Code Change No: G23-07/08

Sections: 304.1, 202 (New) [IFC [B] 202 (New)], 421 (New); IFC 903.2.2 (New) [IBC [F] 903.2.2 (New)], 907.2.2 (IBC [F] 907.2.2)

Proponent: John Williams, State of Washington Department of Health, Construction Review Services, WA

THESE PROPOSALS ARE ON THE AGENDA OF THE IBC GENERAL AND IFC CODE DEVELOPMENT COMMITTEES AS 2 SEPARATE CODE CHANGES. SEE THE TENTATIVE HEARING ORDERS FOR THESE COMMITTEES.

PART I – IBC GENERAL

1. Revise as follows:

304.1 (IFC [B] 202) Business Group B. Business Group B occupancy includes, among others, the use of a building or structure, or a portion thereof, for office, professional or service-type transactions, including storage of records and accounts. Business occupancies shall include, but not be limited to, the following:

- Airport traffic control towers
- Ambulatory health care facilities (see section 421)
- Animal hospitals, kennels and pounds
- Banks
- Barber and beauty shops
- Car wash
- Civic administration
- Clinic—outpatient
- Dry cleaning and laundries: pick-up and delivery stations and self-service
- Educational occupancies for students above the 12th grade
- Electronic data processing
- Laboratories: testing and research
- Motor vehicle showrooms
- Post offices
- Print shops
- Professional services (architects, attorneys, dentists, physicians, engineers, etc.)
- Radio and television stations
- Telephone exchanges
- Training and skill development not within a school or academic program

2. Add new definition as follows:

SECTION 202 (IFC 202)
DEFINITIONS

AMBULATORY HEALTH CARE FACILITY. Buildings or portions thereof used to provide medical, surgical, psychiatric, nursing or similar care on a less than 24-hour basis to individuals who are rendered incapable of self-preservation.

3. Add new text as follows:

SECTION 421
AMBULATORY CARE FACILITIES

421.1 General. Occupancies classified as Group B Ambulatory Health Care Facilities shall comply with the provisions of this section and other applicable provisions of this code.
421.2 **Smoke barriers.** Smoke barriers shall be provided to subdivide every ambulatory care facility greater than 10,000 square feet (929 m²) into a minimum of two smoke compartments. The travel distance from any point in a smoke compartment to a smoke barrier door shall not exceed 200 feet (60 960 mm). The smoke barrier shall be installed in accordance with Section 709.

421.3 **Refuge area.** At least 30 net square feet (2.8 m²) per nonambulatory patient shall be provided within the aggregate area of corridors, patient rooms, treatment rooms, lounge or dining areas and other low-hazard areas on each side of each smoke barrier.

421.4 **Independent egress.** A means of egress shall be provided from each smoke compartment created by smoke barriers without having to return through the smoke compartment from which means of egress originated.

421.5 **Automatic Sprinkler Systems.** Automatic sprinklers systems shall be provided for ambulatory care facilities in accordance with Section 903.2.2.

421.6 **Fire alarm systems.** A fire alarm system shall be provided in accordance with Section 907.2.2.

**PART II – IFC**

1. **Add new text as follows:**

903.2.2 *(IBC [F] 903.2.2) Group B ambulatory health care facilities.* An automatic sprinkler system shall be provided for Group B Ambulatory Health Care Facility occupancies when either of the following conditions are met:

1. Four or more care recipients are incapable of self preservation at any given time
2. One or more care recipients that are incapable of self preservation are located at other than the level of exit discharge.

(Renumber subsequent sections)

2. **Revise as follows:**

907.2.2 *(IBC [F] 907.2.2) (Supp) Group B.* A manual fire alarm system that activates the occupant notification system in accordance with Section 907.6 shall be installed in Group B occupancies where one of the following conditions exists:

1. The combined Group B occupant load of all floors is 500 or more.
2. The Group B occupant load is more than 100 persons above or below the lowest level of exit discharge.

**Exception:** Manual fire alarm boxes are not required where the building is equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.1 and the occupant notification appliances will activate throughout the notification zones upon sprinkler water flow.

A manual and automatic fire alarm system shall be installed in all Group B Ambulatory Health Care Facilities.

**Reason:** This code change is intended to address the issue of ambulatory surgery centers. Thirty years ago, few surgical procedures were performed outside of the hospital. Today, complex outpatient surgeries outside of the hospital are commonplace. They are performed in facilities often called “day surgery centers” or “Ambulatory surgical centers (ASC’s)” because patients are able to walk in and walk out the same day. Procedures render patients temporarily incapable of self-preservation by application of nerve blocks, sedation, or anesthesia. Patients in these facilities typically recover quickly. The IBC identifies the healthcare Group I occupancies as having 24 hour stay. Without 24 stay these surgery centers are being classified as Group B. Essentially this allows you to render an unlimited number of people incapable of self preservation with no more protection than a business office. Since there is no distinct classification for ASC’s in the I codes, the total number of these facilities cannot be quantified. These types of facilities contain distinctly different hazards to life and safety than other Business Occupancies, such as:

- Patients incapable of self-preservation require rescue by other occupants or fire personnel.
- Medical staff must stabilize the patient prior to evacuation; therefore, staff may require evacuation as well.
- Use of oxidizing medical gases such oxygen and nitrous oxide
- Prevalence of surgical fires.

Past changes have tried to force these occupancies into the Group I-2 category. This is a poor fit, because these are not hospitals. Other Federal and State jurisdictions have recognized that there is a middle ground somewhere in between Group B and I-2. This proposal provides a scaled approach to protection. Occupancy classification stays as group B. A fire alarm is required in all facilities for increased staff awareness. A sprinkler is required when several people are incapable of self preservation. In larger facilities, a smoke compartment is provided to allow more of a protect in place environment. These allow staff a safer environment to stabilize the patients before evacuation, and protection for fire personnel who may have to evacuate both patients and staff.

An ICC CTC study group was formed last year to examine these facilities and determine what if any changes to the code are necessary. Unfortunately, scheduling did not allow enough time for the study group to complete a proposal for a code change. Hundreds of these facilities are being built every year, and those are the ones that we know about. Please do not wait until 2012 to provide a safer environment for this very sensitive population of patients.

**Cost Impact:** The code change proposal will not increase the cost of construction.
PART I – IBC GENERAL

Committee Action: Approved as Modified

Modify the proposal as follows:

304.1 (IFC [B] 202) Business Group B. Business Group B occupancy includes, among others, the use of a building or structure, or a portion thereof, for office, professional or service-type transactions, including storage of records and accounts. Business occupancies shall include, but not be limited to, the following:

- Airport traffic control towers
- Ambulatory health care facilities (see section 421)
- Animal hospitals, kennels and pounds
- Banks
- Barber and beauty shops
- Car wash
- Civic administration
- Clinic—outpatient
- Dry cleaning and laundries: pick-up and delivery stations and self-service
- Educational occupancies for students above the 12th grade
- Electronic data processing
- Laboratoriest: testing and research
- Motor vehicle showrooms
- Post offices
- Print shops
- Professional services (architects, attorneys, dentists, physicians, engineers, etc.)
- Radio and television stations
- Telephone exchanges
- Training and skill development not within a school or academic program

421.2 Smoke barriers. Smoke barriers shall be provided to subdivide every ambulatory care facility greater than 10,000 square feet (929 m²) into a minimum of two smoke compartments per story. The travel distance from any point in a smoke compartment to a smoke barrier door shall not exceed 200 feet (60 960 mm). The smoke barrier shall be installed in accordance with Section 709.

(Portions of proposal not shown remain unchanged)

Committee Reason: The proposal was felt to comprehensively address the issue of surgery centers that are not classified as Group I occupancies but need increased regulation based upon the conditions of the people being treated at these facilities. There were two modifications made. The first was simply an editorial revision to remove an unnecessary reference in the occupancy classifications to the new Section 421. The second clarifies that each story needs to be divided into at least 2 smoke compartments. This addresses multiple story facilities. The committee also felt that an issue to be addressed during public comment would be the threshold number of patients that classify an occupancy as an ambulatory health care facility.

Assembly Action: None

PART II – IFC

Committee Action: Approved as Modified

Modify the proposal as follows:

903.2.2 (IBC [F] 903.2.2) Group B ambulatory health care facilities. An automatic sprinkler system shall be provided for installed throughout all fire areas containing a Group B Ambulatory Health Care Facility occupancies when either of the following conditions exist at any given time:

1. Four or more care recipients are rendered incapable of self preservation at any given time
2. One or more care recipients that are incapable of self preservation are located at other than the level of exit discharge.

[F] 907.2.2 Group B. A manual fire alarm system that activates the occupant notification system in accordance with Section 907.6 shall be installed in Group B occupancies where one of the following conditions exists:

1. The combined Group B occupant load of all floors is 500 or more.
2. The Group B occupant load is more than 100 persons above or below the lowest level of exit discharge.
3. Fire areas containing a Group B occupancy classified as an ambulatory health care facility

Exception: Manual fire alarm boxes are not required where the building is equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.1 and the occupant notification appliances will activate throughout the notification zones upon sprinkler water flow.

A manual and automatic fire alarm system shall be installed in all Group B ambulatory health care facilities.

[F] 907.2.2 Group B - Ambulatory health care facilities. Fire areas containing ambulatory health care facilities shall be provided with an electrically supervised automatic smoke detection system installed within the ambulatory health care facility and in public use areas outside of tenant spaces, including public corridors and elevator lobbies.
Exception: Buildings equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1 provided the occupant notification appliances will activate throughout the notification zones upon sprinkler water flow.

Committee Reason: The committee agreed that the proponent’s reason statement accurately and adequately substantiates the need for the change. This code change represents a co-operative effort of concerned parties through the ICC Code Technology Committee’s Care Study Group to resolve a long-standing problem in how the code deals with the subject facilities. This also correlates with the action taken by the IBC-G Committee in Part I. The modification represents additional consensus on the level of protection that should be afforded these facilities.

Assembly Action: None

Final Hearing Results

G23-07/08, Part I AM
G23-07/08, Part II AM

Code Change No: FS10-07/08

Section: 703.6

Proponent: Ron Nickson, National Multi Housing Council (NMHC)

Revise as follows:

703.6 Marking and identification. Fire walls, fire barriers, fire partitions, smoke barriers and smoke partitions or any other wall required to have protected openings or penetrations shall be effectively and permanently identified with signs or stenciling. Such identification shall:

1. Be located above any decorative ceiling, in concealed spaces or other approved location;
2. Be repeated at intervals not exceeding 30 feet (914 mm) measured horizontally along the wall or partition; and
3. Include lettering not less than 0.5 inch (12.7 mm) in height, incorporating the suggested wording: “FIRE AND/OR SMOKE BARRIER – PROTECT ALL OPENINGS”, or other approved wording.

Exception: Walls in Group R-2 occupancies that do not have a removable decorative ceiling allowing access to the concealed space.

Reason: To provide a reasonable exception for R-2 occupancies. The new section 703.6 would required the marking in a location that is not accessible in the typical apartment building in which the walls and ceilings are covered with either ½” of 5/8” Type C fire rated drywall installed as part of the code required fire rated assembly between dwelling units under the requirements of Section 420. The fire rated walls in these R-2 use areas are also not seldom altered after original construction of the residential building, unlike the potential constant changes in other types of commercial buildings that may provide for inexperienced workmen accessible to workmen that might inadvertently damage the wall and thus create an issue with the ability of the wall to work as designed.

Cost Impact: The code change proposal will not increase the cost of construction. This code change will reduce costs.

Committee Action: Approved as Submitted

Committee Reason: The committee agreed that marking or signage identifying fire-resistance rated, or smoke, barriers or partitions within Group R-2 occupancies that do not have a removable ceiling was not necessary. Without this exception the marking or signage in a typical hotel room would be required on all interior walls of the room.

Assembly Action: None

Final Hearing Results

FS10-07/08 AS
Section: 703.6

Proponent: Lawrence G. Perry, AIA, representing Building Owners and Managers Association (BOMA) International

Delete without substitution as follows:

703.6 (Supp) Marking and identification. Fire walls, fire barriers, fire partitions, smoke barriers and smoke partitions or any other wall required to have protected openings or penetrations shall be effectively and permanently identified with signs or stenciling. Such identification shall:

1. Be located above any decorative ceiling, in concealed spaces or other approved location;
2. Be repeated at intervals not exceeding 30 feet (914 mm) measured horizontally along the wall or partition; and
3. Include lettering not less than 0.5 inch (12.7 mm) in height, incorporating the suggested wording: "FIRE AND/OR SMOKE BARRIER – PROTECT ALL OPENINGS", or other approved wording.

Reason: This proposal seeks to remove the provision requiring marking of fire rated assemblies that was added by a successful public comment at the Rochester Final Hearings. As approved, this new section will require markings on the following walls:

- Interior and exterior sides of exterior walls (where the walls are required to have a fire-resistance rating).
- All walls separating residential dwelling units from adjacent units or corridors.
- All walls separating hotel guest rooms from adjacent rooms or corridors.

As written, this new section also requires the markings of ceilings, and possibly floors, where these assemblies are part of a smoke barrier.

Some of the testimony on this issue noted that these markings would be hidden behind decorative ceilings, however, the approved language requires these markings at all rated positions, and only provides additional information as to where to locate the markings when decorative ceilings are provided.

Representatives from several jurisdictions last cycle indicated that they already require this; however, the text approved requires markings in far more locations, and in far more visible locations, than other local amendments and enforcement levels.

There is no evidence that providing these markings, will provide any reduction in the problem of trades creating openings and failing to properly seal them. If anything, this change will likely lead to a false sense of protection; someone seeing this marking, and not already understanding the complexity of fire rated assemblies, firestopping products and installation methods, will simply fill the opening with whatever material they have on hand.

BOMA has submitted a separate code change to address the concerns raised by the proponent of this change in a different manner; a proposed revision to IFC section 509.1 (and correlative change to IBC 911.1) would add, for buildings with fire command centers, information regarding the location of these rated wall assemblies to the schematic building plans that are already required to be provided.

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

Committee Action: Disapproved

Committee Reason: The committee agreed that the requirements dealing with marking or signage identifying fire-resistance rated, or smoke, barriers or partitions were appropriate and should remain in the code. These assemblies should be identified for the construction trades to avoid breaching of the assemblies during construction that will occur during alterations, additions or repairs.

Assembly Action: None

Public Hearing Results

Public Comments

Individual Consideration Agenda

This item is on the agenda for individual consideration because public comments were submitted.

Public Comment 2:

Michael Vieria, Willdan, representing Sacramento Valley Association of Building Officials (SVABO) requests Approved as Modified by this public comment.
Replace the proposal with the following:

703.6 (Supp) Marking and Identification. Fire walls, fire barriers, fire partitions, smoke barriers and smoke partitions or any other wall required to have protected openings or penetrations shall be effectively and permanently identified with signs or stenciling. Such identification shall:

1. Be located above any decorative ceiling, in accessible concealed floor, floor-ceiling, or attic spaces or other approved location; and
2. Be repeated at intervals not exceeding 30 feet (914mm) measured horizontally along the wall or partition; and
3. Include lettering not less than 0.5 inch (12.7mm) in height, incorporating the suggested wording: "FIRE AND/OR SMOKE BARRIER – PROTECT ALL OPENINGS", or other approved wording.

Commenter’s Reasons: Concerns were raised at the code hearings in Palm Springs that the code text approved in Rochester was too broad and would require marking of all fire and smoke rated walls, barriers, and partitions, including exterior walls, corridors, etc. We believe the intent of the code was to protect those walls, barriers, and partitions in locations that generally were not visible to the building occupants, where utility piping, wiring, ducts, or other service elements are generally installed. We believe the proposed text clarifies the locations where the identification is necessary.

Final Hearing Results

FS11-07/08  AMPC2

Code Change No: F135-07/08

Original Proposal

Sections: 903.2.6 (IBC [F] 903.2.6)


Revise as follows:

903.2.6 (IBC [F] 903.2.6) Group M. An automatic sprinkler system shall be provided throughout buildings containing a Group M occupancy where one of the following conditions exists:

1. Where a Group M fire area exceeds 12,000 square feet (1115 m²);
2. Where a Group M fire area is located more than three stories above grade plane; or
3. Where the combined area of all Group M fire areas on all floors, including any mezzanines, exceeds 24,000 square feet (2230 m²); or
4. Where a Group M occupancy is used primarily for the display and sale of upholstered furniture.

Reason: This proposal is submitted jointly by the American Home Furnishings Alliance (AHFA) and the National Home Furnishings Association (NHFA) in the interest of making furniture retail and warehouse facilities safer for employees, customers and first responders. AHFA represents manufacturers and importers of residential furniture, some of whom also operate branded retail stores. NHFA represents corporate entities representing 10,000 retail furniture stores in all 50 states and several foreign countries.

The proposal to require sprinklers for Group M occupancies containing significant amounts of upholstered furniture recognizes that, under certain circumstances, all upholstered furniture will ignite and contribute to the fuel load of a fire. There is no such thing as totally fire safe upholstered furniture.

The AHFA and the NHFA have examined proposals for exempting vendors of certain constructions of furniture and concluded that such exemptions would be impractical for local code officials to enforce. This is the case because the internal construction of furniture cannot be established reliably without deconstructing it.

Further, materials and constructions touted as more fire resistant have not proven so to the satisfaction of fire authorities. The U.S. Consumer Product Safety Commission (CPSC) has tested furniture with combustion modified polyurethane foam such as that required in California and the United Kingdom and found that such foam does not meaningfully improve fire performance when furniture is exposed to an open flame. Other researchers have found that constructions employing the fire-blocking barriers now prevalent in mattresses do not reliably slow the progression of furniture fires. This is likely due to the variety of upholstery fabrics and seating geometries typical of furniture as compared to mattresses.

The most protective code measure would establish uniform, easily enforceable sprinkler requirements and not base safety considerations on differences in furniture construction that may or may not exhibit better fire performance in a retail setting.

Cost Impact: The code change proposal will increase the cost of construction.

Public Hearing Results

Approved as Modified

Committee Action: Modify the proposal as follows:
903.2.6 (IBC [F] 903.2.6) Group M. An automatic sprinkler system shall be provided throughout buildings containing a Group M occupancy where one of the following conditions exists:

1. Where a Group M fire area exceeds 12,000 square feet (1115 m²);
2. Where a Group M fire area is located more than three stories above grade plane;
3. Where the combined area of all Group M fire areas on all floors, including any mezzanines, exceeds 24,000 square feet (2230 m²); or
4. Where a Group M occupancy is used primarily for the display and sale of upholstered furniture.

Committee Reason: The proposal was approved because the committee felt that it is a good first step supported by the furniture industry in attempting to deal with the hazards presented by upholstered furniture. The committee indicated its sense that future efforts on the topic need to address Group F and S upholstered furniture occupancies as well and that a reasonable sprinkler threshold needs to be added to provide some relief to the small businesses that will now be affected. The modification removes a subjective term that the committee felt could create serious enforcement inconsistencies.

Assembly Action: None

Final Hearing Results

F135-07/08 AM

Code Change No: E127-07/08

Original Proposal

Sections: 1019.2, Table 1019.2, 1015.1, Table 1015.1 (IFC [B] 1019.2, [B] Table 1019.2, [B] 1015.1, [B] Table 1015.1)

Proponent: Jonathan C. Siu, City of Seattle Department of Planning and Development, Gregory R. Keith, Professional heuristic Development, representing The Boeing Company

Revise as follows:

1019.2 (IFC [B] 1019.2) (Supp) Stories with one exit. Single exits. Only one exit shall be required from Group R-3 occupancy buildings or from stories of other buildings as indicated in Table 1019.2, specified below. Occupancies shall be permitted to have a single exit in buildings otherwise required to have more than one exit if the areas served by the single exit do not exceed the limitations of Table 1019.2. Mixed occupancies shall be permitted to be served by single exits provided each individual occupancy complies with the applicable requirements of Table 1019.2 for that occupancy. Where applicable, cumulative occupant loads from adjacent occupancies shall be considered in accordance with the provisions of Section 1004.1. Basements with a single exit shall not be located more than one story below grade plane.

1. Stories meeting the limitations of Table 1021.2.
2. Buildings of Group R-3 occupancy.

<table>
<thead>
<tr>
<th>STORY ABOVE GRADE PLANE</th>
<th>OCCUPANCY</th>
<th>MAXIMUM OCCUPANTS (OR DWELLING UNITS) PER FLOOR AND TRAVEL DISTANCE TO EXIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>First story or basement</td>
<td>A, B’, E”, F”, M, U, S”</td>
<td>49 occupants and 75 feet travel distance</td>
</tr>
<tr>
<td></td>
<td>H-2, H-3</td>
<td>3 occupants and 25 feet travel distance</td>
</tr>
<tr>
<td></td>
<td>H-4, H-5, I, R</td>
<td>10 occupants and 75 feet travel distance</td>
</tr>
<tr>
<td></td>
<td>S”</td>
<td>29 occupants and 100 feet travel distance</td>
</tr>
<tr>
<td>Second story</td>
<td>B”, F, M, S”</td>
<td>29 occupants and 75 feet travel distance</td>
</tr>
<tr>
<td></td>
<td>R-2</td>
<td>4 dwelling units and 50 feet travel distance</td>
</tr>
<tr>
<td>Third story</td>
<td>R-2”</td>
<td>4 dwelling units and 50 feet travel distance</td>
</tr>
</tbody>
</table>
uniformity in application of single exit provisions. An indication that this is necessary is offered in the 2006 International Building Code, Code and
This proposal primarily adds explanatory language to the section text. It is felt that this more detailed verbiage is necessary to provide clarity and lend to
details remain unaddressed. The City of Seattle frequently encounters single exit designs and we feel that too much is presently left to interpretation.
requirements. They share our concern about the vagueness of single exit provisions and are co-proponents of this proposal. Boeing noted that the
occupancies as delineated in Table 1019.2. The Boeing Company has been instrumental in the development of current IBC mixed occupancy
perceived limitation of mixed occupancies in individual story applications could also be applied to individual spaces given the similarity of threshold
portion-by-portion philosophy also potentially applies to mixed occupancies so long as the individual occupancies do not exceed the limitations for those
Lastly, and to support a position stated in the 2006 Commentary, the last sentence of Section 1019.2 stipulates that single exit basement
applications are limited to the first story below grade plane. To be consistent with the allowance for single exit basements, the column heading in Table
1019.2 has been changed to acknowledge that the story could be above or below grade plane (basement).

1015.1 (IFC [B] 1015.1) (Supp) Exits or exit access doorways from spaces. Two exits or exit access doorways from any space shall be provided where one of the following conditions exists:

1. The occupant load of the space exceeds one of the values in Table 1015.1.

   Exception: In Groups R-2 and R-3 occupancies, one means of egress is permitted within and from individual dwelling units with a maximum occupant load of 20 where the dwelling unit is equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1 or 903.3.1.2.

2. The common path of egress travel exceeds one of the limitations of Section 1014.3.

3. Where required by Sections 1015.3, 1015.4, 1015.5, 1015.6 or 1015.6.1.

   Exception: Group I-2 occupancies shall comply with Section 1014.2.2.

Where a building contains mixed occupancies, each individual occupancy shall comply with the applicable requirements for that occupancy. Where applicable, cumulative occupant loads from adjacent occupancies shall be considered in accordance with the provisions of Section 1004.1.

<table>
<thead>
<tr>
<th>OCCUPANCY</th>
<th>MAXIMUM OCCUPANT LOAD</th>
</tr>
</thead>
<tbody>
<tr>
<td>A, B, E¹, F, M, U</td>
<td>49</td>
</tr>
<tr>
<td>H-1, H-2, H-3</td>
<td>3</td>
</tr>
<tr>
<td>H-4, H-5, I-1, I-3, I-4, R</td>
<td>10</td>
</tr>
<tr>
<td>S</td>
<td>29</td>
</tr>
</tbody>
</table>

a. Day care maximum occupant load is 10.

Reason: This proposal is intended to follow up on Item E136-06/07 of the previous code development cycle. The City of Portland, Oregon, proponents of that submittal, correctly identified shortcomings in the 2006 Table 1019.2. The Means of Egress Code Development Committee and the membership agreed as the item was approved and appears in the 2007 Supplement. As much as the code change represents a significant improvement, specific details remain unaddressed. The City of Seattle frequently encounters single exit designs and we feel that too much is presently left to interpretation. This proposal primarily adds explanatory language to the section text. It is felt that this more detailed verbiage is necessary to provide clarity and lend to uniformity in application of single exit provisions. An indication that this is necessary is offered in the 2006 International Building Code, Code and Commentary, Volume 1. That document makes two statements of questionable technical merit or history. For example, it states, “Also, this section assumes single occupancy buildings. The use of these provisions for mixed occupancies is subject to approval by the building official.” Section 1019.1 or 1019.2 do not make that distinction and previous editions of the commentary have not either. The 2006 Commentary also states, “It is important to note that the provisions in Section 1019.2 apply to entire buildings only, not individual stories or fire areas.” This statement has obviously been nullified by the 2007 Supplement.

The reformatting of Table 1019.2 in the 2007 Supplement goes a long way in implying the purpose of the table. That is, to indicate the combination of variables under which a given occupancy may be served by a single exit. It is felt that these provisions are intended to be used in combination based on their individual merit. For example, a building of any height where the remainder of the building is served by two or more exits may have a Group M occupancy at the second story of the building so long as that occupancy has an occupant load of not more that 29 persons and the travel distance does not exceed 75 feet. This obviously assumes no cumulative occupant loads as regulated by Section 1004.1. Should one occupancy egress through another occupancy, the cumulative occupant load and applicable travel distance would serve as entry values for Table 1019.2. Additionally, the same building could have a Group A occupancy at the first story of the building provided that the occupant load and the travel distance did not exceed 49 occupants and 75 feet, respectively.

Section 1001.1 fundamentally requires that, “Buildings or portions thereof shall be provided with a means of egress system as required by this chapter. The provisions of this chapter shall control the design, construction and arrangement of means of egress components required to provide an approved means of egress from structures and portions thereof.” Clearly, means of egress provisions apply to the “portions served” and may be designed independently of other “portions served” within a given building. The proposed second sentence of Section 1019.2 makes this distinction. This portion-by-portion philosophy also potentially applies to mixed occupancies so long as the individual occupancies do not exceed the limitations for those occupancies as delineated in Table 1019.2. The Boeing Company has been instrumental in the development of current IBC mixed occupancy requirements. They share our concern about the vagueness of single exit provisions and are co-proponents of this proposal. Boeing noted that the perceived limitation of mixed occupancies in individual story applications could also be applied to individual spaces given the similarity of threshold requirements in Section 1015.1. Accordingly, that section has also been modified to clarify mixed occupancy requirements. Additionally, the title of Table 1015.1 has been altered to agree with the title of the section and the text in Section 1015.1.

Lastly, and to support a position stated in the 2006 Commentary, the last sentence of Section 1019.2 stipulates that single exit basement applications are limited to the first story below grade plane. To be consistent with the allowance for single exit basements, the column heading in Table 1019.2 has been changed to acknowledge that the story could be above or below grade plane (basement).
In summary, this proposal provides needed amplification of single exit provisions from various stories within a building. It provides necessary guidance for designers and code enforcement officials alike and will lend to more uniform and appropriate interpretations of this important concept. **Cost Impact:** The code proposal will not increase the cost of construction.

### Public Hearing Results

**Committee Action:** Approved as Submitted

**Committee Reason:** The proposal adds consistency and clarifies the provisions for single exit buildings as provided in the 2007 Supplement.

**Assembly Action:** None

### Final Hearing Results

**E127-07/08**

**AS**

### Code Change No: S82-06/07

**Original Proposal**

**Sections:** 2305, 1613.6.1, Table 2306.4.5

**Proponent:** Jeffrey B. Stone, American Forest & Paper Association

**Revise as follows:**

#### SECTION 2305

**GENERAL DESIGN REQUIREMENTS FOR LATERAL-FORCE-RESISTING SYSTEMS**

**2305.1 General.** Structures using wood shear walls and diaphragms to resist wind, seismic and other lateral loads shall be designed and constructed in accordance with AF&PA SDPWS and the provisions of Section 2305, 2306, and 2307. Alternatively, compliance with the AF&PA SDPWS shall be permitted subject to the limitations therein and the limitations of this code.

**2305.1.1 Shear resistance based on principles of mechanics.** Shear resistance of diaphragms and shear walls are permitted to be calculated by principles of mechanics using values of fastener strength and sheathing shear resistance.

**2305.1.2 Framing.** Boundary elements shall be provided to transmit tension and compression forces. Perimeter members at openings shall be provided and shall be detailed to distribute the shearing stresses. Diaphragm and shear wall sheathing shall not be used to splice boundary elements. Diaphragm chords and collectors shall be placed in, or tangent to, the plane of the diaphragm framing unless it can be demonstrated that the moments, shears and deformations, considering eccentricities resulting from other configurations can be tolerated without exceeding the adjusted resistance and drift limits.

**2305.1.2.1 Framing members.** Framing members shall be at least 2 inch (51 mm) nominal width. In general, adjoining panel edges shall bear and be attached to the framing members and butt along their centerlines. Nails shall be placed not less than 3/8 inch (9.5 mm) from the panel edge, not more than 12 inches (305 mm) apart along intermediate supports, and 6 inches (152 mm) along panel edge bearings, and shall be firmly driven into the framing members.

**2305.4.3 2305.1.1 Openings in shear panels.** Openings in shear panels that materially affect their strength shall be fully detailed on the plans, and shall have their edges adequately reinforced to transfer all shearing stresses.

**2305.1.4 Shear panel connections.** Positive connections and anchorages capable of resisting the design forces shall be provided between the shear panel and the attached components. In Seismic Design Category D, E or F, the capacity of toenail connections shall not be used when calculating lateral load resistance to transfer lateral earthquake forces in
excess of 150 pounds per foot (2189 N/m) from diaphragms to shear walls, drag struts (collectors) or other elements, or from shear walls to other elements.

2305.1.5 Wood members resisting horizontal seismic forces contributed by masonry and concrete walls. Wood shear walls, diaphragms, horizontal trusses and other members shall not be used to resist horizontal seismic forces contributed by masonry or concrete walls in structures over one story in height.

Exceptions:

1. Wood floor and roof members are permitted to be used in horizontal trusses and diaphragms to resist horizontal seismic forces contributed by masonry or concrete walls, provided such forces do not result in torsional force distribution through the truss or diaphragm.

2. Wood structural panel sheathed shear walls are permitted to be used to provide resistance to seismic forces contributed by masonry or concrete walls in two-story structures of masonry or concrete walls, provided the following requirements are met:
   2.1. Story-to-story wall heights shall not exceed 12 feet (3658 mm).
   2.2. Diaphragms shall not be designed to transmit lateral forces by rotation and shall not cantilever past the outermost supporting shear wall.
   2.3. Combined deflections of diaphragms and shear walls shall not permit story drift of supported masonry or concrete walls to exceed the limit of Section 12.12.1 in ASCE-7.
   2.4. Wood structural panel sheathing in diaphragms shall have unsupported edges blocked. Wood structural panel sheathing for both stories of shear walls shall have unsupported edges blocked and, for the lower story, shall have a minimum thickness of 15/32 inch (11.9 mm).
   2.5. There shall be no out-of-plane horizontal offsets between the first and second stories of wood structural panel shear walls.

2305.1.6 Wood members resisting seismic forces from nonstructural concrete or masonry. Wood members shall be permitted to resist horizontal seismic forces from nonstructural concrete, masonry veneer or concrete floors.

2305.2 Design of wood diaphragms.

2305.2.1 General. Wood diaphragms are permitted to be used to resist horizontal forces provided the deflection in the plane of the diaphragm, as determined by calculations, tests or analogies drawn therefrom, does not exceed the permissible deflection of attached distributing or resisting elements. Connections shall extend into the diaphragm a sufficient distance to develop the force transferred into the diaphragm.

2305.2.2 Diaphragm Deflection. Permissible deflection shall be that deflection up to which the diaphragm and any attached distributing or resisting element will maintain its structural integrity under design load conditions, such that the resisting element will continue to support design loads without danger to occupants of the structure. Calculations for diaphragm deflection shall account for the usual bending and shear components as well as any other factors, such as nail deformation, which will contribute to deflection. The deflection (Δ) of a blocked wood structural panel diaphragm uniformly nailed fastened throughout is permitted to be calculated by using the following equation. If not uniformly nailed fastened, the constant 0.188 (For SI: 1/1627) in the third term must be modified accordingly.

\[
\Delta = \frac{5L^3}{8EAb} + \frac{vL}{4Gt} + 0.188Le_n + \sum (\Delta_c X) \frac{2b}{2b}
\]

(Equation 23-1)

For SI:

\[
\Delta = \frac{0.052vL^3}{EAb} + \frac{vL}{4Gt} \frac{Le_n}{1627} + \sum (\Delta_c X) \frac{2b}{2b}
\]

Where:

A = Area of chord cross section, in square inches (mm²).
B = Diaphragm width, in feet (mm).
E = Elastic modulus of chords, in pounds per square inch (N/mm²).
e_n = Nail or staple deformation, in inches (mm) [see Table 2305.2.2(1)].
Gt = Panel rigidity through the thickness, in pounds per inch (N/mm) of panel width or depth [see Table 2305.2.2(2)].
L = Diaphragm length, in feet (mm).
v = Maximum shear due to design loads in the direction under consideration, in pounds per linear foot (plf) (N/mm).
Δ = The calculated deflection, in inches (mm).
\[ \Sigma(\Delta X) = \text{Sum of individual chord-splice slip values on both sides of the diaphragm, each multiplied by its distance to the nearest support.} \]

**TABLE 2305.2.2(4) 2305.2(1)**

<table>
<thead>
<tr>
<th>LOAD PER FASTENER(^c) (pounds)</th>
<th>FASTENER DESIGNATIONS(^b)</th>
<th>6d</th>
<th>8d</th>
<th>10d</th>
<th>14-Ga staple x 2 inches long</th>
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</thead>
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<tr>
<td>60</td>
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<td>0.04</td>
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<tr>
<td>140</td>
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<td>0.02</td>
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<tr>
<td>180</td>
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<tr>
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<td>0.09</td>
<td>0.06</td>
<td>-</td>
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<td>-</td>
<td>-</td>
<td>0.07</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound = 4.448 N.

a. Increase \(e_n\) values 20 percent for plywood grades other than Structural I.

b. Nail values apply to common wire nails or staples identified.

c. Load per fastener = maximum shear per foot divided by the number of fasteners per foot at interior panel edges.

d. Decrease \(e_n\) values 50 percent for seasoned lumber (moisture content < 19 percent).

**TABLE 2305.2.2(2) 2305.2(2)**

VALUES OF G\(_t\) FOR USE IN CALCULATING DEFLECTION OF WOOD STRUCTURAL PANEL SHEAR WALLS AND DIAPHRAGMS

(No change to table entries)

**2305.2.3 Diaphragm aspect ratios.** Size and shape of diaphragms shall be limited as set forth in Table 2305.2.3.

**TABLE 2305.2.3**

MAXIMUM DIAPHRAGM DIMENSION RATIOS

**HORIZONTAL AND SLOPED DIAPHRAGM**

**2305.2.4 Construction.** Wood diaphragms shall be constructed of wood structural panels manufactured with exterior glue and not less than 4 feet by 8 feet (1219mm by 2438 mm), except at boundaries and changes in framing where minimum sheet dimension shall be 24 inches (610 mm) unless all edges of the undersized sheets are supported by and fastened to framing members or blocking. Wood structural panel thickness for horizontal diaphragms shall not be less than the values set forth in Tables 2304.7(3), 2304.7(4) and 2304.7(5) for corresponding joist spacing and loads.

**2305.2.4.1 Seismic Design Category F.** Structures assigned to Seismic Design Category F shall conform to the additional requirements of this section. Wood structural panel sheathing used for diaphragms and shear walls that are part of the seismic-force-resisting system shall be applied directly to the framing members.

**Exception:** Wood structural panel sheathing in a diaphragm is permitted to be fastened over solid lumber planking or laminated decking, provided the panel joints and lumber planking or laminated decking joints do not coincide.

**2305.2.5 Rigid diaphragms.** Design of structures with rigid diaphragms shall conform to the structure configuration requirements of Section 12.3.2 of ASCE 7 and the horizontal shear distribution requirements of Section 12.8.4 of ASCE 7. Open front structures with rigid wood diaphragms resulting in torsional force distribution are permitted, provided the length, \(l\), of the diaphragm normal to the open side does not exceed 25 feet (7620 mm), the diaphragm sheathing conforms to Section 2305.2.4 and the \(l/w\) ratio (as shown in Figure Figure 2305.2.5(1)) is less than 1 for one-story structures or 0.67 for structures over one story in height. **Exception:** Where calculations show that diaphragm deflections can be tolerated, the length, \(l\), normal to the open end is permitted to be increased to a \(l/w\) ratio not greater than 1.5 where sheathed in compliance with Section 2305.2.4 or to 1 where sheathed in compliance with Section 2306.3.4 or 2306.3.5.
Rigid wood diaphragms are permitted to cantilever past the outermost supporting shearwall (or other vertical resisting element) a length, \( l \), of not more than 25 feet (7620 mm) or two-thirds of the diaphragm width, \( w \), whichever is smaller. Figure 2305.2.5(2) illustrates the dimensions of \( l \) and \( w \) for a cantilevered diaphragm.

Structures with rigid wood diaphragms having a torsional irregularity in accordance with Table 12.3-1, Item 1, of ASCE 7 shall meet the following requirements: the \( l/w \) ratio shall not exceed 1 for one-story structures or 0.67 for structures over one story in height, where \( l \) is the dimension parallel to the load direction for which the irregularity exists.

**Exception:** Where calculations demonstrate that the diaphragm deflections can be tolerated, the width is permitted to be increased and the \( l/w \) ratio is permitted to be increased to 1.5 where sheathed in compliance with Section 2305.2.4 or 1 where sheathed in compliance with Section 2306.3.4 or 2306.3.5.

**FIGURE 2305.2.5(1)**
DIAPHRAGM LENGTH AND WIDTH FOR PLAN VIEW OF OPEN FRONT BUILDING

**FIGURE 2305.2.5(2)**
DIAPHRAGM LENGTH AND WIDTH FOR PLAN VIEW OF CANTILEVERED DIAPHRAGM

### 2305.3 Design of wood shear walls.

#### 2305.3.1 General
Wood shear walls are permitted to resist horizontal forces in vertical distributing or resisting elements, provided the deflection in the plane of the shear wall, as determined by calculations, tests or analogies drawn there from, does not exceed the more restrictive of the permissible deflection of attached distributing or resisting elements or the drift limits of Section 12.12.1 of ASCE 7. Shear wall sheathing other than wood structural panels shall not be permitted in Seismic Design Category E or F (see Section 1613).

#### 2305.3.2 Shear wall Deflection
Permissible deflection shall be that deflection up to which the shear wall and any attached distributing or resisting element will maintain its structural integrity under design load conditions, i.e., continue to support design loads without danger to occupants of the structure. The deflection (\( \Delta \)) of a blocked wood structural panel shear wall uniformly fastened throughout is permitted to be calculated by the use of the following equation:

\[
\Delta = \frac{8v h^3}{E A b} + \frac{v h}{Gt} + 0.75 e_a + d_a \frac{h}{b}
\]

(Equation 23-2)

For SI:
\[
\Delta = \frac{v h^3}{3E A b} + \frac{v h}{Gt} + \frac{e_a}{407.6} + d_a \frac{h}{b}
\]

where:
- \( A \) = Area of boundary element cross section in square inches (mm²) (vertical member at shear wall boundary).
- \( b \) = Wall width, in feet (mm).
- \( d_a \) = Vertical elongation of overturning anchorage (including fastener slip, device elongation, anchor rod elongation, etc.) at the design shear load (\( v \)).
- \( E \) = Elastic modulus of boundary element (vertical member at shear wall boundary), in pounds per square inch (N/mm²).
- \( e_a \) = Nail or staple deformation, in inches (mm) [see Table 2305.2.2(2)].
- \( Gt \) = Panel rigidity through the thickness, in pounds per inch (N/mm) of panel width or depth [see Table 2305.2.2(2)].
- \( H \) = Wall height, in feet (mm).
- \( v \) = Maximum shear due to design loads at the top of the wall, in pounds per linear foot (N/mm).
- \( \Delta \) = The calculated deflection, in inches (mm).

#### 2305.3.3 Construction
Wood shear walls shall be constructed of wood structural panels manufactured with exterior glue and not less than 4 feet by 8 feet (1219mm by 2438 mm), except at boundaries and at changes in framing. All edges of all panels shall be supported by and fastened to framing members or blocking. Wood structural panel thickness for shear walls shall not be less than set forth in Table 2304.6.1 for corresponding framing spacing and loads, except that 1/4 inch (6.4 mm) is permitted to be used where perpendicular loads permit.
2305.3.4 Shear wall aspect ratios. Size and shape of shear walls, perforated shear wall segments within perforated shear walls and wall piers within shear walls that are designed for force transfer around openings shall be limited as set forth in Table 2305.3.4. The height, h, and the width, w, shall be determined in accordance with Sections 2305.3.5 through 2305.3.6.2 and 2305.3.6 through 2305.3.6.2, respectively.

<table>
<thead>
<tr>
<th>TABLE 2305.3.4</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAXIMUM SHEAR WALL DIMENSION RATIOS</td>
</tr>
</tbody>
</table>

2305.3.5 Shear wall height definition. The height of a shear wall, h, shall be defined as:

1. The maximum clear height from the top of the foundation to the bottom of the diaphragm framing above; or
2. The maximum clear height from the top of the diaphragm to the bottom of the diaphragm framing above [see Figure 2305.3.5(a)].

2305.3.5.1 Perforated shear wall segment height definition. The height of a perforated shear wall segment, h, shall be defined as specified in Section 2305.3.5 for shear walls.

2305.3.5.2 Force transfer shear wall pier height definition. The height, h, of a wall pier in a shear wall with openings designed for force transfer around openings shall be defined as the clear height of the pier at the side of an opening [see Figure 2305.3.5(b)].

2305.3.6 Shear wall width definition. The width of a shear wall, w, shall be defined as the sheathed dimension of the shear wall in the direction of application of force [see Figure 2305.3.5(a)].

2305.3.6.1 Perforated shear wall segment width definition. The width of a perforated shear wall segment, w, shall be defined as the width of full-height sheathing adjacent to openings in the perforated shear wall [see Figure 2305.3.5(a)].

2305.3.6.2 Force transfer shear wall pier width definition. The width, w, of a wall pier in a shear wall with openings designed for force transfer around openings shall be defined as the sheathed width of the pier at the side of an opening [see Figure 2305.3.5(b)].

2305.3.7 Overturning restraint. Where the dead load stabilizing moment in accordance with Chapter 16 allowable stress design load combinations is not sufficient to prevent uplift due to overturning moments on the wall, an anchoring device shall be provided. Anchoring devices shall maintain a continuous load path to the foundation.

2305.3.8 Shear walls with openings. The provisions of this section shall apply to the design of shear walls with openings. Where framing and connections around the openings are designed for force transfer around the openings, the provisions of Section 2305.3.8.1 shall apply. Where framing and connections around the openings are not designed for force transfer around the openings, the provisions of Section 2305.3.8.2 shall apply.

2305.3.8.1 Force transfer around openings. Where shear walls with openings are designed for force transfer around the openings, the limitations of Table 2305.3.4 shall apply to the overall shear wall, including openings, and to each wall pier at the side of an opening. Design for force transfer shall be based on a rational analysis. Detailing of boundary elements around the opening shall be provided in accordance with the provisions of this section [see Figure 2305.3.5(b)].

2305.3.8.2 Perforated shear walls. The provisions of Section 2305.3.8.2 shall be permitted to be used for the design of perforated shear walls. For the determination of the height and width of perforated shear wall segments, see Sections 2305.3.5.1 and 2305.3.6.1, respectively.

2305.3.8.2.1 Limitations. The following limitations shall apply to the use of Section 2305.3.8.2:

1. A perforated shear wall segment shall be located at each end of a perforated shear wall. Openings shall be permitted to occur beyond the ends of the perforated shear wall, provided the width of such openings is not be included in the width of the perforated shear wall.
2. The allowable shear set forth in Table 2305.3.4.1 shall not exceed 490 plf (7150 N/m).
3. Where out-of-plane offsets occur, portions of the wall on each side of the offset shall be considered as separate perforated shear walls.
4. Collectors for shear transfer shall be provided through the full length of the perforated shear wall.
5. A perforated shear wall shall have uniform top of wall and bottom of wall elevations. Perforated shear walls not having uniform elevations shall be designed by other methods.
6. Perforated shear wall height, h, shall not exceed 20 feet (6096 mm).
2305.3.8.2.2 Perforated shear wall resistance. The resistance of a perforated shear wall shall be calculated in accordance with the following:

1. The percentage of full-height sheathing shall be calculated as the sum of the widths of perforated shear wall segments divided by the total width of the perforated shear wall, including openings.
2. The maximum opening height shall be taken as the maximum opening clear height. Where areas above and below an opening remain unsheathed, the height of the opening shall be defined as the height of the wall.
3. The unadjusted shear resistance shall be the allowable shear set forth in Table 2306.4.1 for height-to-width ratios of perforated shear wall segments that do not exceed 2:1 for seismic forces and 3:1 for other than seismic forces. For seismic forces, where the height-to-width ratio of any perforated shear wall segment used in the calculation of the sum of the widths of perforated shear wall segments, \( \sum L_i \), is greater than 2:1 but does not exceed 3:1, the unadjusted shear resistance shall be multiplied by \( 2.0 / h \).
4. The adjusted shear resistance shall be calculated by multiplying the unadjusted shear resistance by the shear resistance adjustment factors of Table 2305.3.8.2. For intermediate percentages of full-height sheathing, the values in Table 2305.3.8.2 are permitted to be interpolated.
5. The perforated shear wall resistance shall be equal to the adjusted shear resistance times the sum of the widths of the perforated shear wall segments.

2305.3.8.2.3 Anchorage and load path. Design of perforated shear wall anchorage and load path shall conform to the requirements of Sections 2305.3.8.2.4 through 2305.3.8.2.8, or shall be calculated using principles of mechanics. Except as modified by these sections, wall framing, sheathing, sheathing attachment and fastener schedules shall conform to the requirements of Section 2305.2.4 and Table 2306.4.1.

2305.3.8.2.4 Uplift anchorage at perforated shear wall ends. Anchorage for uplift forces due to overturning shall be provided at each end of the perforated shear wall. The uplift anchorage shall conform to the requirements of Section 2305.3.7, except that for each story the minimum tension chord uplift force, \( T \), shall be calculated in accordance with the following:

(Equation 23-3)

<table>
<thead>
<tr>
<th>WALL HEIGHT, ( H )</th>
</tr>
</thead>
<tbody>
<tr>
<td>SHEAR RESISTANCE ADJUSTMENT FACTOR, ( Co )</td>
</tr>
<tr>
<td>GENERAL DEFINITION OF SHEAR WALL HEIGHT, WIDTH AND HEIGHT-TO-WIDTH RATIO</td>
</tr>
</tbody>
</table>

2305.3.8.2.5 Anchorage for in-plane shear. The unit shear force, \( v \), transmitted into the top of a perforated shear wall, out of the base of the perforated shear wall at full-height sheathing and into collectors connecting shear wall segments shall be calculated in accordance with the following:

(Equation 23-4)

2305.3.8.2.6 Uplift anchorage between perforated shear wall ends. In addition to the requirements of Section 2305.3.8.2.4, perforated shear wall bottom plates at full-height sheathing shall be anchored for a uniform uplift force, \( t \), equal to the unit shear force, \( v \), determined in Section 2305.3.8.2.5.

2305.3.8.2.7 Compression chords. Each end of each perforated shear wall segment shall be designed for a compression chord force, \( C \), equal to the tension chord uplift force, \( T \), calculated in Section 2305.3.8.2.4.

2305.3.8.2.8 Load path. Load path. A load path to the foundation shall be provided for each uplift force, \( T \) and \( t \), for each shear force, \( V \) and \( v \), and for each compression chord force, \( C \). Elements resisting shear wall forces contributed by multiple stories shall be designed for the sum of forces contributed by each story.

2305.3.8.2.9 Deflection of shear walls with openings. The controlling deflection of a blocked shear wall with openings uniformly fastened throughout shall be taken as the maximum individual deflection of the shear wall segments calculated in accordance with Section 2305.3.2, divided by the appropriate shear resistance adjustment factors of Table 2305.3.8.2.
2305.3.9 Summing shear capacities. The shear values for shear panels of different capacities applied to the same side of the wall are not cumulative except as allowed in Table 2306.4.1.

The shear values for material of the same type and capacity applied to both faces of the same wall are cumulative. Where the material capacities are not equal, the allowable shear shall be either two times the smaller shear capacity or the capacity of the stronger side, whichever is greater.

Summing shear capacities of dissimilar materials applied to opposite faces or to the same wall line is not allowed.

**Exception:** For wind design, the allowable shear capacity of shear wall segments sheathed with a combination of wood structural panels and gypsum wallboard on opposite faces, fiberboard structural sheathing and gypsum wallboard on opposite faces or hardboard panel siding and gypsum wallboard on opposite faces shall equal the sum of the sheathing capacities of each face separately.

2305.3.10 Adhesives. Adhesive attachment of shear wall sheathing is not permitted as a substitute for mechanical fasteners, and shall not be used in shear wall strength calculations alone, or in combination with mechanical fasteners in Seismic Design Category D, E or F.

2305.3.11 Sill plate size and anchorage in Seismic Design Category D, E or F. Anchor bolts for shear walls shall include steel plate washers, a minimum of 0.229 inch by 3 inches by 3 inches (5.82 mm by 76 mm by 76 mm) in size, between the sill plate and nut. The hole in the plate washer is permitted to be diagonally slotted with a width of up to 3/16 inch (4.76 mm) larger than the bolt diameter and a slot length not to exceed 13/4 inches (44 mm), provided a standard cut washer is placed between the plate washer and the nut. Sill plates resisting a design load greater than 490 plf (7154 N/m) using load and resistance factor design or 350 plf (5110 N/m) using allowable stress design shall not be less than a 3-inch (76 mm) nominal member. Where a single 3-inch (76 mm) nominal sill plate is used, 2-20d box end nails shall be substituted for 2-16d common end nails found in line 8 of Table 2304.9.1.

**Exception:** In shear walls where the design load is greater than 490 plf (7151 N/m) but less than 840 plf (12264 N/m) using load and resistance factor design or greater than 350 plf (5110 N/m) but less than 600 plf (8760 N/m) using allowable stress design, the sill plate is permitted to be a 2-inch (51 mm) nominal member if the sill plate is anchored by two times the number of bolts required by design and 0.229-inch by 3-inch by 3-inch (5.82mm by 76mm by 76mm) plate washers are used.

1613.6.1 Assumption of flexible diaphragm. Add the following text at the end of Section 12.3.1.1 of ASCE 7:

Diaphragms constructed of wood structural panels or untopped steel decking shall also be permitted to be idealized as flexible, provided all of the following conditions are met:

1. Toppings of concrete or similar materials are not placed over wood structural panel diaphragms except for nonstructural toppings no greater than 11/2 inches (38 mm) thick.
2. Each line of vertical elements of the lateral-force-resisting system complies with the allowable story drift of Table 12.12-1.
3. Vertical elements of the lateral-force-resisting system are light-framed walls sheathed with wood structural panels rated for shear resistance or steel sheets.
4. Portions of wood structural panel diaphragms that cantilever beyond the vertical elements of the lateral-force-resisting system are designed in accordance with Section 2305.2.5 4.2.5.2 of AF & PA SDPWS the International Building Code.

**TABLE 2306.4.5**

**ALLOWABLE SHEAR FOR WIND OR SEISMIC FORCES FOR SHEAR WALLS OF LATH AND PLASTER OR GYPSUM BOARD WOOD FRAMED WALL ASSEMBLIES**

(No change to table entries)

a. These shear walls shall not be used to resist loads imposed by masonry or concrete construction (see Section 2305.1.5) walls (see Section 4.1.5 of AF & PA SDPWS). Values shown are for short-term loading due to wind or seismic loading. Walls resisting seismic loads shall be subject to the limitations in Section 12.2.1 of ASCE 7. Values shown shall be reduced 25 percent for normal loading.

b. through k. (No change to current text)

**Reason:** Revision of Section 2305: Provisions being deleted from Section 2305 of the IBC are contained in ANSI/AF&PA NDS Supplement “Special Design Provisions for Wind and Seismic” (SDPWS) which is currently adopted by reference. These provisions are primarily for the building designer and duplication of the provisions not only is unnecessary, but duplication causes confusion. It is proper that all the design provisions be contained in a single document. Provisions of IBC-2006 Section 2305 are covered in the SDPWS-05 as shown in the following Table 2305.
<table>
<thead>
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<th>IBC-2006</th>
<th>SDPWS-05</th>
<th>Comment</th>
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<td>2305.1.2.1</td>
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<tr>
<td>2305.1.3</td>
<td>4.3.5</td>
<td>This sentence is retained because a specific requirement to detail on plans the reinforcing of holes in shear panels is not included in SDPWS. Requirements for force transfer for shear walls with openings are covered in SDPWS 4.3.5 and SDPWS includes general criteria by reference to NDS for ASD and LRFD which addresses effect of net section on design.</td>
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<td>4.1.5</td>
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</tr>
<tr>
<td>2305.1.6</td>
<td>4.1.6</td>
<td>Same</td>
</tr>
<tr>
<td>2305.2.1</td>
<td>4.2.1</td>
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</tr>
<tr>
<td>2305.2.2</td>
<td>4.2.2</td>
<td>Same in substance, however, SDPWS does not address deflection calculations for stapled diaphragms. Therefore, the diaphragm deflection equation and staple slip values are being retained. For nailed diaphragms, the SDPWS Simplified deflection equation has the same basis as Eq. 23-1. Use of Eq. 23-1 is permitted as an alternative and necessary equation inputs are provided in SDPWS Commentary. Stiffness properties for diaphragm construction other than wood structural panel are given in SDPWS for purposes of complying with drift and diaphragm flexibility requirements specified elsewhere in the building code.</td>
</tr>
<tr>
<td>2305.2.3</td>
<td>4.2.4</td>
<td>Same</td>
</tr>
<tr>
<td>Table 2305.2.3</td>
<td>Table 4.2.4</td>
<td>Same</td>
</tr>
<tr>
<td>2305.2.4</td>
<td>4.2.7</td>
<td>Same</td>
</tr>
<tr>
<td>2305.2.4.1</td>
<td>4.2.7.1</td>
<td>Same except attachment of sheathing directly to framing is generally required in SDPWS and not a special detail for SDC F. Expanded criteria are provided in SDPWS for wood structural panel over lumber decking.</td>
</tr>
<tr>
<td>2305.2.5</td>
<td>4.2.5</td>
<td>Same</td>
</tr>
<tr>
<td>2305.3.1</td>
<td>4.3.1</td>
<td>Same</td>
</tr>
<tr>
<td>2305.3.2</td>
<td>4.3.1, 4.3.2</td>
<td>Same in substance, however, SDPWS does not address deflection calculations for stapled shear walls. Therefore, the shear wall deflection equation and staple slip values are being retained. The SDPWS simplified deflection equation has the same basis as Eq. 23-2. Use of Eq. 23-2 is permitted as an alternative and necessary equation inputs are provided in SDPWS Commentary. Stiffness properties for shear wall construction other than wood structural panel are given in SDPWS for purposes of complying with drift and shear wall compatibility requirements specified elsewhere in the building code.</td>
</tr>
<tr>
<td>2305.3.3</td>
<td>4.3.7</td>
<td>Same</td>
</tr>
<tr>
<td>2305.3.4</td>
<td>4.3.4, 4.3.5</td>
<td>Same</td>
</tr>
<tr>
<td>Table 2305.3.4</td>
<td>Table 4.3.4</td>
<td>Same</td>
</tr>
<tr>
<td>2305.3.5</td>
<td>2.3</td>
<td>Same</td>
</tr>
<tr>
<td>2305.3.5.1</td>
<td>2.3</td>
<td>Same</td>
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<tr>
<td>2305.3.5.2</td>
<td>4.3.5.2</td>
<td>Same</td>
</tr>
<tr>
<td>2305.3.6</td>
<td>2.3</td>
<td>Same</td>
</tr>
<tr>
<td>2305.3.6.1</td>
<td>2.3</td>
<td>Same</td>
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<tr>
<td>2305.3.6.2</td>
<td>4.3.5.2</td>
<td>Same</td>
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<tr>
<td>2305.3.7</td>
<td>4.3.6.4.2</td>
<td>Same in substance except SDPWS language is applicable to designs in accordance with both ASD and LRFD methods.</td>
</tr>
<tr>
<td>2305.3.8</td>
<td>4.3.5</td>
<td>Same</td>
</tr>
<tr>
<td>2305.3.8.1</td>
<td>4.3.5.2</td>
<td>Same</td>
</tr>
<tr>
<td>2305.3.8.2</td>
<td>4.3.5.3</td>
<td>Same</td>
</tr>
<tr>
<td>2305.3.8.2.1</td>
<td>4.3.5.3</td>
<td>Same in substance except SDPWS language is applicable to designs in accordance with both ASD and LRFD methods. SDPWS language clarifies perforated shear wall sheathing limitations for one-sided and two-sided walls and for walls resisting wind and seismic.</td>
</tr>
<tr>
<td>2305.3.8.2.2</td>
<td>4.3.3.4, 4.3.4.1</td>
<td>Same</td>
</tr>
<tr>
<td>2305.3.8.2.3</td>
<td>4.3.6</td>
<td>Same</td>
</tr>
<tr>
<td>2305.3.8.2.4</td>
<td>4.3.6.1.2</td>
<td>Same</td>
</tr>
<tr>
<td>Table 2305.3.8.2</td>
<td>Table 4.3.2.1</td>
<td>Same</td>
</tr>
<tr>
<td>Figure 2305.3.5</td>
<td>Figure C4.3.5.1 and C4.3.5.2</td>
<td>Same</td>
</tr>
<tr>
<td>2305.3.8.2.5</td>
<td>4.3.6.1.1</td>
<td>Same</td>
</tr>
<tr>
<td>2305.3.8.2.6</td>
<td>4.3.6.4.2.1</td>
<td>Same</td>
</tr>
<tr>
<td>2305.3.8.2.7</td>
<td>4.3.6.1.2</td>
<td>Same</td>
</tr>
<tr>
<td>2305.3.8.2.8</td>
<td>4.3.6.4.4</td>
<td>Same</td>
</tr>
<tr>
<td>2305.3.8.2.9</td>
<td>4.3.2.1</td>
<td>Same in substance except SDPWS clarifies calculation method for perforated shear wall deflection.</td>
</tr>
<tr>
<td>2305.3.9</td>
<td>4.3.3.2</td>
<td>Same in substance except SDPWS clarifies criteria for both ASD and LRFD methods. SDPWS also clarifies criteria for combination of materials on opposite sides of a two-sided wall for seismic. Currently, IBC states that they should not be summed.</td>
</tr>
<tr>
<td>2305.3.10</td>
<td>4.3.6.3.1</td>
<td>SDPWS limits use of adhesive shear wall systems to SDC A, B, and C and specifies R=1.5. In IBC, a reduced R is not specified for a system with adhesive.</td>
</tr>
<tr>
<td>2305.3.11</td>
<td>4.3.6.4.3</td>
<td>Same intent which is to minimize sill plate or bottom plate splitting; however, SDPWS specifies a minimum 2-1/2&quot; square by 1/4&quot; washer for anchor bolts in all seismic design categories. To account for different bottom plate width and potential for cross-grain bending, SDPWS also requires the plate washer to extend to within 1/2&quot; of the sheathed edge of the bottom plate. For SDC D, E and F only, IBC specifies 3x nominal sill plate with 3&quot; square x 0.229&quot; unless twice the number of anchor bolts are used. Where twice the number of anchor bolts are used, a 2x nominal sill plate is permitted provided the ASD design load is less than 600 plf.</td>
</tr>
</tbody>
</table>
Revision of Section 1613.6.1: The reference to Section 2305.2.5 of the IBC is replaced by reference to Section 4.2.5.2 of SDPWS containing the same limitations for cantilever diaphragms.

Revision of Table 2306.4.5 footnote a: The reference to Section 2305.1.5 of the IBC is replaced by reference to Section 4.1.5 of SDPWS containing the same limitations for wood members and systems resisting seismic forces contributed by masonry and concrete walls. The word "construction" is changed to "walls" to match language in both IBC and SDPWS.

Cost Impact: The cost change proposal will not increase the cost of construction. Provisions being deleted from Section 2305 of the IBC are contained in ANSI/AF&PA NDS Supplement “Special Design Provisions for Wind and Seismic” (SDPWS) which is currently adopted by reference.

Public Hearing Results

Committee Action: Approved as Modified

Modify proposal as follows:

SECTION 2305
GENERAL DESIGN REQUIREMENTS FOR LATERAL-FORCE-RESISTING SYSTEMS

2305.1 General. Structures using wood shear walls and diaphragms to resist wind, seismic and other lateral loads shall be designed and constructed in accordance with AF&PA SDPWS and the provisions of Section 2305, 2306, and 2307.

2305.1.1 Openings in shear panels. Openings in shear panels that materially affect their strength shall be fully detailed on the plans, and shall have their edges adequately reinforced to transfer all shearing stresses.

2305.2 Diaphragm deflection. The deflection ($\Delta$) of a blocked wood structural panel diaphragm uniformly fastened throughout with staples is permitted to be calculated by using the following equation. If not uniformly fastened, the constant 0.188 (For SI: 1/1627) in the third term must be modified accordingly.

$$
\Delta = \frac{5vL^3}{8EAb} + \frac{vL}{4Gt} + \frac{0.188Le_n}{2b} + \frac{\Sigma(\Delta_c X)}{2b}
$$

(Equation 23-1)

For SI:

$$
\Delta = \frac{0.052vL^3}{EAb} + \frac{vL}{4Gt} + \frac{Le_n}{1627} + \frac{\Sigma(\Delta_c X)}{2b}
$$

(Equation 23-2)

Where:

- $A$ = Area of chord cross section, in square inches (mm$^2$).
- $b$ = Diaphragm width, in feet (mm).
- $E$ = Elastic modulus of chords, in pounds per square inch (N/mm$^2$).
- $e_n$ = Staple deformation, in inches (mm) [see Table 2305.2.2(1) 2305.2(1)].
- $Gt$ = Panel rigidity through the thickness, in pounds per inch (N/mm) of panel width or depth [see Table 2305.2.2(2) 2305.2(2)].
- $L$ = Diaphragm length, in feet (mm).
- $v$ = Maximum shear due to design loads in the direction under consideration, in pounds per linear foot (plf) (N/mm).
- $\Delta$ = The calculated deflection, in inches (mm).
- $\Sigma(\Delta_c X)$ = Sum of individual chord-splice slip values on both sides of the diaphragm, each multiplied by its distance to the nearest support.

<table>
<thead>
<tr>
<th>LOAD PER FASTENER$^a$ (pounds)</th>
<th>FASTENER DESIGNATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>60</td>
<td>0.011</td>
</tr>
<tr>
<td>80</td>
<td>0.018</td>
</tr>
<tr>
<td>100</td>
<td>0.028</td>
</tr>
<tr>
<td>120</td>
<td>0.04</td>
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<tr>
<td>140</td>
<td>0.053</td>
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<tr>
<td>160</td>
<td>0.068</td>
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<tr>
<td>180</td>
<td>-</td>
</tr>
<tr>
<td>200</td>
<td>-</td>
</tr>
<tr>
<td>220</td>
<td>-</td>
</tr>
<tr>
<td>240</td>
<td>-</td>
</tr>
</tbody>
</table>

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound = 4.448 N.

$^a$ Increase $e_n$ values 20 percent for plywood grades other than Structural I.
b. Load per fastener = maximum shear per foot divided by the number of fasteners per foot at interior panel edges.

c. Decrease en values 50 percent for seasoned lumber (moisture content < 19 percent).

**TABLE 2305.2(2)**
VALUES OF Gt FOR USE IN CALCULATING DEFLECTION OF WOOD STRUCTURAL PANEL SHEAR WALLS AND DIAPHRAGMS
(No change to table contents)

2305.3 Shear wall deflection. The deflection (Δ) of a blocked wood structural panel shear wall uniformly fastened throughout with staples is permitted to be calculated by the use of the following equation:

\[
\Delta = \frac{8vh^3}{EAb} + \frac{vh}{Gt} + 0.75he_n + \frac{d_a h}{b} + \frac{h}{407.6}
\]

(Equation 23-2)

\[
\Delta = \frac{vh^3}{3EAb} + \frac{vh}{Gt} + \frac{he_n}{407.6} + \frac{d_a h}{b}
\]

For SI:

Where:

- \(A\) = Area of boundary element cross section in square inches (mm²) (vertical member at shear wall boundary).
- \(b\) = Wall width, in feet (mm).
- \(d_a\) = Vertical elongation of overturning anchorage (including fastener slip, device elongation, anchor rod elongation, etc.) at the design shear load (\(\nu\)).
- \(E\) = Elastic modulus of boundary element (vertical member at shear wall boundary), in pounds per square inch (N/mm²).
- \(e_n\) = Staple deformation, in inches (mm) [see Table 2305.2(2)(1) 2305.2(1)].
- \(Gt\) = Panel rigidity through the thickness, in pounds per inch (N/mm) of panel width or depth [see Table 2305.2(2)(2) 2305.2(2)].
- \(h\) = Wall height, in feet (mm).
- \(\nu\) = Maximum shear due to design loads at the top of the wall, in pounds per linear foot (N/mm).
- \(\Delta\) = The calculated deflection, in inches (mm).

1613.6.1 Assumption of flexible diaphragm. Add the following text at the end of Section 12.3.1.1 of ASCE 7: Diaphragms constructed of wood structural panels or untopped steel decking shall also be permitted to be idealized as flexible, provided all of the following conditions are met:

1. Toppings of concrete or similar materials are not placed over wood structural panel diaphragms except for nonstructural toppings no greater than 11/2 inches (38 mm) thick.
2. Each line of vertical elements of the lateral-force-resisting system complies with the allowable story drift of Table 12.12-1.
3. Vertical elements of the lateral-force-resisting system are light-framed walls sheathed with wood structural panels rated for shear resistance or steel sheets.
4. Portions of wood structural panel diaphragms that cantilever beyond the vertical elements of the lateral-force-resisting system are designed in accordance with Section 4.2.5.2 of AF & PA SDPWS.

**TABLE 2306.4.5**
ALLOWABLE SHEAR FOR WIND OR SEISMIC FORCES FOR SHEAR WALLS OF LATH AND PLASTER OR GYPSUM BOARD WOOD FRAMED WALL ASSEMBLIES
(No change to table contents)

a. These shear walls shall not be used to resist loads imposed by masonry or concrete walls (see Section 4.1.5 of AF & PA SDPWS). Values shown are for short-term loading due to wind or seismic loading. Walls resisting seismic loads shall be subject to the limitations in Section 12.2.1 of ASCE 7. Values shown shall be reduced 25 percent for normal loading.

b. through k. (No change to current text)

**Committee Reason:** This proposal substitutes a referenced standard for the provisions of Section 2305. The modification helps achieve the intent of the code change to retain IBC provisions pertaining to staple fasteners.

**Assembly Action:** None

**Final Hearing Results**

S82-06/07 AM