BCAC Structural work group Report of Group B proposals

Item	Topic
6	Loadbearing vs Nonloadbearing Wall
7	FIRE LOADS

BCAC Structural Workgroup Item #6 – Load-Bearing vs Non-Load Bearing Walls

Proposal #6A

Modify as follows:

[BS] WALL, LOAD-BEARING. Any wall meeting either of the following classifications:

1. Any cold-formed steel ~~metal~~ or wood stud wall that supports more than 100 pounds per linear foot (1459 N/m) of vertical load in addition to its own weight or the weight of a cold-formed steel or wood stud wall directly above. Exterior wall coverings and interior finishes are considered vertical load.

2. Any *masonry*, concrete or *mass timber* wall that supports more than 200 pounds per linear foot (2919 N/m) of vertical *load* in addition to its own weight.

[BS] WALL, NONLOAD-BEARING. Any wall that is not a *load-bearing wall*.

Reason: Some building officials have interpreted the amount of vertical load counting towards the 100 pound per linear foot trigger for a light-frame load-bearing wall to include the weight of any light-frame walls located directly above the subject wall, even in a platform-framed building. With such an interpretation, the only conditions under which a light-frame exterior wall could qualify as non-loadbearing would be a light-frame wall with lightweight cladding (e.g. vinyl siding), no more than 9 or 10 feet in height, on either a one-story building or at the top story of a building or portion thereof, with all roof loads taken by framing parallel to the wall. Such an interpretation has significant implications for the required fire-resistance rating of walls and can result in significant increased cost of construction, and perhaps limitations on desired wall finishes.

The proposed change to the definition would allow a light-frame wall to be considered non-loadbearing if there are light-frame walls above and in the same vertical plane as the wall in question, and if not more than 100 pounds per linear foot are imposed on the wall in question from either tributary floor or roof loads or from the weight of exterior wall coverings and interior finishes on either the wall in question or the walls directly above.

Often a rim board, rim joist, or other framing member supporting roof or floor sheathing is placed directly on top of a light-framed wall, and the next joist, truss, beam or other roof or floor framing member is located 16” to 24” or more away. In this case, it is likely more than 100 plf of tributary roof or floor load would be supported by the light-frame wall and it would be considered “load-bearing” regardless of whether there is another light-frame wall directly above. In addition, walls with heavy cladding such as brick veneer or stucco or heavy interior finishes would also likely be classified as “load-bearing”.

This change would at least provide relief where the framing is laid out and detailed such that a light-frame wall with lightweight exterior cladding and interior finishes is just enclosing the building or separating space within and does not support any tributary floor or roof loads.

Cost Impact: The code change will decrease the cost of construction
The code change will reduce the cost of construction where exterior walls in a light-frame building have been inappropriately classified as bearing walls needing to meet a higher fire resistance rating.

Proposal #6B

Modify as follows:

[BS] WALL, LOAD-BEARING. Any wall meeting either of the following classifications:

1. Any metal or wood stud wall that supports more than 100 pounds per linear foot (1459 N/m) of vertical load in addition to its own weight~~.~~

2. Any *masonry*, concrete or *mass timber* wall that supports more than 200 pounds per linear foot (2919 N/m) of vertical *load* in addition to its own weight.

3. <u>For the purposes of Chapters 16 to 23 only, the wall is an element of the lateral force resisting system.</u>

Reason: Some walls in a building may not support any vertical loads coming from areas of the floor or roof tributary to the wall, as those loads are taken by framing members running parallel to and within a few inches of the walls, but are designed as shear walls comprising part of the lateral force-resisting system for wind and seismic loads. Under the existing definition, such walls may be considered as non-load-bearing walls. However, shear walls are critical to the stability of the building and it is important they are properly anchored to foundations to transfer lateral loads. Thus, such walls should be considered as load-bearing walls even if they do not support significant uniform dead and live loads.

The added condition clarifies walls that are part of the seismic force-resisting system or main wind-force resisting system would also need to be considered a bearing wall even if they are not supporting any vertical load other than its own weight.

Cost Impact: The code change will increase the cost of construction.
The code change will increase the cost of construction where shear walls in buildings may previously have been considered non-loadbearing walls. Such walls may now require additional exterior wall coverings or interior finishes to meet fire resistance ratings associated with bearing walls, as well as additional foundation anchorage and continuous footings for portions of the wall not designated as shear panels.

SECTION 1616 FIRE LOADS

1616.1 General. Where the structural fire protection of structural elements is designed considering system-level behavior or realistic fire exposures, the design shall be in accordance with ASCE/SEI 7 . Where the Structural fire protection is designed per this section, all other provisions of Chapter 7 shall apply.

Reason: American Society of Civil Engineers/Structural Engineering Institute (ASCE/SEI) has developed industry consensus on performance-based structural fire design within the ASCE/SEI 7 standard [1] as demonstrated in their freely-available ASCE/SEI Design Guide (Performance-Based Structural Fire Design: Exemplar Designs of Four Regionally Diverse Buildings using ASCE 7-16, Appendix E) [2]. For the first time in U.S. practice, this standard establishes the process that enables designers to upgrade structures (e.g., structural connections) to be intrinsically safer to fire effects (e.g., restrained thermal expansion/contraction and large deflections) in order to better protect building occupants and firefighters from structural collapse due to uncontrolled fire events. Also, ASCE/SEI 7 Appendix E works within the greater ASCE/SEI 7 context which is important to ensure that fire effects are analyzed in a similar fashion as other structural loads (e.g., wind and seismic). Notably, ASCE/SEI 7 Appendix E Section E.3 requires for a structural fire design to comply with the requirements of ASCE/SEI 7 Section 1.3.1.3, which details peer review requirements among other structural engineering aspects. Lastly, the standard is structured to formally integrate building officials into the design process in a similar manner as performance-based structural engineering is conducted for other design hazards (e.g., blast, seismic, and wind). In summary, this code change proposal adds the appropriate reference to the ASCE/SEI 7 standard for performance-based structural fire design. Importantly, ASCE/SEI 7 Appendix E Appendix E provides material-neutral and critical overarching requirements.

Bibliography: [1] ASCE/SEI 7: Minimum Design Loads and Associated Criteria for Buildings and Other Structures, Appendix E: Performance-Based Design Procedures for Fire Effects on Structures, American Society of Civil Engineers: Structural Engineering Institute, 2016

[2] ASCE/SEI Performance-Based Structural Fire Design: Exemplar Designs of Four Regionally Diverse Buildings using ASCE 7-16, Appendix E, American Society of Civil Engineers: Structural Engineering Institute and Charles Pankow Foundation, 2020 < https://ascelibrary.org/doi/book/10.1061/9780784482698 >

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

The proposed code change would have no direct impact on construction costs since alternative methods are already being conducted in practice and the performance-based structural fire design procedures in ASCE/SEI 7 represent current industry best practices.