IBC - Structural

2022 GROUP B PUBLIC COMMENT AGENDA

SEPTEMBER 14 - 21, 2022
KENTUCKY INTERNATIONAL CONVENTION CENTER
LOUISVILLE, KY

ICC
INTERNATIONAL CODE COUNCIL®

2022 Public Comment Agenda

First Printing

Publication Date: August 2022

PRINTED IN THE USA

S102-22

IBC: 1607.9.1.2, 1607.9.1.2.1 (New)

Proposed Change as Submitted

Proponents: John Grenier, representing National Council of Structural Engineers Associations (NCSEA) (jgrenier@grenierenng.com); Erik Madsen, representing NCSEA (erik@madsenengineering.com)

2021 International Building Code

Revise as follows:

1607.9.1.2 Guard component loads. Balusters, panel fillers and guard infill components, including all rails , wires and cables except the handrail and the top rail, shall be designed to resist a horizontally applied concentrated load of 50 pounds (0.22 kN), distributed in accordance with Section 4.5.1.2 of ASCE 7.

Add new text as follows:

1607.9.1.2.1 Barrier Cable Systems. For wire or cable used as guard infill components of a pedestrian barrier / protection system, the wires or cables shall be tightened or stressed sufficient to prevent a sphere with a diameter equivalent to the opening limitations of Section 1015.4 from passing through the barrier when the component force is applied to the sphere. The 50 pound (0.22 kN) component force applied to an individual opening sphere may be divided by the number of wires or cables within a 12 inch (305 mm) width.

Reason: The use of barrier cable systems for guards is widely used. The criteria for how to apply the component force to design or test the cable stressing however is not currently in the code or referenced standards.
The purpose of the proposed change is to address the unique aspect of cable rail systems in order to provide guidance for the amount of tension required on the infill cables to prevent splaying of the cables beyond the code opening limitation. Currently the 50 pound infill load per ASCE 7 Section 4.5.1.2 is applied on an area not to exceed 12 in. by 12 in., including openings. If the force is applied to a flat pate applied to the cables then the effect of cables splaying will not be captured. The new text clarifies that that the load for design and testing of a cable system should be applied to the individual sphere or cone and would be reduced by the number of cables in the test area.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
The intent of the code change is to capture the state of the practice for cable systems and properly designed systems already meet the proposed changes.

S102-22

Public Hearing Results

Committee Action: **Disapproved**

Committee Reason: Disapproved as this issue needs to apply consistently to all infill systems. The committee recommended that the interested parties work together to offer a public comment update. (Vote: 13-0)

S102-22

Individual Consideration Agenda

Public Comment 1:

IBC: 1607.9.1.2, 1607.9.1.2.1

Proponents: Erik Madsen, NCSEA, representing NCSEA (erik@madsenengineering.com) requests As Modified by Public Comment

Modify as follows:

2021 International Building Code

1607.9.1.2 Guard infill component loads. ~~Balusters, panel fillers and g~~ Guard infill components, including ~~all rails,~~ balusters, panel fillers, cables, rods, ornamental elements and all rails ~~wires and cables~~ except the handrail and the top rail, shall be designed to resist a horizontally applied

concentrated load of 50 pounds (0.22 kN), distributed in accordance with Section 4.5.1.2 of ASCE 7. The 50-pound load may be divided by the number of components within 12 inches perpendicular to the direction of the load. The load shall be applied to an individual opening based on the opening limitations of Section 1015.4.

1607.9.1.2.1 Guard infill serviceability. ~~Barrier Cable Systems.~~ Guard infill components shall be designed to have adequate stiffness to ~~For wire or cable used as guard infill components of a pedestrian barrier / protection system, the wires or cables shall be tightened or stressed sufficient to~~ prevent the load from 1607.9.1.2 from passing through the guard. ~~a sphere with a diameter equivalent to the opening limitations of Section 1015.4 from passing through the barrier when the component force is applied to the sphere. The 50 pound (0.22 kN) component force applied to an individual opening sphere may be divided by the number of wires or cables within a 12 inch (305 mm) width.~~

Commenter's Reason: Based on the discussion during the hearings, the public comment is intended to address the concerns raised by different members of the industry.
The current proposed changes address the following previously received comments:

1) Updates guard component loads title to address the intended load is to be applied to "infill" components

2) Updates list of components

3) Provides a method for calculating loads on additional components. The ASCE method is based on applying 50 pounds over a one-square foot area. This text allows the engineer to reduce the load of 50-pounds in the common case where individual guard components are spaced at 4" on center. In the example where pickets or cables are at 4" on center, the load may be reduced such that 50 lbs x 4" o.c. / 12" = 16.7 lbs per component. This appears to be a common practice, but is not codified.

4) Provides a reference pointer to Section 1015.4 discussing guards

5) The serviceability section provides resistance criteria to prevent infill spread. Where thin pickets, cables or other flexible guard components are installed, there is currently no method to qualify restraint. While elements may be placed at 4" on center and meet the letter of the law, the code must provide a way of keeping the elements from spreading wide enough that they negate the intent. This serviceability criteria speaks to that issue and corrects the gap in the code.

Cost Impact: The net effect of the public comment and code change proposal will not increase or decrease the cost of construction
The proposal and public comment are intended to address the application of the component load., and not change the cost of construction for properly designed systems.

Public Comment# 3441

Public Comment 2:

IBC: 1607.9.1.2, 1607.9.1.2.1, 1607.9.1.2.1 (New), 1607.9.1.2.2 (New)

Proponents: Thomas Zuzik Jr, representing Feeney Inc. (coderep@railingcodes.com) requests As Modified by Public Comment

Modify as follows:

2021 International Building Code

1607.9.1.2 Guard infill component loads. All guard infill components except for the top rail and handrail shall meet the following loads. These loads shall not be applied simultaneously.
~~Balusters, panel fillers and guard infill components, including all rails, wires and cables except the handrail and the top rail, shall be designed to resist a horizontally applied concentrated load of 50 pounds (0.22 kN), distributed in accordance with Section 4.5.1.2 of ASCE 7.~~

~~**1607.9.1.2.1 Barrier Cable Systems.** For wire or cable used as guard infill components of a pedestrian barrier / protection system, the wires or cables shall be tightened or stressed sufficient to prevent a sphere with a diameter equivalent to the opening limitations of Section 1015.4 from passing through the barrier when the component force is applied to the sphere. The 50 pound (0.22 kN) component force applied to an individual opening sphere may be divided by the number of wires or cables within a 12 inch (305 mm) width.~~

1607.9.1.2.1 Horizontally applied concentrated load. A horizontally applied concentrated load of 50 pounds (0.22 kN) designed in accordance with Section 4.5.1.2 of ASCE 7.

1607.9.1.2.2 Cone. A horizontally applied concentrated load of 16.5 pounds (0.0734 kN) from a cone passing through the guard where openings exist in the guard infill. The cone shall have a diameter and height both equal to the applicable infill opening limitation of Section 1015.4.

Commenter's Reason: This modification by public comment (P.C.) further builds on the original proposal by first applying the requirements to all

infill components, not just wire cables. Additionally, this P.C. further defines and establishes the basis for the 16.5 pound load presented in this modification by public comment and the justification for the penetration cone designation.
In addition to the information and documentation presented in this published reason statement; the proponent of this P.C. has established a url web address; fore-which additional documentation and videos will be available for review for a more in-depth explanation and simplification of the documentation. For viewing see https://www.feeneyinc.com/S102-22 and this documentation will be updated throughout the remainder of this Part B cycle.

ORIGINAL S102-22 PROPOSAL

THE proponents of the original proposal began with wire cables, this public comment builds on the true intent of the original proposal by adding a guard infill deflection requirement into the model code based on a published ASTM testing method written specifically for the testing of infill deflection within metal guard systems and expanded from the wire cables, by applying the method to all guard infill material types.

The first part of the modification by public comment to the original text of 1607.9.1.2 is to separate the charging statement to apply to the now two different guard infill load requirements. The first being the breakout of the original text for the design of the 50lbs over a one square foot area, as per ASCE7 Section 4.5.1.2 into a new sub section now titled 1607.9.1.2.1. and then revising the text for wire cable infill spreading in the original proposal, to follow the ASTM standard E935-00 PART D, as the method for all guard infill, based on the simplified text proposed in this public comment in the new section 1607.9.1.2.2.

ESTABLISHED ASTM TESTING METHOD

In the published edition of ASTM Standard E935-00, the method for testing guard infill deflection is provided and titled as; “Test Method D – Application of Horizontal Static Load to Determine Resistance to Cone Penetration by Infill Area of Baluster and Panel Railing Systems.”

In this standard there are two specific parameters that are definitively established for testing the deflection of guard infill. The first being the use of a penetrate cone, not a sphere, and the second is the size of the penetration cone to be 25-percent larger than the maximum permissible spacing between balusters and other infill elements. Through these defined specifications in ASTM E935-00, we can validate that the spheres noted in Chapter 10 of the model IBC are simple measurement specifications, and not a load requirement. Continuing, to simplify the information for this reason statement, the E935-00 test standard follows loads established through another ASTM standard, and this is the 50lb load used for our calculations. Using this information, we establish the test method of applying a specific load to a penetration cone with a diameter of 5-inches, as it directly correlates to the base 4-inch opening limitation within the model code for guard opening limitations.

TRANSLATING THE PENETRATION CONE TEST METHOD TO CODE LANGUAGE

The proponents of S102-22 focused on wire cables, as they are the most scrutinized type of guard infill for infill deflection concerns with the tensioning parameters. For this reason, we are limiting the rest of our discussion for the reason statement to the most common wire cable used in the built environment 1/8-inch diameter, 1x19 stainless steel construction, one of the most flexible types of infill commonly used in guard systems today. Though this public comment proposal adds the requirement to all guard infill, by far wire cable guard infill is the most affected by the proposed new model code requirement.

The original proposal uses a prescribed method to divide a 50lb load by the number of wire cables within 12-inches to establish a minimum tension to prevent a sphere from passing. This converts into a few numbers with the first being based on 3 wire cables translating into 16.66lbs, next 4 wire cables translate into 12.5lbs and 5 wire cables translate into 10lbs. However, the original proponents didn't provide any documentation in the published reason statement as to where these numbers are derived from.

The proponent of this modification by public comment, through inhouse testing to validate engineered calculations for the 16.5lb load presented, has correlated this number for the 4-inch limit off a result from the load testing of the 5-inch cone infill penetration method established in ASTM E935-00 Part D, on 1/8-inch diameter, 1x19 wire cables installed in a sample guard system with 3-inch centerline spacing of the cables and 36-inches clear span between stabilizers. The tension of the wire cables is directly affected by the length of the wire cable, and the span of the wire cable between stabilizers. A chart is provided below in this reason statement and the website listed in this reason statement and bibliography. During the proponents inhouse testing the tension can be directly correlated to the chart listed below.

SAFE INFILL – SAFE CABLE DESIGN LOADS

The tensioning, stiffness and resistance that the guard infill preforms to is directly related to the material, and with wire cable this is directly related to safe cable design loads. With 1/8-inch diameter, 1x19 stainless steel wire cable the listed minimum break point is 1,869 lbs. Simply, the wire cable will break at approximately 1,869lbs of tension. Thus, industry-based safety factors are designated as Safe Workload and Maximum Cable Pretension for Cable Rail Installations.

The Safe Workload limit is based on 20% of the break load and Maximum Cable Pretension for Cable Rail Installations is 25% of the break load. This translates into a 373lb Safe Workload and 467lb Maximum Pretension Load for 1/8-inch diameter, 1x19 stainless steel wire cable. A chart of other cables and types are listed on the website link in the bibliography.