

1 **FOURTH BALLOT PROPOSAL 6-114R2 (2009)**  
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5 **SCOPE: Part 2, Commentary Chapter 14, Sec. C14.2.2.14 and C14.4.8**  
6 **as approved in the third ballot**  
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10 **THIRD BALLOT RESULTS:**

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12 **Proposal 6-114 (Y= 23, YR= 3, N= 7, NV= 12--79%)**  
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14 *TS 6 found the AISI comment editorial and the word “Steel” has been added (it was not in ASCE 7-05*  
15 *originally but is in errata). TS 5 addressed the BIA comment and proposed a clearer explanation than*  
16 *what was provided in the first sentence of Sec. C14.4.8. The PUC found the BIA proposed solution*  
17 *nonpersuasive (Y=21, N=0, NV=0). TS4 addressed the SEAoCC comment on wall piers and found it*  
18 *persuasive (Y=21, N=0, NV=0). The last sentence in Sec. C14.2.2.14 has been stricken and the TS4*  
19 *proposed wording was inserted as underlined text. Since this is considered a substantive change, the*  
20 *changed wording will be reballoted (Y=21, N=0, NV=0). The similar CMACN and SEA/NCSEA*  
21 *comments are therefore persuasive. The TMS comment was discussed by the PUC and it was determined*  
22 *that the existing commentary is fair and no additional wording is required as proposed by the first TMS*  
23 *comment. The second TMS comment was found Persuasive / Editorial and the change adding, “for this*  
24 *requirement” has been made.*  
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28 **AISI (YR):** On page 3 of 14, line 15 the section title should read “C14.1.4.1 Light-Framed Cold-Formed  
29 Steel Construction.” (i.e., insert word “Steel”)  
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31 *TS 6 Response: Editorial. “Steel” is not in ASCE 7-05 diectly put has been entered in errata.*  
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33 **BIA(No):** I object to the following: “**C14.4.8 Modifications to Chapter 6 of ACI 530/ASCE 5/T MS**  
34 **402.** This requirement addresses an apparent inconsistency in the 2005 MSJC Code. Chapter 6 of that  
35 document, dealing with masonry veneer, permits corrugated sheet-metal anchors. Chapters 2 and 3 of that  
36 document do not permit multi-wythe, noncomposite masonry (functionally identical to veneer) to be  
37 bonded by corrugated sheet-metal anchors.”  
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39 **Reason:** I believe that the content of C14.4.8 does not address the content of the NEHRP 2003 Provisions  
40 in Section 11.4.3.2, which is: 11.4.3.2 For structures in Seismic Design Category E, corrugated sheet metal  
41 anchors shall not be used.  
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43 The first sentence of the proposed C14.4.8 is not correct. There is no inconsistency. The remaining  
44 sentences of the proposed C14.4.8, which are correct statements, point this out.  
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46 The Code simply excludes the use of corrugated sheet metal anchors in SDC E.  
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48 Recent testing in the NSF NEES Project on Seismic Performance of Modern Masonry now underway does  
49 not support content of Code Section 11.4.3.2. This section was based on opinions of TS5 members who  
50 wrote the 2003 NEHRP Provisions.  
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52 **Solution:** Replace the current wording of Section C14.4.8 with: “C14.4.8 Sheet metal corrugated anchors  
53 are prohibited because of their suspected poor performance at the highest seismic loading.”

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*TS5 Response: Nonpersuasive. TS 5 recognized that there is a need to have a clearer explanation than what is provided in the first sentence but it proposes to solve the problem by adding the following:*

**C14.4.8 Modifications to Chapter 6 of ACI 530/ASCE 5/TMS 402.** There is an apparent difference in the treatment of corrugated sheet metal anchors in different chapters of the 2005 MSJC Code. ....

**SEAOCC (YR):** YR vote will be changed to affirmative if modifications are made to better address the fundamental difference of C14.2.2.9 and C14.2.2.14 on concrete wall piers.

**Comments:** C14.2.2.9 and C14.2.2.14 - The design provision for wall pier detailing was originally introduced by SEAOC in 1987 to legacy UBC and was included in 1988 UBC through 1997 UBC. The wall pier detailing was intended for high seismic zones equivalent to current SDC D, E or F. Whereas ACI 318-05 Sec. 21.2.1.4 emphasized special structural wall in regions of high seismic risk, ASCE 7 Table 12.2-1, Design Coefficient and Factors for Seismic-Resisting System, permits intermediate precast structural wall system in SDC D, E or F. Current Section 14.2.2.14 does not limit to just structures assigned to SDC C. The required shear strength in 21.12.3 is based on  $V_u$  under either nominal moment strength or two times the code prescribed earthquake force. The required shear strength in 21.4.5.1 is based on the probable shear strength,  $V_e$  under the probable moment strength,  $M_{pr}$ . In addition, the spacing of required shear reinforcement is 8 inches on center under current 21.4.6 instead of 6 inches on center with seismic hooks at both ends under 21.7.10.2.

Current practice in commercial buildings constructed using precast panels wall system have large window and door openings and/or narrow wall piers. Wall panels varying up to three stories high with openings resembles wall frame which is not currently recognized under any of the defined seismic-force resisting systems other than consideration of structural wall system. Conformance to special structural wall system detailing will ensure minimum life safety performance in resisting earthquake forces in SDC D, E or F.

This commentary should discuss the conceptual difference of wall pier in the two sections cited.

*TS4 Response: Persuasive. In Proposal 6-114, C14.2.2.9 deals with Wall Piers and Wall Segments for special structural walls. C14.2.2.14 deals with Intermediate Precast Structural Walls. Most of the discussion in the existing C14.2.2.14 concerns the introduction of the intermediate wall concept and the insertion of the requirement that connections be designed to maintain 80% of their design strength at the deformation induced by the design displacement, etc. The only statement on wall piers in C14.2.2.14 is the following: "The wall pier requirements of Section 21.13.5 duplicate the same requirements of Section 14.2.2.9 for wall piers in special structural walls." That statement is incorrect. The wall pier requirements of 14.2.2.14 do not duplicate those of 14.2.2.9. The requirements of 14.2.2.14 are more liberal than those of 14.2.2.9.*

*The suggested fix is to delete the existing statement on wall piers for intermediate precast walls and replace it with the following: "The wall pier requirements in the modified Section 21.13.5 are less stringent than those for wall piers for special structural walls as specified in the modified Section 21.7.10. Where intermediate precast structural walls are used in SDC D, E and F, wall piers should satisfy the requirements of 21.7.10 rather than 21.13.5."*

**CMACN (No):** Concur with SEAOC. Negative vote will be changed to affirmative if modifications are made to better address the fundamental difference of C14.2.2.9 and C14.2.2.14 on concrete wall piers. [See SEAoCC comments above.]

*TS 4 Response: Persuasive. See response to SEAoCC.*

**SEAoSC (No):** Same as CMACN.  
**SEAoNC (No):** Same as CMACN.

1 NCSEA (No): Same as CMACN.

2 SEAoC (No): Same as CMACN.

3 SEAoSD (No): Same as CMACN

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*TS 4 Response: Persuasive. See response to SEAoCC.*

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**TMS (YR):**

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1. Chapter 14, page 10, lines 7-11, item C14.4.6.1 – Add the following “The MSJC is working to resolve this conflict.”

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*TS 4 Response: Nonpersuasive. Presnt commentary is fair.*

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2. Chapter 14, page 10, lines 25-26, item C14.4.6.2.2 – The Commentary should read “However, there is some controversy concerning the technical validity and necessity for this requirement for masonry walls.”

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*TS 4 Response: Persuasive/ Editorial. Underlined text will be added.*

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## 20 **FOURTH BALLOT PROPOSAL FOR CHANGE**

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22 **Revise Part 2, Commentary Sec. C14.2.2.14 as approved in the third**  
23 **ballot as follows:**

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25 **C14.2.2.14 Intermediate Precast Structural Walls.** Section 21.13 of ACI 318 imposes  
26 requirements on precast walls for moderate seismic risk applications. The intent is to produce  
27 ductile behavior by yielding of the steel elements or reinforcement between panels or between  
28 panels and foundations. The 2003 edition of the IBC restricted yielding to steel reinforcement  
29 because of concern that steel elements in the body of a connection could fracture due to strain  
30 demands.

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32 Several steel element connections have been tested under simulated seismic loading and the  
33 adequacy of their load-deformation characteristics and strain capacity of yield has been  
34 demonstrated (Schultz and Magana). One such connection was used in the five-story building  
35 test that was part of the PRESSS Phase 3 research. The connection was used to provide damping  
36 and energy dissipation, and demonstrated a very large strain capacity (Nakaki, Stanton, and  
37 Sritharan). Since then several other steel element connections have been developed that can  
38 achieve similar results (Banks and Stanton; Nakaki et al.). In view of these results it is  
39 appropriate to allow yielding in steel elements that have been shown experimentally to have  
40 adequate strain capacity to maintain at least 80% of their yield force of through the full design  
41 displacement of the structure. This provision requires the designer to determine the deformation  
42 in the connection corresponding to the earthquake design displacement, and then to check for  
43 experimental data that the connection type used can accommodate that deformation without  
44 significant strength degradation.

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The wall pier requirements of Section 21.13.5 duplicate the same requirements of Section

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14.2.2.9 for wall piers in special structural walls.

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The wall pier requirements in the modified Section 21.13.5 are less stringent than those for wall  
48 piers for special structural walls as specified in the modified Section 21.7.10. Where intermediate  
49 precast structural walls are used in SDC D, E and F, wall piers should satisfy the requirements of  
50 21.7.10 rather than 21.13.5.

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**Revise Part 2, Commentary Sec. C14.4.8 as approved in the third ballot as follows:**

**C14.4.8 Modifications to Chapter 6 of ACI 530/ASCE 5/TMS 402.** ~~This requirement addresses an apparent inconsistency in the 2005 MSJC Code.~~ There is an apparent difference in the treatment of corrugated sheet metal anchors in different chapters of the 2005 MSJC Code. Chapter 6 of that document, dealing with masonry veneer, permits corrugated sheet-metal anchors. Chapters 2 and 3 of that document do not permit multi-wythe, noncomposite masonry (functionally identical to veneer) to be bonded by corrugated sheet-metal anchors.

**REASON FOR FOURTH BALLOT PROPOSAL**

Proposal 6-114R2 presents changes that respond to comments from the third member organization ballot on wall piers and clarification of the 2005 MSJC Code.