July 10, 2019

Doug Orth
State Building Code Council Chair
1500 Jefferson Street SE
PO Box 21499
Olympia, WA 98504

Dear Doug,

Please find the attached public comment "Burwell-1" on a proposal to amend the future 2018 Washington State Building Code. The public comment addresses structural analysis procedures in Section 1613.

Sincerely,

Cheryl Burwell, P.E, S.E.
Engineering and Technical Codes Manager
Seattle Department of Construction and Inspections

State Building Code Council Committee

Public Comment "Burwell-1" on proposed 2018 Washington State code change

Submitted by Cheryl Burwell, P.E., S.E., Seattle Department of Construction and Inspections

Proposed Revised Code Amendment:

1613.4.2 ASCE 7 Section 12.6. Amend ASCE 7 Section 12.6 and Table 12.6-1 to read as follows:

12.6 ANALYSIS PROCEDURE SELECTION

12.6.1 Analysis Procedure

The structural analysis required by Chapter 12 shall consist of one of the types permitted in Table 12.6-1, based on the structure's Sseismic Ddesign Ccategory, structural system, dynamic properties, and regularity, or with the approval of the authority having jurisdiction, an alternative generally accepted procedure is permitted to be used. The analysis procedure selected shall be completed in accordance with the requirements of the corresponding section referenced in Table 12.6-1.

Table 12.6-1 Permitted Analytical Procedures

Seismic Design Category	Structural Characteristics	Equivalent Lateral Force Procedure, Section 12.8[a]	Modal Response Spectrum Analysis, Section 12.9.1, or Linear Response History Analysis, Section 12.9.2[a]	Nonlinear Response History Procedures, Chapter 16[a]
B, C	All structures	P	P	P
D, E, F	Risk Category I or II buildings not exceeding two stories above the base	P	P	P
	Structures of light frame construction	P	P	P
	Structures with no structural irregularities and not exceeding 160 ft in structural height	P	P	P
	Structures exceeding 160 ft in structural height with no structural irregularities and with $T < 3.5T_s$	P	P	P
	Structures not exceeding 160 ft in structural height and having only horizontal irregularities of Type 2, 3, 4, or 5 in Table 12.3-1 or vertical irregularities of Type 4, 5a, or 5b in Table 12.3-2	P	P	P

	All other structures ≤ 240 ft in structural height	NP	P	P
	All structures > 240 ft in structural height	NP	NP	P

[a]P: Permitted; NP: Not Permitted; $T_s = S_{D1}/S_{DS}$.

Reason Statement:
The 2018 Washington State Building Code references ASCE 7-16 *Minimum Design Loads and Associated Criteria for Buildings and Other Structures*. The 2015 Washington State Building Code amendments to Section 1613 had referenced the previous ASCE 7-10 edition.

The ASCE 7-16 edition has now capitalized the term "Seismic Design Category" in Section 12.6. This public comment proposes to match ASCE 7-16 by also capitalizing the term.

ASCE 7-16 uses "structural height" to define a structural system's and analysis procedure's limits. This public comment proposes to match ASCE 7-16 language in the 240-foot height limit structural characteristics in Table 12.6-1. Using the correct term "structural height" will not only provide consistent language with ASCE 7-16 but will also limit confusion as to what height may be used (i.e. building height as defined in the IBC, land use height per the Authority Having Jurisdiction, or structural height per ASCE 7-16.)

This public comment has no technical change as it is intended to provide alignment with ASCE 7-16 language and clarity.

Note Lee Kranz's proposal does not show changes to the 2015 Washington Building Code amendments. For example, deletion of Table 12.6-1 footnotes b and c, combining two of the table's columns into one, and removal of Section 12.6.2.

July 10, 2019

Doug Orth
State Building Code Council Chair
1500 Jefferson Street SE
PO Box 21499
Olympia, WA 98504

Dear Doug,

Please find the attached public comment "Burwell-2" on a proposal to amend the future 2018 Washington State Building Code. The public comment addresses structural analysis procedures in Section 1613.

Sincerely,

Cheryl Burwell, P.E, S.E.
Engineering and Technical Codes Manager
Seattle Department of Construction and Inspections

State Building Code Council Committee

Public Comment "Burwell-2" on proposed 2018 Washington State code change

Submitted by Cheryl Burwell, P.E., S.E., Seattle Department of Construction and Inspections

Proposed Revised Code Amendment:

1613.4.1 ASCE 7 Section 12.2.5.4. Amend ASCE 7 Section 12.2.5.4 to read as follows:

12.2.5.4 Increased Structural Height Limit for Steel Eccentrically Braced Frames, Steel Special Concentrically Braced Frames, Steel Buckling-Restrained Braced Frames, Steel Special Plate Shear Walls, and Special Reinforced Concrete Shear Walls.

The limits on height, h_n, in Table 12.2-1 are permitted to be increased from 160 ft (50 m) to 240 ft (75 m) for structures assigned to Seismic Design Categories D or E and from 100 ft (30 m) to 160 ft (50 m) for structures assigned to Seismic Design Category F, provided that the seismic force-resisting systems are limited to steel eccentrically braced frames, steel special concentrically braced frames, steel buckling-restrained braced frames, steel special plate shear walls, or special reinforced concrete cast-in-place shear walls and all of the following requirements are met:

1. The structure shall not have an extreme torsional irregularity as defined in Table 12.3-1 (horizontal structural irregularity Type 1b).
2. The steel eccentrically braced frames, steel special concentrically braced frames, steel buckling-restrained braced frames, steel special plate shear walls or special reinforced concrete shear walls in any one plane shall resist no more than 60 percent of the total seismic forces in each direction, neglecting accidental torsional effects.
3. Where floor and roof diaphragms transfer forces from the vertical seismic force-resisting elements above the diaphragm to other vertical force-resisting elements below the diaphragm, these in-plane transfer forces shall be amplified by the overstrength factor, Ω_o for the design of the diaphragm flexure, shear, and collectors.

4~~3~~. The earthquake force demands in foundation mat slabs, grade beams, and pile caps supporting braced frames and/or walls arranged to form a shear-resisting core shall be amplified by 2 for shear and 1.5 for flexure.

5~~4~~. The earthquake shear force demands in special reinforced concrete shear walls shall be amplified by the over-strength factor, Ω_o.

Reason Statement:

The requirement for transfer diaphragm forces to be amplified by the overstrength factor was removed from the original 2018 Washington State Code amendment proposal with the assumption that this requirement is now addressed in the new edition of reference standard ASCE 7-16 *Minimum Design Loads and Associated Criteria for Buildings and Other Structures*.

ASCE 7-16 Section 12.10.1.1 Diaphragm Design Forces requires transfer diaphragm forces to be amplified by the overstrength factor for only one specific structural configuration; those buildings with a Type 4 horizontal irregularity. This does not capture all transfer diaphragms configurations that the original Washington State amendment was intended to apply.

ASCE 7-16 defines a Type 4 horizontal irregularity per Table 12.3-1 as a discontinuity in the lateral force-resisting path, such as an out-of-plane offset. The original Washington State amendment is

intended to also apply to those diaphragms where a change in stiffness occurs in the lateral force-resisting system above and below the diaphragm, resulting in forces transferring through the diaphragm. For high-rise buildings this most often occurs at 1) a podium roof where forces from a tower above transfer through the podium roof diaphragm to lateral force-resisting elements below, and 2) at-grade floors where forces from a centralized core transfer through the floor diaphragm to perimeter basement walls. Both common conditions are not characterized as Type 4 horizontal irregularities and therefore ASCE 7-16 will not capture the diaphragm force amplification as intended by the original Washington State amendment.

This public comment is a technical change that addresses an unintended deletion.

Note Lee Kranz's proposal does not show changes to the 2015 Washington Building Code amendments. For example, deleting the requirement to increase transfer diaphragm forces.

July 10, 2019

Doug Orth
State Building Code Council Chair
1500 Jefferson Street SE
PO Box 21499
Olympia, WA 98504

Dear Doug,

Please find the attached public comment "Burwell-3" on a proposal to amend the future 2018 Washington State Building Code. The public comment addresses structural analysis procedures in Section 1613.

Sincerely,

Cheryl Burwell, P.E, S.E.
Engineering and Technical Codes Manager
Seattle Department of Construction and Inspections

State Building Code Council Committee

Public Comment "Burwell-3" on proposed 2018 Washington State code change

Submitted by Cheryl Burwell, P.E., S.E., Seattle Department of Construction and Inspections

Proposed Revised Code Amendment:

1613.4.1 ASCE 7 Section 12.2.5.4. Amend ASCE 7 Section 12.2.5.4 to read as follows:

12.2.5.4 Increased Structural Height Limit for Steel Eccentrically Braced Frames, Steel Special Concentrically Braced Frames, Steel Buckling-Restrained Braced Frames, Steel Special Plate Shear Walls, and Special Reinforced Concrete Shear Walls.

The limits on height, h_n, in Table 12.2-1 are permitted to be increased from 160 ft (50 m) to 240 ft (75 m) for structures assigned to Seismic Design Categories D or E and from 100 ft (30 m) to 160 ft (50 m) for structures assigned to Seismic Design Category F, provided that the seismic force-resisting systems are limited to steel eccentrically braced frames, steel special concentrically braced frames, steel buckling-restrained braced frames, steel special plate shear walls, or special reinforced concrete cast-in-place shear walls and all of the following requirements are met:

1. The structure shall not have an extreme torsional irregularity as defined in Table 12.3-1 (horizontal structural irregularity Type 1b).
2. The steel eccentrically braced frames, steel special concentrically braced frames, steel buckling-restrained braced frames, steel special plate shear walls or special reinforced concrete shear walls in any one plane shall resist no more than 60 percent of the total seismic forces in each direction, neglecting accidental torsional effects.
3. The earthquake force demands in foundation mat slabs, grade beams, and pile caps supporting braced frames and/or walls arranged to form a shear-resisting core shall be amplified by 2 for shear and 1.5 for flexure. <u>The redundancy factor, ρ, applies and shall be the same as that used for the structure in accordance with Section 12.3.4.</u>
4. The earthquake shear force demands in special reinforced concrete shear walls shall be amplified by the over-strength factor, Ω_o.

Reason Statement:

The requirement to amplify the foundation earthquake force demands is independent of the redundancy factor, ρ, provisions in reference standard ASCE 7-16 *Minimum Design Loads and Associated Criteria for Buildings and Other Structures* Section 12.3.4.2. It is a common misconception that if the foundation earthquake force demands are amplified per Washington State Building Code Section 1613.4.1 then the forces need not be further increased by the ASCE 7-16 redundancy factor.

This public comment has no technical change as it is meant for clarification only.

Note Lee Kranz's proposal does not show changes to the 2015 Washington Building Code amendments. For example, deleting the requirement to increase transfer diaphragm forces.