Seismic Evaluation and Retrofit of Existing Buildings

ASCE/SEI 41-17

Errata 1

Effective: December 3, 2018

This document contains errata to the above title, which is posted on the ASCE Library at https://doi.org/10.1061/9780784414859

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Chapter 3

THE FOLLOWING TEXT IS COMMENTARY, NOT PROVISIONS, AND IS DUPLICATED IN SECTION C3.4.1:

A building defined as one of the common building types, or those buildings that have seismic isolation or supplemental energy dissipation systems installed, that meet the requirements of Section 3.3, Benchmark Buildings, shall be deemed to meet the structural performance objective as defined in that section. The nonstructural performance must still be evaluated.

3.4.1 Limitations on the Use of Tier 1 and Tier 2 Evaluation and Retrofit Procedures. The Tier 1 screening and Tier 2 deficiency-based procedures shall only be used with a Performance Objective that satisfies at least one of the following conditions:

1. The Performance Objective involves a Seismic Hazard Level less than or equal to BSE-1E with a Structural Performance Level up to and including Immediate Occupancy (S-1) and/or a Nonstructural Performance Level up to and including Position Retention (N-B).
2. The Performance Objective involves a Seismic Hazard Level greater than BSE-1E but less than or equal to BSE-2E with a Structural Performance Level up to and including Life Safety (S-3) and/or a Nonstructural Performance Level up to and including Life Safety (N-C).

The selected Seismic Hazard Level shall be compared to BSE-1E or BSE-2E by comparing the respective values of S_S and S_1.

In addition, the Tier 1 and Tier 2 procedures shall only be used for buildings that conform to the limitations of Table 3-4 and of Section 3.4.1.1 or 3.4.1.2.

In many cases, deficiency-based retrofit represents a cost-effective improvement in seismic performance, and it often requires less detailed evaluation or partial analysis to qualify for a specific performance level. Partial Retrofit Objective measures, which target high-risk building deficiencies such as parapets and other exterior falling hazards, are included as deficiency-based techniques. Partial Retrofit Objective measures need not be limited to buildings that conform to the limitations of Table 3-4. Acceptance of the specific partial retrofit method for regulatory purposes depends on the Authority Having Jurisdiction.

Regardless of whether it is permitted for use, the Tier 1 screening in Chapter 4 is a good starting point for the identification of potential deficiencies for any building type covered here and being evaluated using this standard.

3.4.1.1 Buildings Conforming to One of the Common Building Types. Where a building conforms to one of the common building types contained in Table 3-1, the limitations in Table 3-4 with regard to building size, Structural Performance Level, and Level of Seismicity determine whether the Tier 1 screening and Tier 2 deficiency-based procedures are allowed to demonstrate compliance with the Performance Objectives of this standard.

Chapter 9

THE LETTERS ‘a’ AND ‘b’ IN THE TABLE REPRESENTING THE ACCEPTANCE CRITERIA SHOULD NOT BE SUPERSCRIPT. THE TABLE SHOULD READ AS FOLLOWS:

Table 9-7.1. Modeling Parameters and Acceptance Criteria for Nonlinear Procedures—Structural Steel Beams and Columns—Flexural Actions

Modeling Parameters		Acceptance Criteria		
Plastic rotation angle a and b (radians) Residual strength ratio c		**Plastic rotation angle (radians) Performance Level**		
		IO	**LS**	**CP**
Beams				
1. Where: $\frac{b_f}{2t_f} \le 0.30\sqrt{\frac{E}{F_{ye}}}$ and $\frac{h}{t_w} \le 2.45\sqrt{\frac{E}{F_{ye}}}$	$a = 9\theta_y$ $b = 11\theta_y$ $c = 0.6$	~~0.25~~[a] 0.25a	[a]	[b]
2. Where: $\frac{b_f}{2t_f} \ge 0.38\sqrt{\frac{E}{F_{ye}}}$ or $\frac{h}{t_w} \ge 3.76\sqrt{\frac{E}{F_{ye}}}$	$a = 4\theta_y$ $b = 6\theta_y$ $c = 0.2$	~~0.25~~[a] 0.25a	~~0.75~~[a] 0.75a	[a] a
3. Other: Linear interpolation between the values on lines 1 and 2 for both flange slenderness (first term) and web slenderness (second term) shall be performed, and the lower resulting value shall be used.				

Modeling Parameters	Acceptance Criteria		
Plastic rotation angle a and b (radians) **Residual strength ratio c**	**Plastic rotation angle (radians)** **Performance Level**		
	IO	**LS**	**CP**
Columns in Compression [a,b]			
1. Where: $\frac{b_f}{2t_f} \le 0.30\sqrt{\frac{E}{F_{ye}}}$ and For $\frac{P_G}{P_{ye}} < 0.2$, $\frac{h}{t_w} \le 2.45\sqrt{\frac{E}{F_{ye}}}\left(1-0.71\frac{P_G}{P_{ye}}\right)$ For $\frac{P_G}{P_{ye}} \ge 0.2$, $\frac{h}{t_w} \le 0.77\sqrt{\frac{E}{F_{ye}}}\left(2.93-\frac{P_G}{P_{ye}}\right) \le 1.49\sqrt{\frac{E}{F_{ye}}}$ $a = 0.8\left(1-\frac{P_G}{P_{ye}}\right)^{2.2}\left(0.1\frac{L}{r_y}+0.8\frac{h}{t_w}\right)^{-1} - 0.0035 \ge 0$ $b = 7.4\left(1-\frac{P_G}{P_{ye}}\right)^{2.3}\left(0.5\frac{L}{r_y}+2.9\frac{h}{t_w}\right)^{-1} - 0.006 \ge 0$ $c = 0.9 - 0.9\frac{P_G}{P_{ye}}$	~~0.5~~[a] 0.5a	~~0.75~~[b] 0.75b	~~b~~ b
2. Where $\frac{b_f}{2t_f} \ge 0.38\sqrt{\frac{E}{F_{ye}}}$ or For $\frac{P_G}{P_{ye}} < 0.2$, $\frac{h}{t_w} \ge 3.76\sqrt{\frac{E}{F_{ye}}}\left(1-1.83\frac{P_G}{P_{ye}}\right)$ For $\frac{P_G}{P_{ye}} \ge 0.2$, $\frac{h}{t_w} \ge 1.12\sqrt{\frac{E}{F_{ye}}}\left(2.33-\frac{P_G}{P_{ye}}\right) \ge 1.49\sqrt{\frac{E}{F_{ye}}}$ $a = 1.2\left(1-\frac{P_G}{P_{ye}}\right)^{1.2}\left(1.4\frac{L}{r_y}+0.1\frac{h}{t_w}+0.9\frac{b}{2t_f}\right)^{-1} - 0.0023 \ge 0$ $b = 2.5\left(1-\frac{P_G}{P_{ye}}\right)^{1.8}\left(0.1\frac{L}{r_y}+0.2\frac{h}{t_w}+2.7\frac{b}{2t_f}\right)^{-1} - 0.0097 \ge 0$ $c = 0.5 - 0.5\frac{P_G}{P_{ye}}$	~~0.5~~[a] 0.5a	~~0.75~~[b] 0.75b	~~b~~ b
3. Other: Linear interpolation between the values on lines 1 and 2 for both flange slenderness (first term) and web slenderness (second term) shall be performed, and the lower resulting value shall be used.			

Modeling Parameters	Acceptance Criteria		
Plastic rotation angle a and b (radians) **Residual strength ratio c**	**Plastic rotation angle (radians)** **Performance Level**		
	IO	**LS**	**CP**
Columns in Tension [a,b]			
1. For $\lvert P_G\rvert/P_{ye} < 0.2$ $a = 9\theta_y$ $b = 11\theta_y$ $c = 0.6$	~~0.25~~[a] 0.25a	~~a~~ a	~~b~~ b
2. For $\lvert P_G\rvert/P_{ye} \geq 0.2$ $a = 13.5\ (1 - 5/3\ \lvert P_G\rvert/P_{ye})\ \theta_y \geq 0$ $b = 16.5\ (1 - 5/3\ \lvert P_G\rvert/P_{ye})\ \theta_y \geq 0$ $c = 0.6\ (1 - 5/3\ \lvert P_G\rvert/P_{ye}) + 0.2 \geq 0.2$	~~0.25~~[a] 0.25a	~~a~~ a	~~b~~ b
3. Other: Linear interpolation between the values on lines 1 and 2 shall be used.			

[a] P_G is the axial force component of the gravity load as determined by Eq. (7-3). For rectangular or square sections used as columns, replace $b_t/2t_f$ with b/t, replace 0.30 with 0.55, and replace 0.38 with 1.12.

[b] Where the modeling parameter a is equal to zero or where $P_G/P_{ye} > 0.6$, the column shall remain elastic for flexure. θy for the purpose of computing a plastic rotation angle is computed using Eq. (9-2) using $P = P_G$.

Chapter 10

IN TABLE 10-5, THE FLEXURAL RIGIDITY FOR WALLS SHOULD BE CALCULATED AS FOLLOWS:

~~$0.35E_{cE}A_g$~~ $0.35E_{cE}I_g$

Errata 2

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Chapter 11: Masonry

PAGE 184

Equation 11-18 should be edited as shown below.

$$V_{s2} = \frac{f_{dt}}{2.3\left(1+\frac{l_{sp}}{2h_{sp}}\right)}\sqrt{1+\frac{p_{sp}}{f_{dt}}}\,h_{sp}b_{sp} \qquad (11\text{-}18)$$

Errata 3

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PAGE 19

In Section 1.4.4, the reference should be to Section 3.4, not 3.3.

Errata 4

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Page 14

The word in the first line, “comprehensive,” should be “compressive.”

$f'_{cL/E}$ = Lower-bound or expected concrete comprehensive strength, as applicable to force-controlled or deformation-controlled actions, respectively, lb/in.^{2} (kN/m^2), Chapter 10

Page 41

Section 4.3, Paragraph 1, Sentence 1 states Tier 1 checklists are provided in Chapter 16. This statement is incorrect. The correct chapter is 17.

Table 11-2c, the footnote “a” superscript after “Compressive strength” in the first line should be deleted.

Table 11-2c. Default Lower-Bound Strengths for Unreinforced Masonry with Lime Mortar

Material	Solid Units
Compressive strength[a]	285 lb/in.^{2}
Flexural tensile strength	5 lb/in.^{2}
Shear strength	[a]

[a] Strength shall be taken as 80% of shear strength values determined in accordance with Section 9.2.6 of TMS 402.