *V*, and shall be converted in accordance with Section 1609.3.1 to allowable stress design wind speeds, V_{asd}, when the provisions of the standards referenced in Exceptions 4 and 5 are used.

SECTION 1612
FLOOD LOADS

Revise as follows:

1612.2 Design and construction. The design and construction of buildings and structures located in *flood hazard areas*, including *coastal high hazard areas* and *coastal A zones*, shall be in accordance with Chapter 5 of ASCE 7 and ASCE 24.

Exception: *Temporary structures* complying with Section 3103.5.1.5.

SECTION 1613
EARTHQUAKE LOADS

Revise as follows:

1613.1 Scope. Every structure, and portion thereof, including nonstructural components that are permanently attached to structures and their supports and attachments, shall be designed and constructed to resist the effects of earthquake motions in accordance with Chapters 11, 12, 13, 15, 17 and 18 of ASCE 7, as applicable. The *seismic design category* for a structure is permitted to be determined in accordance with Section 1613 or ASCE 7.

Exceptions:

1. Detached one- and two-family dwellings, assigned to *Seismic Design Category* A, B or C, or located where the mapped short-period spectral response acceleration, S_S, is less than 0.4 g.
2. The *seismic force-resisting system* of wood-frame buildings that conform to the provisions of Section 2308 are not required to be analyzed as specified in this section.
3. Agricultural storage structures intended only for incidental human occupancy.
4. Structures that require special consideration of their response characteristics and environment that are not addressed by this code or ASCE 7 and for which other regulations provide seismic criteria, such as vehicular bridges, electrical transmission towers, hydraulic structures, buried utility lines and their appurtenances and nuclear reactors.
5. References within ASCE 7 to Chapter 14 shall not apply, except as specifically required herein.

6. *Temporary structures* complying with Section 3103.5.1.6.

SECTION 1614
ATMOSPHERIC ICE LOADS

Revise as follows:

1614.1 General. *Ice-sensitive structures* shall be designed for atmospheric ice *loads* in accordance with Chapter 10 of ASCE 7. *Public-occupancy temporary structures* shall comply with Section 3103.7.3.

Exception: *Temporary structures* complying with Section 3103.5.1.7.

SECTION 1615
TSUNAMI LOADS

Revise as follows:

1615.1 General. The design and construction of *Risk Category* III and IV buildings and structures located in the *Tsunami Design Zones* defined in the *Tsunami Design Geodatabase* shall be in accordance with Chapter 6 of ASCE 7, except as modified by this code.

Exception: *Temporary structures* complying with Section 3103.5.1.8.

CHAPTER 31
SPECIAL CONSTRUCTION

SECTION 3103
TEMPORARY STRUCTURES

Revise as follows:

3103.1 General. The provisions of Sections 3103.1 through ~~3103.4~~ 3103.7 shall apply to structures erected for a period of less than 180 days. Temporary *special event structures*, tents, umbrella structures and other membrane structures erected for a period of less than 180 days shall also comply with the *International Fire Code* . ~~Those~~ *Temporary structures* erected for a longer period of time and *public-occupancy temporary structures* shall comply with applicable sections of this code.

Exception: *Public-occupancy temporary structures* complying with Section 3103.1.1 shall be permitted to remain in service for 180 days or more but not more than 1 year when approved by the *Building Official.*

Add new text as follows:

3103.1.1 Extended period of service time. *Public-occupanc* y *temporary structures* shall be permitted to remain in service for 180 days or more without complying with requirements in this code for new buildings or structures when extensions for up to 1 year are granted by the *Building Official* in accordance with Section 108.1 and when the following conditions are satisfied:

1. Additional inspections as determined by the *Building Official* shall be performed to verify that site conditions and the approved installation comply with the conditions of approval at the time of final inspection.
2. The *Building Official* shall perform follow up inspections after initial occupancy at intervals not exceeding 180 days to verify the site conditions and the installation conform to the approved site conditions and installation requirements.
3. An examination shall be performed by a registered design professional to determine the adequacy of the *temporary structure* to resist the structural loads required in Section 3103.5.
4. Relocation of the *temporary structures* shall require a new approval by the *Building Official.*
5. The use or occupancy approved at the time of final inspection shall remain unchanged.

Revise as follows:

~~**3103.1.1**~~ **3103.1. 2 Conformance.** Temporary structures and uses shall conform to the structural strength, fire safety, *means of egress*, accessibility, light, *ventilation* and sanitary requirements of this code as necessary to ensure public health, safety and general welfare.

~~**3103.1.2**~~ **3103.1.3 Permit required.** Temporary structures that cover an area greater than 120 square feet (11.16 m^2), including connecting areas or spaces with a common *means of egress* or entrance that are used or intended to be used for the gathering together of 10 or more persons, shall not be erected, operated or maintained for any purpose without obtaining a *permit* from the *building official*.

Add new text as follows:

3103.5 Structural requirements. *Temporary structures* shall comply with Chapter 16 of this code. *Public-occupancy temporary structures* shall be designed and erected to comply with requirements of this Section.

3103.5.1 Structural loads. *Public-occupanc* y *temporary structures* shall be classified, based on the risk to human life, health, and welfare associated with damage or failure by nature of their occupancy or use, according to Table 1604.5 for the purposes of applying flood, wind, snow, earthquake, and ice provisions. Additionally, public assembly facilities that require more than 15 min to evacuate to a safe location and any structure whose failure or collapse would endanger the public assembled near the structure, such as speaker stands or other temporary structures for public gatherings shall be classified as Risk Category III.

TABLE 3103.5.1 REDUCTION FACTORS FOR GROUND SNOW LOADS FOR PUBLIC-OCCUPANCY TEMPORARY STRUCTURES

	Service Life	
Risk Category	≤ 10 yr	>10 yr
II	0.7	1.0
III	0.8	1.0
IV	1.0	1.0

3103.5.1.1 Dead. Dead loads on *public-occupancy temporary structures* shall be determined in accordance with Section 1606.

3103.5.1.2 Live. Live loads on *public-occupancy temporary structures* shall be determined in accordance with Section 1607.

Exception : Where *approved, live loads* less than those prescribed by Table 1607.1 *Minimum Uniformly Distributed Live Loads, L_0, and Minimum Concentrated Live Loads* shall be permitted where shown by the *registered design professional* that a rational approach has been used and that such reductions are warranted.

3103.5.1.3 Snow. Snow loads on *public-occupancy temporary structures* shall be determined in accordance with Section 1608 and Chapter 7 of ASCE 7. The ground snow loads, p_g, in Section 1608 shall be modified according to Table 3103.5.1.
If the *public-occupancy temporary structure* is not subject to snow loads or not constructed and occupied during winter months when snow is to be expected, snow loads need not be considered, provided that the design is reviewed and modified, as appropriate, to account for snow loads if the period of time when the public-occupancy *temporary structure* is in service shifts to include winter months.

Exception: Risk Category II *public-occupancy temporary structures* that employ controlled occupancy measures per Section 3103.7.2 shall be permitted to use a ground snow load reduction factor of 0.65 instead of the ground snow load reduction factors in Table 3105.1.

3103.5.1.4 Wind. Wind loads on *public-occupancy temporary structures* shall be determined in accordance with Section 1609 and Chapters 26 to 30 of ASCE 7. The design wind load shall be modified according to Table 3103.5.2.

Exceptions

1. *Public-occupancy temporary structures* that employ controlled occupancy measures per Section 3103.7.1 shall be permitted to use a load reduction factor of 0.65 instead of the load reduction factors in Table 3103.5.2.
2. *Public-occupancy temporary structures* erected in a hurricane-prone region outside of hurricane season, the design wind speed shall be set at the following 3-second gust basic *wind speeds* depending on *Risk Category*:
   2.1. For *Risk Category* II use 115 mph,
   2.2. For Risk Category III use 120 mph, and
   2.3. For Risk Category IV use 125 mph.

3103.5.1.5 Flood. An Emergency Action Plan, in accordance with 3103.5.4, shall be submitted for *public-occupancy temporary structures* in a Flood Hazard Area when requested by the Building or Fire Official. *Public-occupancy temporary structures* need not be designed for flood loads specified in Section 1615 except when specifically designed as a dry floodproofed structure or designated to be occupied during a storm event per the approved Emergency Action Plan.

3103.5.1.6 Seismic. Seismic loads on *public-occupancy temporary structures* assigned to Seismic Design Categories C through F shall be determined in accordance with Section 1613. The resulting seismic loads are permitted to be taken as 75% of those determined by Section 1613. *Public-occupancy temporary structures* assigned to Seismic Design Categories A and B need not be designed for seismic loads.

3103.5.1.7 Ice. Ice loads on *public-occupancy temporary structures* shall be determined in accordance with Section 1614, Chapter 10 of ASCE 7, with the largest maximum nominal thickness being 0.5 in, for all Risk Categories**.** When ice is expected during the occupancy of *public-occupancy temporary structures*, ice loads shall be determined for surfaces on which ice could accumulate in accordance with ASCE 7. If the *public-occupancy temporary structure* is not subject to ice loads or not constructed and occupied during winter months when ice is to be expected, ice loads need not be considered, provided that the design is reviewed and modified, as appropriate, to account for ice loads if the period of time when the temporary structure is in service shifts to include winter months.

3103.5.1.8 Tsunami. An Emergency Action Plan, in accordance with 3103.5.4, shall be submitted for *public-occupancy temporary structures* in a Tsunami Design Zone when requested by the Building or Fire Official. The *public-occupancy temporary structure* need not be designed for tsunami loads specified in Section 1615.

3103.5.2 Foundations. *Public-occupancy temporary structures* may be supported on the ground with temporary foundations when approved by the Building Official. Consideration shall be given for the impacts of differential settlement when foundations do not extend below the ground or

foundations supported on compressible materials. The presumptive load-bearing value for *public-occupancy temporary structures* supported on a pavement, slab on grade or on other *Collapsible or Controlled Low Strength* substrates soils such as beach sand or grass shall be assumed not to exceed 1,000 psf unless determined through testing and evaluation by a registered design professional. The presumptive load-bearing values listed in Table 1806.2 shall be permitted to be used for other supporting soil conditions.

TABLE 3103.5.2 REDUCTION FACTORS FOR WIND LOADS FOR PUBLIC-OCCUPANCY TEMPORARY STRUCTURES

	Service Life	
Risk Category	≤ 10 yr	>10 yr
II	0.8	1.0
III	0.9	1.0
IV	1.0	1.0

3103.5.3 Installation and maintenance inspections. A qualified person shall inspect *public-occupancy temporary structures* that are assembled using transportable and reusable materials; components shall be inspected when purchased or acquired and at least once per year. The inspection shall evaluate individual components, and the fully assembled structure, to determine suitability for use based on the requirements in ESTA ANSI E1.21. Inspection records shall be kept and shall be made available for verification by the *Building Official*. Additionally, *public-occupancy temporary structures* shall be inspected at regular intervals when in service.

3103.5.4 Emergency Action plans. When required by the *Building Official*, Emergency Action Plans shall be submitted and approved. Emergency Action Plans shall include procedures to be implemented due to flood, wind, or snow hazards, or within the tsunami design zone. The action plans shall include provisions for evacuating, securing, or dismantling *public-occupancy temporary structures*, in whole or in part, and removal to prevent damage to surrounding buildings or structures.

3103.5.5 Durability and maintenance. Reusable components used in the erection and the installation of *public-occupancy temporary structures* shall be manufactured of durable materials necessary to withstand environmental conditions at the service location. Components damaged during transportation or installation and due to the effects of weathering shall be replaced or repaired.
A qualified person shall inspect *public-occupancy temporary structures*, including components, when purchased or acquired and at least once per year, based on the requirements in ANSI E1.21. Inspection records shall be kept and shall be made available for verification by the *building official.* Additionally, *public-occupancy temporary structures* shall be inspected at regular intervals when in service to ensure that the structure continues to perform as designed and initially erected.

3103.6 Serviceability. The effects of structural loads or conditions shall not adversely affect the serviceability or performance of the *public-occupancy temporary structure.*

3103.7 Controlled occupancy. *Public-occupancy temporary structures* that comply with Section 3103.5 for structural requirements do not require monitoring for controlled occupancy. *Public-occupancy temporary structures* that employ exceptions for reduced environmental loads shall employ controlled occupancy procedures as specified in this section and in accordance with ANSI ES1.7. An operations management plan conforming to ANSI E1.21 with an occupant evacuation plan shall be submitted to the *Building Official* for approval as a part of the permit documents.

3103.7.1 Wind. Wind speeds associated with the design wind loads shall be monitored before and during occupancy of the *public-occupancy temporary structure. T*he *public-occupancy temporary structure* shall be vacated in the event that the design wind speed is expected to be exceeded during its occupancy.

3103.7.2 Snow. Surfaces on which snow accumulates shall be monitored before and during occupancy of the *public-occupancy temporary structure* and any loads in excess of the design snow load shall be removed prior to its occupancy, or the *public-occupancy temporary structure* shall be vacated in the event that the design snow load is exceeded during its occupancy.

3103.7.3 Ice. Surfaces on which ice accumulates shall be monitored before and during occupancy of the *public-occupancy temporary structure* and any loads in excess of the design ice load *shall* be removed prior to its occupancy, or the *public-occupancy temporary structure* shall be vacated in the event that the design ice load is exceeded during its occupancy.

CHAPTER 35
REFERENCED STANDARDS

Add new standard(s) as follows:

ANSI

American National Standards Institute
25 West 43rd Street, Fourth Floor
New York, NY 10036

E1.21-2013	Entertainment Technology: Temporary Structures Used for Technical Production of Outdoor Entertainment Event
ES1.7-2021	Event Safety Requirements - Weather Preparednes

Reason: There is a need for code provisions for minimum structural loads for temporary structures. In past code cycles, inappropriate references were attempted to be introduced to the International Building Code but failed due to lack of consensus within the industry. Following that failed

attempt, committee members from the adopted structural loading standard ASCE/SEI 7 *Minimum Design Loads and Associated Criteria for Buildings and Other Structures* committed to work with building officials and industry stakeholders to develop provisions that align with the design basis for Chapter 16 and ASCE/SEI 7, as well as provide the appropriate level of risk and structural reliability to the public.
To meet the need for minimum loading provisions and deliver on their commitment, this code change proposal was developed by a diverse group of experts that have experience with the development of the ASCE/SEI 7 Standard, building officials from many jurisdictions from across the country that have experience with large events and temporary structures, and industry representatives from the US entertainment industry.

This proposal was developed by an ad hoc committee that met every month since mid-2020 and the included the following members:

- Don Scott; PCS Structural Solutions – ASCE 7 Wind Load Subcommittee
- Jennifer Goupil; ASCE/SEI Codes & Standards - ASCE 7 Main Committee
- Therese McAllister, PhD; NIST – ASCE 7 Load Combinations Subcommittee
- John Hooper; MKA – ASCE 7 Seismic Subcommittee
- John Duntemann; WJE – ASCE 7 Snow Subcommittee
- Andrew Stam; WJE – ASCE 7 Dead & Live Load Subcommittee
- Bryan Lanier; American Tower Corporation – ASCE 7 Ice Load Subcommittee
- Chris Cerino; STV – ASCE 7 Flood Load Subcommittee
- James (Greg) Soules, PhD; CBI – ASCE 7 Main Committee
- Ali Fattah; City of San Diego
- Constadino (Gus) Sirakis; City of New York

This proposal was developed in collaboration with industry stakeholders, many of whom reviewed the proposal and provided comments to the ad hoc committee; the following stakeholders were invited to collaborate, and many provided comments and input for this proposal:

- Richard Nix; Entertainment Services and Technology Assoc. (ESTA)
- Mike Nugent; ICC BCAC Chair
- Steve Kerr; National Council of Structural Engineers Associations (NCSEA)
- Kai Ki Mow; Seattle Department of Construction and Inspection
- Julius Carreon; City of Bellevue Washington
- Paul Armstrong; PCA Code Services
- Daniel Clark; Clark Reder Engineers
- William Gorlin; McLaren Engineers
- David Renn; City of Denver
- Jon Siu; Jon Siu Consulting
- Gary Ehrlich; National Association of Home Builders and ICC/PTF
- Edgar Surla; Southern Nevada Chapter of ICC

Due to the staggered nature of the ICC and ASCE 7 Standard code development processes, this IBC proposal is the first of two efforts to address the need for provisions for loads on temporary structures. The second effort includes development of a new Appendix to ASCE 7 to address

temporary structures.

Following is the description and rationale for content of this code change proposal:

The International Codes regulate the construction of new buildings and temporary structures through the International Building Code (IBC) and regulate existing buildings through the International Existing Building Code (IEBC). A temporary structure is not an existing building because it is not permanent and is therefore regulated through Chapter 31 of the IBC.

Temporary Special Event Structures are regulated by the International Fire Code. However, they are a type of temporary structure and thus need to also meet the requirements of this proposed section.

Three new definitions are added for public-occupancy temporary structures, service life, and temporary event. Public-occupancy temporary structures are new buildings or structures that are used by the general public, or that support public events, where the public expects similar levels of reliability and safety as offered by permanent construction. Public-occupancy temporary structures are often assembled with re-useable components and designed for a particular purpose and defined period of time, which is defined as a temporary event when the period of time is less than one year. Public-occupancy temporary structures in service for a period that exceeds 1-year are required to comply with the IBC for new buildings. Temporary structures should not pose more risk to occupants than permanent structures, but because the code's design-level environmental loads are far less likely during a temporary event, this proposal makes adjustments to reduce the requirements for a consistent level of risk. The code change addresses the hazards in the built environment in IBC chapter 16 for public-occupancy temporary structures. The code change includes the ability to mitigate some hazards through Emergency Action Plans. Portions of temporary structures may be removed to reduce wind loads, for example.

The concept of controlled occupancy is also introduced to address cases where an environmental loading hazard cannot be reasonably mitigated and allows for actions based on a preapproved action plan that the Building Official may use to allow installations that cannot resist code prescribed loads. For example, hazard areas such as flood hazard areas and tsunami inundation zones are clearly mapped, and evacuation plans are adopted and include tsunami alert warning systems and temporary structures subject to high wind loads may be evacuated and have sections removed to reduce the wind load. The code change proposal recognizes that it may be desirable for a temporary structure to remain in service for more than 180 days, whether continuously occupied or not, and provides a process that the Building Official can follow to facilitate such an extended service period. However, after 1-year has passed, the structure is required to comply with requirements for new buildings or is removed from service by being disassembled.

DESIGN PHILOSOPHY:

Temporary structures that are occupied by the general public or that could cause injuries or loss of life by their failure require a design basis that is consistent with the risk and reliability criteria in ASCE 7. The basis of design for temporary structures needs to consider voluntary vs involuntary risk, service life, and reliability as well as the ability to reduce risk for the general public for severe weather events, as elaborated below. Therefore, temporary structures occupied by the general public are expected to have the same level of reliability (or failure rate) and performance as permanent structures.

While temporary structures are developed for use up to 180 days, many of these structures are used repeatedly at different locations. Thus, their actual service life may be on the order of 5 to 10 years. Such structures are consequently subjected to repeated assembly and dismantling with associated wear and tear. Therefore, service life for temporary structures is defined to provide a consistent basis of reliability relative to that of new buildings, and a service life of 10 years is assumed for determining structural load requirements in Section 3103.5.

Risk:

In a general sense, risk represents the potential consequences of exposure to a natural or man-made hazard in the presence of uncertainty. There are three components to risk – hazard, consequences and context – and risk-informed decisions should involve all three. The focus in structural engineering has been on the hazard (and its probability of exceedance) and structural performance in terms of failure given a hazard intensity over a structure's service life. Consequences and context are reflected indirectly through Risk Categories (or Importance Factors).

The concept of voluntary and involuntary risk assumed by the general public should be considered in the design of structures. Voluntary risk assumption occurs when people choose to undertake an activity with a known level of hazard and consequences, such as driving or flying to a destination. Involuntary risks occur when people are exposed to a hazard without understanding the potential consequences. The willingness of people to incur risk depends on whether the risk is incurred voluntarily or involuntarily (Slovic, 2000). Because people require shelter, building

occupancy is an involuntary risk. The general public assumes that all structures, permanent and temporary, have been designed and constructed to provide the same level of structural safety and reliability. If a structure is designed to a lower level of safety or reliability, the general public has no means to identify or assess the difference in risk. This includes temporary structures that may not be accessible to the general public but could cause injuries or loss of life in the event of failure (e.g., special event structures such as towers, platforms, and stages). Analogies can be made to various modes of transportation, and their inherent risks; the general public is aware of differences in assumed risk and can choose a mode of transportation accordingly. In contrast, ASCE 37 was developed for temporary structures used in construction. The risk associated with these structures is generally limited to construction workers, who voluntarily accept a higher-risk environment and have training and skills for operating in a construction environment. Therefore, temporary structures that are used by or in close proximity to the general public need to have a level of reliability consistent with the other structures designed for involuntary risk.

Reliability:

Structural reliability requires the combined analysis of the probability of occurrence of the hazard and the probability that the loads caused by the hazard equal or exceed the structural resistance. Temporary structures that are used, occupied, or placed in close proximity to the general public should meet reliability targets that are consistent with those for permanent structures in ASCE, allowing for differences in service lives and other conditions of use.

ASCE 7 Table 1.3-1 presents the target reliabilities by Risk Category (RC) and failure mode (e.g., ductile vs brittle failures) for hazards other than earthquake, tsunami, or extraordinary events. The target reliabilities are presented in two formats: the mean annual failure rate and the probability of failure for a 50-yr service life, expressed in terms of reliability index, β. For example, a RC II structure with ductile, local failure modes has a target mean annual failure rate $P_F = 3.0 \times 10^{-5}$ and a 50-yr target reliability index of $\beta = 3.0$ (or $P_F = 1.43 \times 10^{-3}$ over 50 years).

WIND:

ASCE 7-16 wind hazard maps were updated to confirm the risk-based mean recurrence interval (MRI) for RC I to III and to establish a risk-based MRI for RC IV (McAllister, Wang, and Ellingwood 2018). The updated wind maps are based on a fully coupled reliability analysis that considered the hazard and structural resistance. The results for the recommended MRI for the target reliabilities are shown in Figure 3105.5.2.

Two exceptions are allowed for wind:

· An exception is allowed where controlled occupancy actions in Section 3103.7 are adopted, given that on-site management and weather forecasting capabilities allow sufficient time to reduce the risk to occupants by canceling events or reducing the wind loads through removal of wind surface area or dismantling sections of the temporary structure.

· An exception is allowed when public-occupancy temporary structures are erected in a hurricane-prone region outside of hurricane season. The wind load reduction is based on hurricane and non-hurricane wind speeds. ASCE 7 publishes wind speed maps that include both hurricane and non-hurricane winds for permanent structures. Pintar et al (2015) published maps of non-hurricane non-tornadic wind speeds for the contiguous United States.

A study by Dasguputa and Ghosh (2019) evaluated a wind speed factor of 0.78 used by the Unified Facilities Criteria for temporary structures for 5-yr and 25-yr service lives. This study selected the 50-yr target reliabilities and associated 50-yr wind speed exceedance probabilities to evaluate the wind speed load factor for occupied temporary structures based on ASCE 7-16 wind speed maps. The ASCE 7-16 wind maps for RC I, II, III and IV structures were developed for 15%, 7%, 3% and 1.6% probabilities of wind speed exceedance. To evaluate the 0.78 wind speed factor, wind speeds at 342 locations across the country were identified for specified mean recurrence intervals (MRI). The specified MRI were determined by computing the MRI that would provide the same probability of wind speed exceedance in 5 years and 25 years as that specified for a 50-yr service life in ASCE 7, as shown in Table C3105.1.1. However, the mean recurrence rates of wind speeds, and therefore the structural reliability, are quite different from the ASCE 7 target reliabilities, as shown in Example 1. Assuming that the structural resistance is similar, a comparison of the RC II mean annual frequency for wind speeds for a 50-yr service life (1.43×10^{-3}) to that of a 5-yr service life (1.43×10^{-2}) and a10-yr service life (7.14×10^{-2}) show service life reliability ratios of 10 and 5, respectively, which do not meet the ASCE 7 target reliability criteria.

Until further analyses can be conducted, a 10-yr service life and a wind speed factor of 0.9 is deemed to provide a reasonable level of reliability, given the ability to evacuate or modify temporary structures for strong wind events.

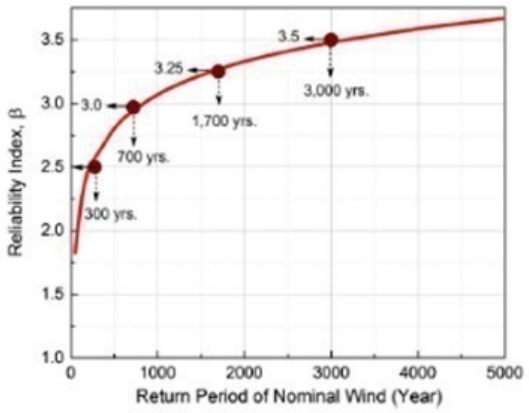

Fig. 3. Recommended mean return periods for wind maps in ASCE 7-16 ($K_{dn} = 0.85$; $\mu_{Kd} = 0.71$)

Figure C3105.5.1. ASCE 7 wind MRI versus reliability index (McAllister, Wang, and Ellingwood 2018).

Table C3105.5.1. Proposed wind speed factor for 5-yr and 25-yr service life for temporary structures by Dasguputa and Ghosh (2019) based on 50-yr service reliability criteria.

ASCE 7 MRIWind speed factor5 yr MRI25 yr MRII3000.7830150II7000.7870350III1,7000.78170850IV3,0000.783001,500

Example 1: Probability of exceedance over T yr service life for W

This example provides a comparison of probability of wind speed exceedance for service lives (T) from 5 to 25 years and Risk Category. The probability of wind exceedance is set to remain constant for each risk category; however, the mean annual frequency (P_a) can vary significantly between different values of T.

$$P(W > w \text{ for } T) = 1-(1-P_a)^T = X\%$$

- W – random wind speed (3-sec gust)
- w – wind speed (3-sec gust) for Mean Recurrence Interval (MRI)
- T is the service life (yr)
- $P_a = 1/T$ is the mean annual frequency for this wind speed (1/yr)
- X is the probability of the wind speed exceedance for T

For a 50 yr service life (ASCE 7):

RC I P(W > 300 MRI in 50 yrs) = $1 – (1 - 0.0033)^{50} = 0.15$ = 15% $P_a = 3.3x10^{-3}$

RC II P(W > 700 MRI in 50 yrs) = $1 – (1 - 0.00143)^{50} = 0.069$ = 7% $P_a = 1.4x10^{-3}$

RC III P(W > 1700 MRI in 50 yrs) = $1 – (1 - 0.00059)^{50} = 0.029$ = 3% $P_a = 5.9x10^{-4}$

RC IV P(W > 3000 MRI in 50 yrs) = $1 – (1 - 0.00033)^{50} = 0.017$ = 1.7% $P_a = 3.3x10^{-4}$

For a 25 yr service life:

RC I P(W > 150 MRI in 25 yrs) = $1 – (1 - 0.0067)^{25} = 0.15$ = 15% $P_a = 6.7x10^{-3}$

RC II P(W > 350 MRI in 25 yrs) = $1 – (1 - 0.0029)^{25} = 0.069$ = 7% $P_a = 2.9x10^{-3}$

RC III P(W > 850 MRI in 25 yrs) = $1 – (1 - 0.0012)^{25} = 0.029$ = 3% $P_a = 1.2x10^{-3}$

RC IV P(W > 1500 MRI in 25 yrs) = $1 – (1 - 0.0007)^{25} = 0.017$ = 1.7% $P_a = 6.7x10^{-4}$

For a 10 yr service life:

RC I P(W > 60 MRI in 10 yrs) = $1 – (1 - 0.017)^{10} = 0.16$ = 16% $P_a = 1.7x10^{-2}$

RC II P(W > 140 MRI in 10 yrs) = $1 – (1 - 0.0714)^{10} = 0.069$ = 7% $P_a = 7.1x10^{-3}$

RC III P(W > 340 MRI in 10 yrs) = $1 – (1 - 0.00294)^{10} = 0.029$ = 3% $P_a = 2.9x10^{-3}$

RC IV P(W > 600 MRI in 10 yrs) = $1 – (1 - 0.00167)^{10} = 0.017$ = 1.7% $P_a = 1.7x10^{-3}$

For a 5 yr service life:

RC I P(W > 30 MRI in 5 yrs) = $1 – (1 - 0.0333)^{5} = 0.16$ = 16% $P_a = 3.3x10^{-2}$

RC II P(W > 70 MRI in 5 yrs) = $1 – (1 - 0.0143)^{5} = 0.069$ = 7% $P_a = 1.4x10^{-2}$

RC III P(W > 170 MRI in 5 yrs) = $1 – (1 - 0.0059)^{5} = 0.029$ = 3% $P_a = 5.9x10^{-3}$

RC IV P(W > 300 MRI in 5 yrs) = $1 – (1 - 0.0033)^{5} = 0.017$ = 1.7% $P_a = 3.3x10^{-3}$

References

Dasguputa, P. and S.K. Ghosh (2019) *An Evaluation of the Wind and Seismic Provisions of UFC 1-201-01 for Temporary Structures*, S.K. Ghosh Associates LLC**,** www.skghoshassociates.com

McAllister, T., N. Wang, and B. R. Ellingwood. 2018. *Risk-informed mean recurrence intervals for update wind maps in ASCE 7-16*, J. Struct. Eng. 144 (5). https://doi.org/10.1061/(ASCE)ST.1943-541X.0002011

Pintar, A.L., Simiu, E., Lombardo, F.T., Levitan, M. 2015. *Maps of Non-hurricane Non-tornadic Wind Speeds With Specified Mean Recurrence Intervals for the Contiguous United States Using a Two-dimensional Poisson Process Extreme Value Model and Local Regression*, NIST Special Publication 500-301, National Institute of Standards and Technology, Gaithersburg, MD
https://nvlpubs.nist.gov/nistpubs/SpecialPublications/NIST.SP.500-301.pdf

Slovic, P. (2000), *The perception of risk*. Earthscan Publications, Sterling, VA.
https://www.researchgate.net/publication/232546133_The_perception_of_risk_Risk_society_and_policy_series

SEISMIC:

The requirement that the seismic loads on temporary structures assigned to Seismic Design Categories C through F are permitted to be taken as 75% of those required by Section 1613, while resulting in reduced seismic performance relative to permanent structures, is consistent with the reduction generally accepted for the evaluation/upgrade of existing buildings and would result in a similar seismic risk to the occupants. Due to the unique lack of warning associated with earthquakes, taking further reductions, even for temporary structures, results in unacceptable, involuntary risk to the occupants. Even for short time frames, the risk to the occupants should be similar, whether it's a temporary or permanent structure. Given the low seismic risk associated with Seismic Design Categories A and B locations, which results in low seismic demands, temporary structures are exempted from designing for seismic loads.

TSUNAMI:

Given that most tsunami-affected areas will have time to respond to a possible inundation, designing temporary structures for tsunami loads was deemed unnecessarily. Rather, temporary structures located in a Tsunami Design Zone will require an Emergency Action Plan that will provide details for evacuating the structure in the event of a tsunami warning.

SNOW:

When snowfall is expected during the service life of a temporary structure, snow loads are determined for surfaces on which snow can accumulate in accordance with Section 1608 and Chapter 7 of ASCE 7. In recognition of the relatively short service life of temporary structures, the ground snow load can be reduced to reflect the relatively low probability that the ASCE 7 ground snow loads will occur during the shorter service life of a temporary structure. The reduction factors of 0.7 and 0.8 in Table 3103.5.1 approximately correspond to 10-year and 20-year MRI for ground snow loads, respectively. If the service life of the temporary structure will not occur during winter months when snow is to be expected, snow loads need not be considered. Similar to wind, an exception is allowed where controlled occupancy actions in Section 3103.7 are adopted, given that on-site management and weather forecasting capabilities allow sufficient time to reduce the risk to occupants by canceling events or reducing the snow loads.

FLOOD:

Temporary structures within riverine and coastal flood zones should be evacuated at the time of loading, therefore the intent of this section is to have a defined plan to secure the structure and minimize the potential for the temporary structure to become floating debris for the surrounding environment. While local flash flooding can occur without advanced warning, the potential hazard area is much more wide-spread and not easily quantified for an enforceable Code provision as part of this cycle. For this reason, there are no requirements for temporary structures outside of a mapped flood zone.

ICE:

When ice can accumulate on a temporary structure during the service life of a temporary structure, ice loads are determined for surfaces on which ice can accumulate in accordance with Section 1614 and Chapter 10 of ASCE 7.

The 0.5-inch nominal ice thickness is based on consideration of the 10-yr and 25-yr mean recurrence interval values. Based on this, the use of a single nominal ice thickness for all locations with a Risk Category II nominal thickness greater than 0.5 inch is recommended. The gust wind speeds in Figure 10.5-1 are concurrent values, rather than extremes, so they should be used in determining wind-ice-loads for temporary ice-sensitive structures.

LOAD FACTORS/RELIABILITY:

The proposed code change is necessary to harmonize the IBC with the IFC since the latter addresses Temporary Special Event Structures and tents that are in service for up to 180 days. The recent pandemic has shown that temporary structures can be in service for more than 180 days and includes structures not regulated within the scope of the IFC.

Given the need to propose load and design criteria for publicly occupied temporary structures based on existing information and standards, the approach presented uses the load and Risk Category criteria in ASCE 7-22. Further analyses may be able to refine these criteria for the next edition of ASCE 7.

EMERGENCY ACTION PLANS:

The code change addresses all the natural hazards and associated environmental loads addressed in IBC chapter 16 and ASCE 7. However, some

hazards are more frequent with a likelihood of occurrence during the in-service period or occupancy while others have a remote possibility of occurrence. Emergency Action plans are currently accepted by authorities having jurisdiction for wind loads to reduce the risk to public safety, given the reduced level of reliability relative to new buildings. Flood hazards may be seasonal for example during hurricane seasons or flash flooding is forecast in advance to allow for removal or tying down of installations. They provide the Building Official with the ability to permit a more cost effective alternative than full compliance.

DURABILITY AND MAINTENCE:

Temporary structures are designed to be assembled and disassembled and transported to many locations as components or as modules. Additionally, they may be in service during varying weather conditions. The components may be damaged during transportation or installation. Components may have been manufactured more than a decade prior to the latest use. As a consequence, and unlike a new structure that is typically constructed with new building materials and components that were not previously used, components for temporary structures need to be inspected regularly and suitability for re-use needs to be assessed. This is typically done by the installation crews, and this is similar to bleachers regulated by ICC 300 (Section 501.2). The qualified person is identified by the owner and approved by the Building Official.

Temporary structures are typically assembled utilizing transportable and reusable components that can get damaged in use or during transportation and in use and need to be verified prior to reuse. The most qualified personnel to address whether superficial corrosion is acceptable or whether bent members can be used will be the specifying engineer or the rigging supervisors or owner's management team who tend to be most familiar with the components and the temporary structure's system.

Cost Impact: The code change proposal will decrease the cost of construction
The proposed code change will reduce the cost of construction since it proposes reduction to the adopted loads in IBC Ch 16 and ASCE 7. The codes and standards that are in effect under the 2021 edition of the I Codes, with the exception of the International Fire Code regulations for Temporary Special Event Structures, do not provide structural loading criteria adjusted to lower loads for temporary structures that typically have a service life of a few days or weeks not to exceed 1 year.

Public Hearing Results

Committee Action: **As Modified**

Committee Modification:

3103.5.1.3 Snow. Snow loads on *public-occupancy temporary structures* shall be determined in accordance with Section 1608 ~~and Chapter 7 of ASCE 7~~. The ground snow loads, p_g, in Section 1608 shall be modified according to Table 3103.5.1.

If the *public-occupancy temporary structure* is not subject to snow loads or not constructed and occupied during winter months when snow is to be expected, snow loads need not be considered, provided that the design is reviewed and modified, as appropriate, to account for snow loads if the period of time when the public-occupancy *temporary structure* is in service shifts to include winter months.

Exception: Risk Category II *public-occupancy temporary structures* that employ controlled occupancy measures per Section 3103.7.2 shall be permitted to use a ground snow load reduction factor of 0.65 instead of the ground snow load reduction factors in Table 3105.1.

3103.5.1.4 Wind. Wind loads on *public-occupancy temporary structures* shall be determined in accordance with Section 1609 ~~and Chapters 26 to 30 of ASCE 7~~. The design wind load shall be modified according to Table 3103.5.2.

Exceptions

1. *Public-occupancy temporary structures* that employ controlled occupancy measures per Section 3103.7.1 shall be permitted to use a load reduction factor of 0.65 instead of the load reduction factors in Table 3103.5.2.

2. *Public-occupancy temporary structures* erected in a hurricane-prone region outside of hurricane season, the design wind speed shall be set at the following 3-second gust basic *wind speeds* depending on *Risk Category*:
   2.1. For *Risk Category* II use 115 mph,
   2.2. For Risk Category III use 120 mph, and
   2.3. For Risk Category IV use 125 mph.

3103.5.1.5 Flood. An Emergency Action Plan, in accordance with 3103.5.4, shall be required ~~submitted~~ for *public-occupancy temporary structures* in a Flood Hazard Area ~~when requested by the Building or Fire Official~~. Where an Emergency Action Plan is approved by the building and fire official, *public* ~~*Public*~~*-occupancy temporary structures* need not be designed for flood loads specified in Section 1612. ~~1615 except when specifically designed as a dry floodproofed structure or designated to be occupied during a storm event per the approved Emergency Action Plan.~~

3103.5.1.6 Seismic. Seismic design of ~~loads on~~ *public-occupancy temporary structures* assigned to Seismic Design Categories C through F shall be determined in accordance with Section 1613. The resulting seismic loads are permitted to be taken as 75% of those determined by Section 1613. *Public-occupancy temporary structures* assigned to Seismic Design Categories A and B need not be designed for seismic loads.

3103.5.1.7 Ice. Ice loads on *public-occupancy temporary structures* shall be determined in accordance with Section 1614~~, Chapter 10 of ASCE 7~~, with the largest maximum nominal thickness being 0.5 in, for all Risk Categories**.** ~~When ice is expected during the occupancy of *public-occupancy temporary structures*, ice loads shall be determined for surfaces on which ice could accumulate in accordance with ASCE 7.~~ If the *public-occupancy temporary structure* is not subject to ice loads or not constructed and occupied during winter months when ice is to be expected, ice loads need not be considered, provided that the design is reviewed and modified, as appropriate, to account for ice loads if the period of time when the temporary structure is in service shifts to include winter months.

3103.5.4 Emergency Action plans. ~~When required by the *Building Official*,~~ Emergency Action Plans shall be submitted and approved. Emergency Action Plans shall include procedures to be implemented due to flood, wind, or snow hazards, or within the tsunami design zone. The action plans shall include provisions for evacuating and anchoring or removal of ~~, securing, or dismantling~~ *public-occupancy temporary structures,* ~~in whole or in part, and removal~~ to prevent damage to surrounding buildings or structures.

Committee Reason: Approved as modified as the proposal appropriately brings guidance for temporary structures into the IBC. The modification provides clarification, removes redundant language adds a needed language to address the Emergency Action Plan. (Vote: 13-1)

S116-22

Individual Consideration Agenda

Public Comment 1:

IBC: 3103.5, 3103.5.1

Proponents: Jonathan Siu, representing Self (jonsiuconsulting@gmail.com); Jennifer Goupil, representing Structural Engineering Institute of ASCE (jgoupil@asce.org) requests As Modified by Public Comment

Further modify as follows:

2021 International Building Code

3103.5 Structural requirements. *Temporary structures* shall comply with Chapter 16 of this code. *Public-occupancy temporary structures* shall be designed and erected to comply with requirements of this Section.
Temporary non-building structures ancillary to public assemblies or special events structures whose structural failure or collapse would endanger assembled public shall be assigned a risk category corresponding to the risk category of the public assembly. For the purposes of establishing an occupant load for the assembled public endangered by structural failure or collapse, the applicable occupant load determination in Section 1004.5 or 1004.6 shall be applied over the assembly area within a radius equal to 1.5 times the height of the temporary non-building structure.

3103.5.1 Structural loads. *Public-occupancy temporary structures* shall be designed in accordance with Sections 3103.5.1.1 through 3103.5.1.9. ~~classified, based on the risk to human life, health, and welfare associated with damage or failure by nature of their occupancy or use, according to Table 1604.5 for the purposes of applying flood, wind, snow, earthquake, and ice provisions. Additionally, public assembly facilities that require more than 15 min to evacuate to a safe location, and any structure whose failure or collapse would endanger the public assembled near the structure, such as speaker stands or other temporary structures for public gatherings shall be classified as Risk Category III.~~

Commenter's Reason: This public comment is being submitted to clarify the original proposal. It address non-building structures such as lighting

or audio equipment stands or camera stands that are associated with public-occupancy temporary structures and special event structures, and can pose a danger to the public if they fail. The intent of this public comment is to say that they should be designed with the appropriate risk category in mind.
The current code is not clear as to how these structures should be classified. IBC Table 1604.5 only says "certain" temporary structures get assigned to Risk Category I. There is no definition of which temporary structures qualify as "certain." The importance factors associated with Risk Category I reduce the required loads these structures are designed to withstand. While Risk Category I may be appropriate for temporary structures that will not affect the public, it is inappropriate where their failure would likely inure or kill people. These types of structures are classified as non-building structures in ASCE 7, and do not fall directly under the definitions of public-occupancy temporary structures or special event structures, since they generally aren't occupied. However, they can still pose a significant danger to people who are assembled nearby, if they should fail.

The original proposal contained a requirement that these all of these ancillary structures should be assigned to Risk Category III. However, this could be viewed as being more restrictive than is required for new construction of, for example, a small theater. In addition, the original proposal did not give guidance as to how to apply the code provisions, since many times the structures are associated with outdoor assembly events whereas the current code generally envisions addressing assemblies within a building.

This public comment requires these non-building structures to be assigned a risk category that is consistent with the risk category associated with the nearby public assembly. If the nearby assembled public would be classified under Risk Category III, any stands that can fall on them should also be Risk Category III. Stands associated with smaller assemblies may get classified as Risk Category II.

In this case, "nearby" is quantified as being an area within 1.5 times the height of the non-building structure. This is consistent with recommendations from the California Building Officials association (CALBO) for the "fall zone" around buildings damaged in earthquakes when conducting ATC-20 building safety evaluations. Those recommendations suggest that building safety evaluators cordon off or barricade for a distance of 1.5 times the height of a damaged building in danger of collapsing to protect the public from building materials that can also shatter and bounce. (Ref. FEMA P-2055, *Post-disaster Building Safety Evaluation Guidance*, November 2019.) The intent of this public comment is to view the assembled public exposed to this falling hazard as being within an area where a radius equal to 1.5 times the height of the non-building structure overlaps the public assembly area. The occupant load used to determine the risk category is determined by counting fixed seats within that overlapping area (Section 1004.6) or applying the appropriate occupant load factors in Table 1004.5 to that area (Section 1004.5).

This public comment is being proposed as an addition to the three WABO TCD/SEI public comments. If all four public comments are approved, the change in Section 3103.5 in this public comment would appear as a second paragraph below the new exception, and the change in Section 3103.5.1 would not override the change in the other public comment. The final result if all four are approved would appear as follows:

3103.5 Structural requirements. Temporary structures shall comply with the structural requirements of this code. Public-occupancy temporary structures shall be designed and erected to comply with the structural requirements of this code and Sections 3103.5.1 through 3103.5.7.

Exception: Where approved, live loads less than those prescribed by Table 1607.1 shall be permitted provided a registered design professional demonstrates that a rational approach has been used and that such reductions are warranted.

Temporary non-building structures ancillary to public assemblies or special events structures whose structural failure or collapse would endanger assembled public shall be assigned a risk category corresponding to the risk category of the public assembly. For the purposes of establishing an occupant load for the assembled public endangered by structural failure or collapse, the applicable occupant load determination in Section 1004.5 or 1004.6 shall be applied over the assembly area within a radius equal to 1.5 times the height of the temporary non-building structure.

3103.5.1 Structural loads. *Public-occupancy temporary structures* shall be designed in accordance with Chapter 16, except as modified by Sections 3103.5.1.1 through 3103.5.1.6.

Cost Impact: The net effect of the public comment and code change proposal will decrease the cost of construction
The original cost impact statement says this proposal will decrease the cost of construction. However, a timed egress analysis for each of these public-occupancy temporary structures will add cost. The change to eliminate that in this public comment will reduce the cost of the original proposal. The change regarding ancillary structures allows some of them to remain under Risk Category II, as opposed to being pushed to Risk Category III, and will therefore reduce costs compared to the original proposal.

Public Comment# 3028

Public Comment 2:

IBC: 3103.1.1

Proponents: Jonathan Siu, representing Washington Association of Building Officials Technical Code Development Committee

(jonsiuconsulting@gmail.com); Jennifer Goupil, representing Structural Engineering Institute of ASCE (jgoupil@asce.org); Micah Chappell, representing Washington Association of Building Officials Technical Code Development Committee (micah.chappell@seattle.gov) requests As Modified by Public Comment

Further modify as follows:

2021 International Building Code

3103.1.1 Extended period of service time. *Public-occupancy temporary structures* shall be permitted to remain in service for 180 days or more without complying with requirements in this code for new buildings or structures when extensions for up to 1 year are granted by the *Building Official* in accordance with Section 108.1 and when the following conditions are satisfied:

1. Additional inspections as determined by the *Building Official* shall be performed by a qualified person to verify that site conditions and the approved installation comply with the conditions of approval at the time of final inspection.
2. ~~The *Building Official*~~ A qualified person shall perform follow up inspections after initial occupancy at intervals not exceeding 180 days to verify the site conditions and the installation conform to the approved site conditions and installation requirements. Inspection records shall be kept and shall be made available for verification by the Building Official.
3. An examination shall be performed by a registered design professional to determine the adequacy of the *temporary structure* to resist the structural loads required in Section 3103.5.
4. Relocation of the *public-occupancy temporary* ~~*structures*~~ *structure* shall require a new ~~approval by the *Building Official*~~ permit application.
5. The use or occupancy approved at the time of final inspection shall remain unchanged.
6. A request for an extension is submitted to the building official. The request shall include records of the inspections and examination in Items 1 and 3 above.

Commenter's Reason: This public comment is intended to improve the enforceability of this proposal. As written, the proposal requires the building official to track and conduct ongoing inspections of these structures after the Certificate of Occupancy is issued. Unless there is work being done that requires a permit, what happens after the CofO is issued is not normally regulated by the building official. For many jurisdictions, this would require setting up a system similar to Temporary CofOs to keep track of these and trigger the required inspections. For those jurisdiction who have an electronic permit tracking system, this is less onerous than for those who are still working in a paper system, but even with electronic permitting, setting up the system may not be a negligible effort.
The biggest changes proposed by this public comment are in Items 1 and 2. Instead of requiring the building official to track these, this public comment puts the onus on the owner and their "qualified person" to provide the additional inspections in Item 1, and the ongoing inspections in Item 2. For the ongoing inspections, the qualified person is required to keep the records, should the building official or their delegee wants to review them. These changes make the process very similar to the process for special inspections in Chapter 17, where the building official relies on a special inspector or agency for many of the details of construction.

The change to Item 4 clarifies this applies to public-occupancy temporary structures (not all temporary structures), and that the owner will need to apply for a new permit and go through the full permit process for relocated public-occupancy temporary structures, as opposed to getting an undefined "new approval" from the building official.

Regarding the new Item 6, the apparent intent of the original proposal is that the extension is granted without requiring the owner to go through the normal permit application process. This public comment clarifies the request has to be submitted to the building official, and that reports resulting from the inspections by the qualified person and the registered design professional's "examination" must be submitted along with the request. The jurisdiction's process will determine what form the request takes (written or electronic).This public comment is one of a series of three being submitted by WABO TCD and ASCE to improve this proposal. This public comment is not intended to override the editorial change being made to Section 3103.1.1 by one of the other comments (changing "when" to "where" in two places). For reference, we have developed a clean version of the proposal that incorporates all three public comments (see link below), showing how the final code language for the entire change should appear, should all three public comments be approved.

https://www.cdpaccess.com/public-comment/3147/27095/files/download/3599/S116-22%20Temp%20Structures%20-%20Combined%20SIU%205-6-12%20PCs%20%28clean%29.pdf

Cost Impact: The net effect of the public comment and code change proposal will decrease the cost of construction
The original proposal states the cost of construction will decrease. This public comment does not change the proposal's effect on the initial cost of construction, since it applies to ongoing maintenance and inspections after the initial Certificate of Occupancy is issued. However, the public comment will increase the costs to the owner relative the original proposal, since the owner will be required to hire/retain the "qualified person" to conduct the ongoing inspections. Because the original proposal is unclear on the qualifications of the "qualified person," and because of the variability in the size and complexity of the temporary structures being regulated, it is not possible to put an accurate dollar value on the additional cost. But supposing the "qualified person" is an engineer who charges $300/hour for their services, and it takes 3 hours to conduct the required inspections, the cost for each inspection would be less than $1000. On the other hand, this public comment will decrease the costs for the building official's jurisdiction relative to the original proposal, since the jurisdiction won't be required to incorporate ongoing inspections and tracking into their

processes and workload. The building official will only incur costs if they choose to follow up on these structures.

Public Comment# 3029

Public Comment 3:

IBC: 3103.5.1.3, 3103.5.1.4, 3103.5.1.5, 3103.5.1.7, 3103.5.1.8, 3103.5.4, 3103.5.5, 3103.7, 3103.7.1, 3103.7.2, 3103.7.3

Proponents: Jonathan Siu, representing Washington Association of Building Officials Technical Code Development Committee (jonsiuconsulting@gmail.com); Jennifer Goupil, representing Structural Engineering Institute of ASCE (jgoupil@asce.org); Micah Chappell, representing Washington Association of Building Officials Technical Code Development Committee (micah.chappell@seattle.gov) requests As Modified by Public Comment

Further modify as follows:

2021 International Building Code

3103.5.1.3 Snow. Snow loads on *public-occupancy temporary structures* shall be determined in accordance with Section 1608. The ground snow loads, p_g, in Section 1608 shall be modified according to Table 3103.5.1.3.
~~If the *public-occupancy temporary structure* is not subject to snow loads or not constructed and occupied during winter months when snow is to be expected, snow loads need not be considered, provided that the design is reviewed and modified, as appropriate, to account for snow loads if the period of time when the public-occupancy *temporary structure* is in service shifts to include winter months.~~

Exception: Risk Category II *public-occupancy temporary structures* that employ controlled occupancy ~~measures~~ procedures per Section ~~3103.7.2~~ 3103.7 shall be permitted to use a ground snow load reduction factor of 0.65 instead of the ground snow load reduction factors in Table 3105.1.3.

Where the *public-occupancy temporary structure* is not subject to snow loads or not constructed and occupied during times when snow is to be expected, snow loads need not be considered, provided that where the period of time when the public-occupancy temporary structure is in service shifts to include times when snow is to be expected, either of the following conditions is met:

1. The design is reviewed and modified, as appropriate, to account for snow loads; or
2. Controlled occupancy procedures in accordance with Section 3103.7 are implemented.

3103.5.1.4 Wind. Wind loads on *public-occupancy temporary structures* shall be determined in accordance with Section 1609. The design wind load shall be modified according to Table 3103.5.1.4.

Exceptions

1. *Public-occupancy temporary structures* that ~~employ~~ implement controlled occupancy ~~measures~~ procedures per Section ~~3103.7.1~~ 3103.7 shall be permitted to use a load reduction factor of 0.65 instead of the load reduction factors in Table 3103.5.1.4.
2. *Public-occupancy temporary structures* erected in a hurricane-prone region outside of hurricane season, the design wind speed shall be set at the following 3-second gust basic *wind speeds* depending on *Risk Category*:
   2.1. For *Risk Category* II use 115 mph,
   2.2. For Risk Category III use 120 mph, and
   2.3. For Risk Category IV use 125 mph.

3103.5.1.5 Flood. ~~An Emergency Action Plan , in accordance with Section 3103.5.4, shall be required for *public-occupancy temporary structures* in a Flood Hazard Area. Where an Emergency Action Plan is approved by the building and fire official,~~ *~~public~~ Public-occupancy temporary structures* need not be designed for flood loads specified in Section1612. Controlled occupancy procedures in accordance with Section 3103.7 shall be implemented.

3103.5.1.7 Ice. Ice loads on *public-occupancy temporary structures* shall be determined in accordance with Section 1614 with the largest maximum nominal thickness being 0.5 in, for all Risk Categories**.** ~~If~~ Where the *public-occupancy temporary structure* is not subject to ice loads or not constructed and occupied during ~~winter months~~ times when ice is to be expected, ice loads need not be considered, provided that where the period of time when the temporary structure is in service shifts to include times when ice is to be expected, either of the following conditions is met:

1. ~~the~~ The design is reviewed and modified, as appropriate, to account for ice loads ~~if the period of time when the temporary structure is in service shifts to include winter months~~ ; or

2. Controlled occupancy procedures in accordance with Section 3103.7 are implemented.

3103.5.1.8 Tsunami. ~~An Emergency Action Plan, in accordance with Section 3103.5.4, shall be submitted for *public-occupancy temporary structures* in a Tsunami Design Zone when requested by the Building or Fire Official. The *public*~~ *Public-occupancy temporary* ~~*structure*~~ *structures* in a tsunami design zone need not be designed for tsunami loads specified in Section 1615. Controlled occupancy procedures in accordance with Section 3103.7, shall be implemented.

~~**3103.5.4 Emergency Action plans.** Emergency Action Plans shall be submitted and approved. Emergency Action Plans shall include procedures to be implemented due to flood, wind, or snow hazards, or within the tsunami design zone. The action plans shall include provisions for evacuating and anchoring or removal of *public-occupancy temporary structures,* to prevent damage to surrounding buildings or structures.~~

~~**3103.5.5**~~ **3103.5.4 Durability and maintenance.** [Text unchanged]

3103.7 Controlled occupancy procedures. ~~*Public-occupancy temporary structures* that comply with Section 3103.5 for structural requirements do not require monitoring for controlled occupancy.~~ Where controlled occupancy procedures are required to be implemented for ~~*Public*~~ *public-occupancy temporary structures* ~~that employ exceptions for reduced environmental loads shall employ controlled occupancy procedures as specified~~ in Section 3103.5.1, the procedures shall comply with this section and ~~in accordance with~~ ANSI ES1.7. An operations management plan ~~conforming to~~ in accordance with ANSI E1.21 ~~with an occupant evacuation plan~~ shall be submitted to the *Building Official* for approval as a part of the permit documents. In addition, the operations management plan shall include an emergency action plan that documents the following information, where applicable:

1. Surfaces on which snow or ice accumulates shall be monitored before and during occupancy of the public-occupancy temporary structure. Any loads in excess of the design snow or ice load shall be removed prior to its occupancy, or the public-occupancy temporary structure shall be vacated in the event that either the design snow or ice load is exceeded during its occupancy.
2. Wind speeds associated with the design wind loads shall be monitored before and during occupancy of the public-occupancy temporary structure. The public-occupancy temporary structure shall be vacated in the event that the design wind speed is expected to be exceeded during its occupancy.
3. Criteria for initiating occupant evacuation procedures for flood and tsunami events.
4. Occupant evacuation procedures shall be specified for each environmental hazard where the occupant management plan specifies the public-occupancy temporary structure is to be evacuated.
5. Procedures for anchoring or removal of the public-occupancy temporary structure, or other additional measures or procedures to be implemented to mitigate hazards in snow, wind, flood, ice, or tsunami events.

~~**3103.7.1 Wind.** Wind speeds associated with the design wind loads shall be monitored before and during occupancy of the *public-occupancy temporary structure. The public-occupancy temporary structure* shall be vacated in the event that the design wind speed is expected to be exceeded during its occupancy.~~

~~**3103.7.2 Snow.** Surfaces on which snow accumulates shall be monitored before and during occupancy of the *public-occupancy temporary structure* and any loads in excess of the design snow load shall be removed prior to its occupancy, or the *public-occupancy temporary structure* shall be vacated in the event that the design snow load is exceeded during its occupancy.~~

~~**3103.7.3 Ice.** Surfaces on which ice accumulates shall be monitored before and during occupancy of the *public-occupancy temporary structure* and any loads in excess of the design ice load *shall* be removed prior to its occupancy, or the *public-occupancy temporary structure* shall be vacated in the event that the design ice load is exceeded during its occupancy.~~

Commenter's Reason: This public comment is intended to coordinate, clarify, and simplify the requirements surrounding the proposed emergency action and operations management plans. As written, the proposal is confusing as to whether the emergency action plan is a separate document from the operations management plan, yet it seems that the (minimal) elements outlined in the section on emergency action plans are, or should be, included in the operations management plan. This public comment places requirements for an emergency action plan within the requirements for controlled occupancy procedures, revises the section on controlled occupancy, and makes other editorial changes to coordinate the applicable sections. Specifically:

- "Controlled occupancy measures" is replaced in the snow and wind sections (exceptions in 3103.5.1.3 and 3103.5.1.4) with "controlled occupancy procedures" to be consistent with Section 3103.7. This is intended to eliminate confusion as to whether "measures" are different from "procedures."
- Requirements for an "emergency action plan" for floods and tsunamis (3103.5.1.5 and 3103.5.1.8) is replaced with a requirement to employ controlled occupancy procedures. This is intended to make the language consistent among the sections, and coordinates with changes to 3103.7. The order of the sentences in both sections has been revised to lead off with the load (non-) requirement, since 3103.5.1 is generally about environmental loads.
- Provisions allowing controlled occupancy procedures for snow have been modified to allow for regional differences in expected snow events. The original proposal referred to "winter months," but there are areas that can expect snow events year-round.

- An allowance to implement controlled occupancy procedures is added to ice loads (3103.5.1.7) as an option to redesigning the structure if the occupancy extends into times when ice is to be expected. This makes the ice provisions parallel with snow, and coordinates this section with 3103.7.3 in the original proposal (3103.7, Item 2 in this public comment).
- Section 3103.5.4 (Emergency action plans) is deleted, since there is a requirement for an operations management plan in 3103.7, which includes an emergency action plan. In addition, the sentence regarding protection of surrounding structures not only should be part of the controlled occupancy procedures, but also fails to recognize that people should be protected from the hazards created by these structures.
- With the deletion of 3103.5.4, the section that follows (durability and maintenance) has been renumbered.
- Besides retitling the section to refer to controlled occupancy procedures, Section 3103.7 has been substantially rewritten and reformatted.
    - The first sentence stating controlled occupancy monitoring (procedures? measures?) are not required is unnecessary and in the cases of flood and tsunami, conflicts with the requirement for an emergency action plan (now part of the operations management plan). The sentence has been deleted without replacement.
    - The first modification to the next sentence simplifies and clarifies the trigger language for controlled occupancy procedures. As written, the requirement that appeared to say controlled occupancy procedures were required where any environmental load is reduced in 3103.5 conflicted with the actual provisions--only certain reductions require the procedures. This has been clarified by referring back to triggers in 3103.5.1.
    - ANSI E1.21 contains requirements for monitoring the weather and forecast for high winds, tornadoes, thunderstorms, lightning, and other "severe conditions," as well as a requirement for mitigating actions for ice and snow to be specified in the operations management plan. These appear to overlap with the originally-proposed emergency action plan. This public comment now requires an emergency action plan be included in the operations management plan, and that some additional information needs to be provided.
    - The originally-proposed wind, snow, and ice subsections of 3103.7 provide some additional guidance on mitigating activities that should be included in the operations management plan. Subsections 3103.7.1 through 3103.7.3 in the original proposal have been reformatted as numbered items in Section 3103.7, for clarity and to make the charging language simpler.
        - Subsections 3103.7.2 and 3103.7.3 have been combined in the new Item 1 since the language in each of the subsections was identical except for the hazard.
        - Subsection 3103.7.1 is now Item 2. The change in order of presentation is so the items will appear in the same order as they appear in Section 3103.5.1 (snow before wind).
        - The new Item 3 clarifies the operations management plan needs to specify what triggers evacuation for flood and tsunami events.
        - The new Item 4 requires the operations management plan to specify the procedures for evacuation, once those procedures are triggered.
        - The new Item 5 is a catch-all for any other necessary procedures, and incorporates requirements from the deleted section on emergency action plans.

This public comment is one of a series of three being submitted by WABO TCD and ASCE to improve this proposal. This public comment is intended to be melded together with the changes proposed by the other two public comments. Because this public comment is proposing very substantive changes to the original proposal, it is being submitted for separate consideration at the Public Comment Hearings. Thus, in some cases, if this public comment is approved, it will override the other public comments, and in others (particularly for editorial changes), the other public comments are intended to govern. For reference, we have developed a clean version of the proposal that incorporates all three public comments (see link below), showing how the final code language for the entire change should appear, should all three public comments be approved.

https://www.cdpaccess.com/public-comment/3147/27095/files/download/3599/S116-22%20Temp%20Structures%20-%20Combined%20SIU%205-6-12%20PCs%20%28clean%29.pdf

Cost Impact: The net effect of the public comment and code change proposal will decrease the cost of construction
The original cost impact statement says this proposal will decrease the cost of construction. This public comment clarifies and reformats the proposal, and therefore, will have no effect on the original cost impact statement.

Public Comment# 3040

Public Comment 4:

IBC: CHAPTER 2, SECTION 202, CHAPTER 31, SECTION 3103, 3103.1, 3103.1.1, 3103.5, 3103.5.1, 3103.5.1.1, 3103.5.1.2, 3103.5.1.3, 3103.5.1.4, 3103.5.1.5, 3103.5.1.6, 3103.5.1.7, 3103.5.1.8, 3103.5.2, 3103.5.3, 3103.5.5, CHAPTER 16, 1608.1, 1609.1.1, 1612.2, 1613.1, 1614.1, 1615.1

Proponents: Jonathan Siu, representing Washington Association of Building Officials Technical Code Development Committee (jonsiuconsulting@gmail.com); Jennifer Goupil, representing Structural Engineering Institute of ASCE (jgoupil@asce.org); Micah Chappell, representing Washington Association of Building Officials Technical Code Development Committee (micah.chappell@seattle.gov) requests As Modified by Public Comment

Further modify as follows:

2021 International Building Code

CHAPTER 2
DEFINITIONS

SECTION 202
DEFINITIONS

PUBLIC-OCCUPANCY TEMPORARY STRUCTURE. Any building or structure erected for a period of one year or less that serves an assembly occupancy or other public use. ~~*support public or private assemblies*, or that provide human shelter, protection, or safety. Public-occupancy temporary structures within the confines of another existing structure (such as convention booths) are exempted from Section 3103.5.~~

CHAPTER 31
SPECIAL CONSTRUCTION

SECTION 3103
TEMPORARY STRUCTURES

3103.1 General. The provisions of Sections 3103.1 through 3103.7 shall apply to structures erected for a period of less than 180 days. Temporary *special event structures*, tents, umbrella structures and other membrane structures erected for a period of less than 180 days shall also comply with the *International Fire Code* . *Temporary structures* erected for a longer period of time and *public-occupancy temporary structures* shall comply with applicable sections of this code.

~~Exception~~ Exceptions:

1. *Public-occupancy temporary structures* complying with Section 3103.1.1 shall be permitted to remain in service for 180 days or more but not more than 1 year ~~when~~ where approved by the *Building Official*.
2. *Public-occupancy temporary structures* erected within the confines of an existing structure are not required to comply with Section 3103.5.

3103.1.1 Extended period of service time. *Public-occupancytemporary structures* shall be permitted to remain in service for 180 days or more without complying with requirements in this code for new buildings or structures ~~when~~ where extensions for up to 1 year are granted by the *Building Official* in accordance with Section 108.1 and ~~when~~ where the following conditions are satisfied:
[No change to conditions]

3103.5 Structural requirements. *Temporary structures* shall comply with ~~Chapter 16~~ the structural requirements of this code. *Public-occupancy temporary structures* shall be designed and erected to comply with the structural requirements of this ~~Section~~ code and Sections 3103.5.1 through 3103.5.7.

Exception: Where approved, live loads less than those prescribed by Table 1607.1 shall be permitted, provided a registered design professional demonstrates that a rational approach has been used and that such reductions are warranted.

3103.5.1 Structural loads. *Public-occupancy temporary structures* shall be designed in accordance with Chapter 16, except as modified by Sections 3103.5.1.1 through 3103.5.1.6. ~~classified, based on the risk to human life, health, and welfare associated with damage or failure by nature of their occupancy or use, according to Table 1604.5 for the purposes of applying flood, wind, snow, earthquake, and ice provisions. Additionally, public assembly facilities that require more than 15 min to evacuate to a safe location and any structure whose failure or collapse would endanger the public assembled near the structure, such as speaker stands or other temporary structures for public gatherings shall be classified as Risk Category III.~~

~~**3103.5.1.1 Dead.** Dead loads on *public-occupancy temporary structures* shall be determined in accordance with Section 1606.~~

~~**3103.5.1.2 Live.** Live loads on *public-occupancy temporary structures* shall be determined in accordance with Section 1607.~~

~~**Exception**: Where *approved, live loads* less than those prescribed by Table 1607.1 *Minimum Uniformly Distributed Live Loads, L_o, and Minimum Concentrated Live Loads* shall be permitted where shown by the *registered design professional* that a rational approach has been used and that such reductions are warranted.~~

~~**3103.5.1.3** **3103.5.1.1 Snow loads.** Snow loads on *public-occupancy temporary structures* shall be determined in accordance with Section 1608. The ground snow loads, p_g, in Section 1608 shall be permitted to be modified ~~according to~~ in accordance with the ground snow load reduction factors in Table ~~3103.5.1.3~~ 3103.5.1.
If the *public-occupancy temporary structure* is not subject to snow loads or not constructed and occupied during ~~winter months~~ times when snow is to be expected, snow loads need not be considered, provided that the design is reviewed and modified, as appropriate, to account for snow loads if the period of time when the public-occupancy *temporary structure* is in service shifts to include ~~winter months~~ times when snow is to be expected.

Exception: Ground snow loads, p_g, for ~~Risk Category II~~ *public-occupancy temporary structures* that employ controlled occupancy measures per Section 3103.7.2 shall be permitted to ~~use~~ be modified using a ground snow load reduction factor of 0.65 instead of the ground snow load reduction factors in Table ~~3105.1.3~~ 3103.5.1.

~~**3103.5.1.4**~~ **3103.5.1.2 Wind loads.** ~~Wind loads on *public-occupancy temporary structures* shall be determined in accordance with Section 1609.~~ The design wind load on *public-occupancy temporary structures* shall be permitted to be modified ~~according to~~ in accordance with the wind load reduction factors in Table ~~3103.5.1.4~~ 3103.5.2.

Exceptions

1. Design wind loads on ~~*Public*~~ *public-occupancy temporary structures* that employ controlled occupancy measures per Section 3103.7.1 shall be permitted to ~~use~~ be modified using a wind load reduction factor of 0.65 instead of the load reduction factors in Table ~~3103.5.1.4~~ 3103.5.2.
2. For ~~*Public*~~ *public-occupancy temporary structures* erected in a hurricane-prone region outside of hurricane season, the ~~design~~*basic wind speed*, *V*, shall be permitted to be set ~~at the following 3-second gust basic *wind speeds*~~ as follows, depending on *Risk Category*:
   2.1. For *Risk Category* II use 115 mph,
   2.2. For Risk Category III use 120 mph, and
   2.3. For Risk Category IV use 125 mph.

~~**3103.5.1.5**~~ **3103.5.1.3 Flood loads.** An Emergency Action Plan, in accordance with Section 3103.5.4, shall be required for *public-occupancy temporary structures* in a Flood Hazard Area. Where an Emergency Action Plan is approved ~~by the building and fire official~~, *public occupancy temporary structures* need not be designed for flood loads specified in Section1612.

~~**3103.5.1.6**~~ **3103.5.1.4 Seismic loads.** ~~Seismic design of *public-occupancy temporary structures* assigned to Seismic Design Categories C through F shall be determined in accordance with Section 1613. The resulting seismic~~ Seismic loads on *public-occupancy temporary structures* assigned to Seismic Design Categories C through F shall be ~~are~~ permitted to be taken as 75% of those determined by Section 1613. *Public-occupancy temporary structures* assigned to Seismic Design Categories A and B need not be designed for seismic loads.

~~**3103.5.1.7**~~ **3103.5.1.5 Ice loads.** Ice loads on *public-occupancy temporary structures* shall be permitted to be determined ~~in accordance with Section 1614~~ with the largest maximum nominal thickness being 0.5 ~~in~~ inches (13 mm), for all Risk Categories. ~~If~~ Where the *public-occupancy temporary structure* is not subject to ice loads or not constructed and occupied during ~~winter months~~ times when ice is to be expected, ice loads need not be considered, provided that the design is reviewed and modified, as appropriate, to account for ice loads if the period of time when the temporary structure is in service shifts to include ~~winter months~~ times when ice is to be expected.

~~**3103.5.1.8**~~ **3103.5.1.6 Tsunami loads.** An Emergency Action Plan, in accordance with Section 3103.5.4, shall be submitted for *public-occupancy temporary structures* in a Tsunami Design Zone ~~when requested by the Building or Fire Official~~. The *public-occupancy temporary structure* need not be designed for tsunami loads specified in Section 1615.

3103.5.2 Foundations. *Public-occupancy temporary structures* ~~may~~ shall be permitted to be supported on the ground with temporary foundations ~~when~~ where approved by the Building Official. Consideration shall be given for the impacts of differential settlement ~~when~~ where foundations do not extend below the ground or foundations supported on compressible materials. The presumptive load-bearing value for *public-occupancy temporary structures* supported on a pavement, slab on grade or on other *Collapsible or Controlled Low Strength* substrates soils such as beach sand or grass shall be assumed not to exceed 1,000 psf unless determined through testing and evaluation by a registered design professional. The presumptive load-bearing values listed in Table 1806.2 shall be permitted to be used for other supporting soil conditions.

3103.5.3 Installation and maintenance inspections. A qualified person shall inspect *public-occupancy temporary structures* that are assembled using transportable and reusable materials; components shall be inspected when purchased or acquired and at least once per year. The inspection shall evaluate individual components, and the fully assembled structure, to determine suitability for use based on the requirements in ESTA ANSI E1.21. Inspection records shall be kept and shall be made available for verification by the *Building Official*. Additionally, *public-occupancy temporary structures* shall be inspected at regular intervals when in service to ensure that the structure continues to perform as designed and initially erected.

3103.5.5 Durability ~~and maintenance~~. Reusable components used in the erection and the installation of *public-occupancy temporary structures* shall be manufactured of durable materials necessary to withstand environmental conditions at the service location. Components damaged during transportation or installation and due to the effects of weathering shall be replaced or repaired.
~~A qualified person shall inspect *public-occupancy temporary structures*, including components, when purchased or acquired and at least once per year, based on the requirements in ANSI E1.21. Inspection records shall be kept and shall be made available for verification by the *building official*. Additionally, *public-occupancy temporary structures* shall be inspected at regular intervals when in service to ensure that the structure continues to perform as designed and initially erected.~~

CHAPTER 16
STRUCTURAL DESIGN

1608.1 General. Design snow *loads* shall be determined in accordance with Chapter 7 of ASCE 7, but the design roof *load* shall be not less than that

determined by Section 1607.

Exception: *Temporary structures* complying with Section ~~3103.5.1.3~~ 3103.5.1.1.

1609.1.1 Determination of wind loads. Wind *loads* on every building or structure shall be determined in accordance with Chapters 26 to 30 of ASCE 7. The type of opening protection required, the basic design *wind speed*, *V*, and the exposure category for a site is permitted to be determined in accordance with Section 1609 or ASCE 7. Wind shall be assumed to come from any horizontal direction and wind pressures shall be assumed to act normal to the surface considered.

Exceptions:

1. Subject to the limitations of Section 1609.1.1.1, the provisions of ICC 600 shall be permitted for applicable Group R-2 and R-3 buildings.
2. Subject to the limitations of Section 1609.1.1.1, residential structures using the provisions of AWC WFCM.
3. Subject to the limitations of Section 1609.1.1.1, residential structures using the provisions of AISI S230.
4. Designs using NAAMM FP 1001.
5. Designs using TIA-222 for antenna-supporting structures and antennas, provided that the horizontal extent of Topographic Category 2 escarpments in Section 2.6.6.2 of TIA-222 shall be 16 times the height of the escarpment.
6. Wind tunnel tests in accordance with ASCE 49 and Sections 31.4 and 31.5 of ASCE 7.
7. *Temporary structures* complying with Section ~~3103.5.1.4~~ 3103.5.1.2.

The wind speeds in Figures 1609.3(1) through 1609.3(12) are basic design wind speeds, *V*, and shall be converted in accordance with Section 1609.3.1 to allowable stress design wind speeds, V_{asd}, when the provisions of the standards referenced in Exceptions 4 and 5 are used.

1612.2 Design and construction. The design and construction of buildings and structures located in *flood hazard areas*, including *coastal high hazard areas* and *coastal A zones*, shall be in accordance with Chapter 5 of ASCE 7 and ASCE 24.

Exception: *Temporary structures* complying with Section ~~3103.5.1.5~~ 3103.5.1.3.

1613.1 Scope. Every structure, and portion thereof, including nonstructural components that are permanently attached to structures and their supports and attachments, shall be designed and constructed to resist the effects of earthquake motions in accordance with Chapters 11, 12, 13, 15, 17 and 18 of ASCE 7, as applicable. The *seismic design category* for a structure is permitted to be determined in accordance with Section 1613 or ASCE 7.

Exceptions:

1. Detached one- and two-family dwellings, assigned to *Seismic Design Category* A, B or C, or located where the mapped short-period spectral response acceleration, S_S, is less than 0.4 g.
2. The *seismic force-resisting system* of wood-frame buildings that conform to the provisions of Section 2308 are not required to be analyzed as specified in this section.
3. Agricultural storage structures intended only for incidental human occupancy.
4. Structures that require special consideration of their response characteristics and environment that are not addressed by this code or ASCE 7 and for which other regulations provide seismic criteria, such as vehicular bridges, electrical transmission towers, hydraulic structures, buried utility lines and their appurtenances and nuclear reactors.
5. References within ASCE 7 to Chapter 14 shall not apply, except as specifically required herein.
6. *Temporary structures* complying with Section ~~3103.5.1.6~~ 3103.5.1.4.

1614.1 General. *Ice-sensitive structures* shall be designed for atmospheric ice *loads* in accordance with Chapter 10 of ASCE 7. *Public-occupancy temporary structures* shall comply with Section 3103.7.3.

Exception: *Temporary structures* complying with Section ~~3103.5.1.7~~ 3103.5.1.5.

1615.1 General. The design and construction of *Risk Category* III and IV buildings and structures located in the *Tsunami Design Zones* defined in the *Tsunami Design Geodatabase* shall be in accordance with Chapter 6 of ASCE 7, except as modified by this code.

Exception: *Temporary structures* complying with Section ~~3103.5.1.8~~ 3103.5.1.6.

Commenter's Reason: This public comment is being submitted to clarify the original proposal by making editorial changes, some minor changes that are technically substantive, and several clearly substantive changes. We believe this will result in a more reasonable, understandable, and enforceable code.
The substantive changes:

- Modify the definition of "public-occupancy temporary structure."

- As proposed, this definition is overly-broad. A building or structure that "provide[s] human shelter, protection, or safety" makes any building fall under this definition. Second, the use of "support" in the definition can cause confusion whether this is intended to mean structural support, or just be associated with the assemblies. Third, including "private assemblies" is confusing when the defined term is "public." Lastly, the second sentence in the definition is an exception to a code requirement that does not belong in a definition.
- This public comment addresses the issues above by changing "supports" to "serves," changes "public and private assemblies" to "assembly occupancies," moves the second sentence to an exception to the scoping of Section 3103.1, and replaces the reference to shelter/protection/safety with "public use."
  - "Serves" still brings the ancillary structures associated with temporary assemblies into these regulations, but doesn't confuse the issue of whether the structure needs to provide actual structural support for a stage, for example, in order for these regulations to apply.
  - The term "public use" was chosen to give the building official the flexibility to interpret it as needed, but to convey the idea the "public" had to be using the structure. Thus, the intent is to include structures like temporary COVID vaccination and testing facilities, field hospitals, or emergency shelter for people experiencing homelessness (e.g., "tiny home" villages), but not include temporary structures, for example, that only provide shelter for materials like cement bags or highway salt/sand.

- Delete the requirements related to Risk Category (Section 3103.5.1).
  - The main reason for the deletion is that the original proposal made some substantive modifications to the Risk Category table (1604.5) that we do not think were appropriate. First, it would have required a computerized timed egress analysis to prove these structures could be evacuated in 15 seconds, or else it would get thrown into Risk Category III. Second, it would require those temporary structures serving any assembly occupancy (speaker stands, light standards, etc.) to be classified as Risk Category III, which could be a more stringent classification than if they were permanent.
  - Ultimately, we think Risk Category should just be determined by Section 1604.5, and not modified here.

- Delete the Risk Category II limitation for reducing the snow loads (Section 3103.5.1.1, Exception).
  - The deletion creates consistency with use of the reduction factors for the wind and ice loads where controlled occupancy procedures are being used.
  - In addition, if controlled occupancy procedures are implemented (for example, evacuating the public-occupancy temporary structure), there is no reason why the same reduction factors could not be applied to structures in a higher risk category.

- Change references to "winter months" in the snow and ice sections to be more generic (Sections 3103.5.1.1 and 3103.5.1.5)
  - As we were collaborating with others on this, it was pointed out that some areas of the country have snow and ice events at times other than the winter months--in some cases, year-round. This public comment changes those references to refer to times when snow or ice "is to be expected," to allow for those regional differences.

- Require an Emergency Action Plan whenever a public-occupancy temporary structure is located in a tsunami design zone (Section 3103.5.1.6).
  - The original proposal made this only a requirement when the building or fire official asked for one. We believe that you should have should have an evacuation plan, along with triggers for initiating the plan whenever these are located in areas subject to tsunami inundation, similar to the flood loads section. These should be included in the Emergency Action Plan.

The technically substantive changes:

- Modifies the exception to Section 3103.5 (moved from the deleted 3103.5.1.2 on live loads) to refer to "a" registered design professional, rather than "the" registered design profession. The latter implies a specific person, which gets into contractural arrangements that the building code should not be regulating.
- Make all the load reductions in Section 3103.5.1 optional ("shall be permitted to be"), instead of making them mandatory per the original proposal.
- Aligns the wind speed terminology in the renumbered Section 3103.5.1.2 (wind loads) with the terminology used in S9-22 (Approved as Submitted by the Structural Committee)

The editorial changes:

- Makes the new text in Section 3103.5.1 (structural loads) charging for the rest of the section, saying to comply with the structural loads in Chapter 16, unless the following subsections modify them. This allows deletion of the dead and live load subsections since they didn't modify Chapter 16, and allows deletion of any pointers to Chapter 16 sections in the remaining subsections.
- Align the language among the sections (use parallel construction),
- Use traditional code language ("where" instead of "if" or "when," and "shall be permitted" instead of "may")
- Modify references to the load reduction tables to reflect the correct table numbers.
- Deletes the unnecessary table title in the relocated exception to Section 3103.5, and rearranges the text of the exception so the registered design professional needs to "demonstrate" the lower loads are justified.
- Reorganize some of the provisions as follows:
  - The exception within the definition of "public-occupancy temporary structure" becomes a second exception to the scoping in Section

3103.1. (See the substantive change to the definition, above.)
    - With the deletion of the live loads section (see substantive change to 3103.5.1 above), the exception that used to be in the live loads section is moved to the general charging for structural requirements (Section 3103.5).
    - A redundant provision for maintenance inspections is deleted from Section 3103.5.5 (Durability) and the statement of purpose for the inspections that was in deleted language is now included to Section 3105.3 (installation and maintenance inspections).
- Modify the references in the Chapter 16 exceptions to reflect the new organization.

This public comment is one of a series of three being submitted by WABO TCD and ASCE to improve this proposal. This public comment is not intended to override any substantive or organizational changes being made by the other comments. For reference, we have developed a clean version of the proposal that incorporates all three public comments (see link below), showing how the final code language for the entire change should appear, should all three public comments be approved.

https://www.cdpaccess.com/public-comment/3147/27095/files/download/3599/S116-22%20Temp%20Structures%20-%20Combined%20SIU%205-6-12%20PCs%20%28clean%29.pdf

Cost Impact: The net effect of the public comment and code change proposal will decrease the cost of construction
The original cost impact statement says the cost of construction will decrease. The editorial changes, minor substantive changes, and the change to the definition are clarifications that will have no effect on the original cost impact statement. The elimination of a requirement for a timed-egress analysis to avoid Risk Category III will reduce the cost of construction as compared to the original proposal, but overall, will have no effect on the original cost impact statement.

G2-22

IBC: SECTION 202 (New)

Proposed Change as Submitted

Proponents: David Bonowitz, representing Self (dbonowitz@att.net)

THIS CODE CHANGE WILL BE HEARD BY THE INTERNATIONAL BUILDING CODE-STRUCTURAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THIS COMMITTEES.

2021 International Building Code

Add new definition as follows:

LIFE SAFETY COMPONENTS (for risk category). Components of *life safety systems*, *designated seismic systems*, *emergency power systems*, and emergency and egress lighting systems. This definition of *life safety components* is limited in application to the provisions of Section 1604.5.

Reason:
This proposal defines a term already used in Section 1604.5.1. (If approved, the words "life safety components," currently used only in Sec 1604.5.1, would be italicized by staff.)

The term "life safety components" is similar to the term *life safety systems*, which was defined only in the 2021 IBC. But "life safety components" is also understood to include certain nonstructural components commonly considered "life safety systems" for purposes of seismic design, as cited in Section 1613 and as used without definition in ASCE 7. Those are identified by the IBC-defined term *designated seismic systems*.

Thus, a reasonable definition of *life safety components*, as already used in Section 1604.5.1 can be derived by combining these two groups of components. By adding *emergency power systems* (also already defined) and lighting, the proposed definition also draws from (and coordinates with) the scope of ASCE 41 (see below).

For reference:

ASCE 7 does not define "life safety systems," but for the design of protection for nonstructural components, Chapter 13 sets the component importance factor equal to 1.5 for any component "required to function for life-safety purposes after an earthquake, including fire protection sprinkler systems and egress stairways." The IBC term *designated seismic systems* covers these.

Similarly, ASCE 41 does not define "life safety systems," but its Tier 1 procedure includes a checklist section titled "Life Safety System," which includes the following items:

- Fire suppression piping: anchorage
- Flexible couplings (for fire suppression piping)
- Emergency power: anchorage of "equipment used to power or control Life Safety systems"
- Stair and smoke ducts
- Sprinkler ceiling clearance
- Emergency lighting (includes egress lighting)

Cost Impact: The code change proposal will not increase or decrease the cost of construction
The proposal merely codifies the current understanding of a previously undefined term, using other terms already defined in the IBC.

Public Hearing Results

Committee Action: **Disapproved**

Committee Reason: Disapproved as the proposed definition could be construed as incomplete and it is recommended for BCAC review and coordination. (Vote: 12-2).

Individual Consideration Agenda

Public Comment 1:

IBC: SECTION 202, 1604.5.1

Proponents: David Bonowitz, representing FEMA-ATC Seismic Code Support Committee (dbonowitz@att.net); Kelly Cobeen, representing Federal Emergency Management Agency/Applied Technology Council - Seismic Code Support Committee (kcobeen@wje.com); Michael Mahoney, representing FEMA (mike.mahoney@fema.dhs.gov) requests As Modified by Public Comment

Modify as follows:

2021 International Building Code

~~**LIFE SAFETY COMPONENTS (for risk category).** Components of *life safety systems*, *designated seismic systems*, *emergency power systems*, and emergency and egress lighting systems. This definition of *life safety components* is limited in application to the provisions of Section 1604.5.~~

1604.5.1 Multiple occupancies. Where a building or structure is occupied by two or more occupancies not included in the same *risk category*, it shall be assigned the classification of the highest *risk category* corresponding to the various occupancies. Where buildings or structures have two or more portions that are structurally separated, each portion shall be separately classified. Where a separated portion of a building or structure provides required access to, required egress from or shares ~~life safety components~~ *life safety systems*, *designated seismic systems*, *emergency power systems*, or emergency and egress lighting systems with another portion having a higher *risk category*, both portions shall be assigned to the higher *risk category*.

Exception: Where a *storm shelter* designed and constructed in accordance with ICC 500 is provided in a building, structure or portion thereof normally occupied for other purposes, the *risk category* for the normal occupancy of the building shall apply unless the *storm shelter* is a designated emergency shelter in accordance with Table 1604.5.

Commenter's Reason: This comment takes a proposed definition that would only have applied to one code section, and instead makes it part of that section's text directly.
At the hearings, most of the opposition to G2 was about the new proposed definition relying almost entirely on other defined terms and not providing much new. There's nothing wrong with that (lots of IBC definitions use other defined terms), but if that's a concern, this comment resolves it. Similarly, any concern that a "system" would be defined as a type of "component" is also made moot by this comment.

The committee's reason for disapproval also reflects part of the direction we suggested at the hearings, namely that a BCAC effort is needed to resolve and coordinate various existing definitions and quasi-definitions, in the code and its referenced standards, related to "life safety components." While that would still be worthwhile, in the mean time it remains important to clarify what the term already used in Section 1604.5.1 intends. This public comment makes that clarification.

Finally, there might be some concern that by clarifying the current code language, we might be excluding some things that should be included, or including some things that should be excluded. But the vague, undefined *current* code language -- which would remain if G2 is disapproved -- presents the same problem. (Examples given at the hearings are interesting but should not justify disapproval. We don't know if alarms, gas detection systems, etc. were intended as *life safety components* when the phrase was first codified, but those should already be included in *life safety systems* because they "enhance or facilitate evacuation." We also don't know if partitions or doors used for smoke compartmentation were intended, but it stands to reason that they should be, and that they would be important to consider explicitly when designing a building with multiple connected wings.)

Our original proposal contemplated a Chapter 2 definition. Since similar terms are already used elsewhere in the code, ICC staff added the final sentence saying that the proposed definition would only apply in Section 1604.5. Once that caveat is added, however, there's no reason to put the definition in Chapter 2. Instead, per this public comment, we can just put the same idea right into the text of Section 1604.5.1, replacing the undefined term with more explicit wording, using terms already defined. Doing this avoids any concern about whether the definition might apply elsewhere, might "be construed as incomplete" because it merely uses other defined terms, or might interfere with other definitions.

Cost Impact: The net effect of the public comment and code change proposal will not increase or decrease the cost of construction
As with the original proposal, the public comment merely codifies the current understanding of an existing but undefined term, using other terms already defined in the IBC.