

# 2022 TMS 402/602 Committee Proposed Change to Masonry Standard

Committee: Main Committee		Ballot #: 22
Item #: 22-PR-001		
Technical Contact/Email:	Arturo E. Schultz <a href="mailto:arturo.schultz@utsa.edu">arturo.schultz@utsa.edu</a>	
Draft Document Dated:	4/1/2022	
Reballot of Main Committee Item No.:	Response to TAC Comment No.:	Response to Public Comment No.:

Reference <i>(Choose from Drop-Down Menu)</i>	Section/Article
TMS 402 Commentary Section	10.5.3

**Notice to voter: If this Ballot Item receives any negative votes there is no possibility of resolution other than withdrawal of all negative votes. If there are any outstanding negative votes 5 days after close of this ballot, this Ballot Item will be withdrawn.**

**Rationale:** *(Rationale is explanatory and not part of the proposed revision)*

In Ballot 14, a definition for the effective depth of sections with both non-prestressed and prestressed reinforcement,  $x_t$ , was accepted. But, not all instances of this issue were corrected. In Ballot 21, some, but not all, remaining instances of effective depth of sections with both non-prestressed and prestressed reinforcement in Code Chapter 10 were corrected. The current ballot seeks to correct the last instances of this issue.

The present ballot item is proposing changes to only the Commentary of Chapter 10 to provide consistency with the accepted code changes. It is noted that the Commentary is not mandatory, and that there are no new technical changes in this ballot.

**PROPOSED CHANGES:** *(Only the suggested change(s) being balloted are proposed for consideration. Supplementary text included for clarity, but not proposed for modification, is not part of this ballot item. Additions are shown underlined and deletions are shown ~~struck through~~.) Do not use 'Track Changes'*

**Code:**

**No changes are proposed to the Code. The following is provided to show the context of the proposed commentary changes.**

**10.5.3** The ratio  $a/x_t$  shall not exceed the value in Table 10.5.3.

**Table 10.5.3: Limits for  $a/x_t$  in Prestressed Masonry Walls**

Type of Wall	Masonry Unit Material	
	Concrete	Clay
Walls subject to out-of-plane loading, ordinary shear walls	0.36	0.38
Intermediate shear walls	0.23	0.29

Special shear walls	0.19	0.24
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**Code Commentary:**

**10.5.3** The ratio,  $a/x_t$ , is limited to assure ductile performance in flexure when using tendons fabricated from steel with yield strengths between 60 ksi (420 MPa) and 270 ksi (1865 MPa). As with reinforced masonry designed in accordance with Chapters 8 and 9, the calculated depth in compression should be compared to the depth available to resist compressive stresses. For sections with uniform width, the value of the compression block depth,  $a$ , should be compared to the solid bearing depth available to resist compressive stresses. For hollow sections that are ungrouted or partially grouted, the available depth may be limited to the face shell thickness of the masonry units, particularly if the webs are not mortared. The  $a/x_t$  limitation is intended to ensure significant yielding of the prestressing tendons prior to masonry compression failure.

In such a situation, the nominal moment strength is determined by the strength of the prestressing tendon, which is the basis for a strength-reduction factor equal to 0.8. In previous editions of TMS 402, this limit was determined for sections with bonded tendons.

For masonry with unbonded tendons, the limit on  $a/x_t$  was defined using the compressive strain distribution described in Section 9.3.2(g) for strength design of reinforced masonry members, and a tensile strain of  $1.5\epsilon_y$  for walls subjected to out-of-plane loading and ordinary shear walls, a tensile strain of  $3\epsilon_y$  for intermediate shear walls, and a tensile strain of  $4\epsilon_y$  for special shear walls. The only exception is for clay masonry walls subject to out-of-plane loading, and ordinary clay masonry shear walls for which the more conservative limit from previous editions of TMS 402 (i.e.,  $a/x_t \leq 0.38$ ) is used. Because reinforcement strain limits can be applied directly only in the case of bonded tendons, the curvature that is implicit in the strain distribution is used as an indication of flexural deformation. In that manner,  $a/x_t$  limits defined using the same strain distribution are imposed on members with either bonded or unbonded tendons. The  $a/x_t$  limits in Table 10.5.3 are equal to or more conservative than the value used in previous editions of TMS 402. Thus, Table 10.5.3 was adopted for both bonded tendons and unbonded tendons. Table 10.5.3 is based upon the tendons being in a single layer. There is one  $d$ -distance value for effective depth for walls loaded out-of-plane, and for beams and lintels. However, each tendon has its own  $d$ -distance effective depth for walls loaded in-plane (shear walls), and the largest value of  $d$  should be used for checking the  $a/x_t$  limit.

**Specification:** (none)

**Specification Commentary:** (none)

**Mandatory Requirements Checklist:** (none)

**Optional Requirements Checklist:** (none)

Subcommittee Vote:									
8	Affirmative	1	Affirmative w/ comment	0	Negative	0	Abstain	0	Did not vote

**Subcommittee Comments:**

Biggs suggested changes to the rationale to emphasize the non-mandatory nature of the Commentary and to more clearly inform that the ballot item affects the Commentary. Most of these changes were adopted.



## 2022 TMS 402/602 Committee Proposed Change to Masonry Standard

Committee: Main Committee		Ballot #: 22	
Item #: 22-SL-001			
Technical Contact/Email:	John M. Hochwalt / <a href="mailto:john.hochwalt@kpff.com">john.hochwalt@kpff.com</a>		
Draft Document Dated:	3/29/2022		
Reballot of Main Committee Item No.:	NA	Response to TAC Comment No.:	NA
		Response to Public Comment No.:	116

Field Code Changed

Reference (Choose from Drop-Down Menu)	Section/Article
TMS 402 Code Section	7.3.2.5

**Notice to voter: If this Ballot Item receives any negative votes there is no possibility of resolution other than withdrawal of all negative votes. If there are any outstanding negative votes 5 days after close of this ballot, this Ballot Item will be withdrawn.**

**Rationale:** *(Rationale is explanatory and not part of the proposed revision)*

In the version of 21-SL-18.3 that passed the main committee, there was an error in the formula used to establish when it would be necessary hook horizontal reinforcement in special reinforced masonry shear wall when designed using the Allowable Stress Design provisions. As written the equation divided a force ( $V$ ) by the allowable stress ( $F_{vm}$ ). It is proposed to correct this by multiplying the allowable stress ( $F_{vm}$ ) by the net shear area ( $A_{nv}$ ) so that the correct result is obtained.

**PROPOSED CHANGES:** *(Only the suggested change(s) being balloted are proposed for consideration. Supplementary text included for clarity, but not proposed for modification, is not part of this ballot item. Additions are shown underlined and deletions are shown ~~struck through~~.) Do not use 'Track Changes'*

**Code:**

**The following reflects the passage of 21-SL-18.3**

**7.3.2.5** Special reinforced masonry shear walls — Design of special reinforced masonry shear walls shall comply with the requirements of Section 8.3, Section 9.3, or Appendix C. Reinforcement detailing shall also comply with the requirements of Section 7.3.2.2.1 and the following:

...

(i) When the ratio of  $V/(F_{vm}A_{nv})$  for masonry designed in accordance with Chapter 8 or when the ratio  $V_u/\phi V_{nm}$  for masonry designed in accordance with Chapter 9, 10, or 11 exceeds 0.40, the termination of horizontal reinforcement embedded in grout shall meet one of the following:

1. Except at wall intersections, the ends of horizontal reinforcement shall be bent around the edge vertical reinforcement with a 180-degree standard hook.
2. At wall intersections, horizontal reinforcement shall be bent around the edge vertical reinforcement with a 90-degree standard hook and shall extend horizontally into the intersecting wall a minimum distance at least equal to the development length.

**Code Commentary:**

None.

**Specification:**

None.

**Specification Commentary:**

None.

**Mandatory Requirements Checklist:**

None.

**Optional Requirements Checklist:**

None.

<b>Subcommittee Vote:</b>									
0	<i>Affirmative</i>	0	<i>Affirmative w/ comment</i>	0	<i>Negative</i>	0	<i>Abstain</i>	0	<i>Did not vote</i>

**Subcommittee Comments:**

This ballot item submitted by Chair in accordance with Technical Committee Operations Manual Section 4.2.1.  
Technical input provided by John Hochwalt.

# 2022 TMS 402/602 Committee Proposed Change to Masonry Standard

Committee: Main Committee		Ballot #: 22	
Item #: 22-SL-002			
Technical Contact/Email:		John M. Hochwalt / <a href="mailto:john.hochwalt@kpff.com">john.hochwalt@kpff.com</a>	
Draft Document Dated:		3/29/2022	
Reballot of Main Committee Item No.:	NA	Response to TAC Comment No.:	NA
		Response to Public Comment No.:	116

Reference (Choose from Drop-Down Menu)	Section/Article
TMS 402 Code Section	7.3.2.5

**Notice to voter: If this Ballot Item receives any negative votes there is no possibility of resolution other than withdrawal of all negative votes. If there are any outstanding negative votes 5 days after close of this ballot, this Ballot Item will be withdrawn.**

**Rationale:** (Rationale is explanatory and not part of the proposed revision)

The commentary that was added 21-SL-18.3 needs to be revised for two reasons:

- It largely assumes behavior around a demand-to-resistance ratio of 40%, and thus does not reflect the full range of behaviors possible when the demand-to-resistance ratio is less than 40%.
- While the shear capacity provisions are another source of over strength that may influence behavior, some users may misunderstand the commentary referencing those provisions to indicate that they should be applying the shear capacity provisions when evaluating this provision.

**PROPOSED CHANGES:** (Only the suggested change(s) being balloted are proposed for consideration. Supplementary text included for clarity, but not proposed for modification, is not part of this ballot item. Additions are shown underlined and deletions are shown ~~struck through~~.) Do not use 'Track Changes'

**Code:**

**The following reflects the passage of 21-SL-18.3 and no changes are proposed in this ballot.**

**7.3.2.5** Special reinforced masonry shear walls — Design of special reinforced masonry shear walls shall comply with the requirements of Section 8.3, Section 9.3, or Appendix C. Reinforcement detailing shall also comply with the requirements of Section 7.3.2.2.1 and the following:

...

(i) When the ratio of  $V/F_{vm}$  for masonry designed in accordance with Chapter 8 or when the ratio  $V_u/\phi V_{nm}$  for masonry designed in accordance with Chapter 9, 10, or 11 exceeds 0.40, the termination of horizontal reinforcement embedded in grout shall meet one of the following:

1. Except at wall intersections, the ends of horizontal reinforcement shall be bent around the edge vertical reinforcement with a 180-degree standard hook.
2. At wall intersections, horizontal reinforcement shall be bent around the edge vertical reinforcement with a 90-degree standard hook and shall extend horizontally into the intersecting wall a minimum distance at least equal to the development length.

**Code Commentary:**

7.3.2.5 (i) Research (Seif Eldin (2017)) has shown an increase in the ductility of masonry piers where the horizontal reinforcement is hooked around the edge vertical bar. When the demand-to-resistance ratio is less than 40%, inelastic response is generally expected to be associated with low ductility demands, ~~but coupled with the shear capacity check required for special reinforced shear walls, the effective R value for these systems is approximately 2~~ where the benefit of prescriptive hooks for shear reinforcement is marginal (Hochwalt (2018)).

**Specification:**

None.

**Specification Commentary:**

None.

**Mandatory Requirements Checklist:**

None.

**Optional Requirements Checklist:**

None.

<b>Subcommittee Vote:</b>									
0	<i>Affirmative</i>	0	<i>Affirmative w/ comment</i>	0	<i>Negative</i>	0	<i>Abstain</i>	0	<i>Did not vote</i>

**Subcommittee Comments:**

This ballot item submitted by Chair in accordance with Technical Committee Operations Manual Section 4.2.1. Technical input provided by John Hochwalt.

# 2022 TMS 402/602 Committee Proposed Change to Masonry Standard

Committee: Main Committee		Ballot #: 22	
Item #: 22-SL-003			
Technical Contact/Email:		John M. Hochwalt / <a href="mailto:john.hochwalt@kpff.com">john.hochwalt@kpff.com</a>	
Draft Document Dated:		3/29/2022	
Reballot of Main Committee Item No.: NA		Response to TAC Comment No.: NA	
		Response to Public Comment No.: 116	

Reference <i>(Choose from Drop-Down Menu)</i>	Section/Article
TMS 402 Code Section	7.3.2.5

**Notice to voter: If this Ballot Item receives any negative votes there is no possibility of resolution other than withdrawal of all negative votes. If there are any outstanding negative votes 5 days after close of this ballot, this Ballot Item will be withdrawn.**

**Rationale:** *(Rationale is explanatory and not part of the proposed revision)*

The shear capacity provisions are a source of potential confusion when evaluating the threshold for hooking horizontal reinforcement in special walls. While the shear capacity provisions are clearly scoped to be applied to determining required shear reinforcement only, previous committees have recognized the potential for the shear capacity provisions to be applied too broadly and have provided commentary to address possible misapplications. It is proposed to add the hook threshold check to the list of those potential misapplications.

**PROPOSED CHANGES:** *(Only the suggested change(s) being balloted are proposed for consideration. Supplementary text included for clarity, but not proposed for modification, is not part of this ballot item. Additions are shown underlined and deletions are shown ~~struck-through~~.) Do not use 'Track Changes'*

**Code:**

**No changes are proposed. The following is provided for context only and reflects the passage of 21-SL-18.3.**

**7.3.2.5** Special reinforced masonry shear walls — Design of special reinforced masonry shear walls shall comply with the requirements of Section 8.3, Section 9.3, or Appendix C. Reinforcement detailing shall also comply with the requirements of Section 7.3.2.2.1 and the following:

...

(i) When the ratio of  $V/F_{vm}$  for masonry designed in accordance with Chapter 8 or when the ratio  $V_u/\phi V_{nm}$  for masonry designed in accordance with Chapter 9, 10, or 11 exceeds 0.40, the termination of horizontal reinforcement embedded in grout shall meet one of the following:

1. Except at wall intersections, the ends of horizontal reinforcement shall be bent around the edge vertical reinforcement with a 180-degree standard hook.
2. At wall intersections, horizontal reinforcement shall be bent around the edge vertical reinforcement with a 90-degree standard hook and shall extend horizontally into the intersecting wall a minimum distance at least equal to the development length.

...



**7.3.2.5.1.1** When designing special reinforced masonry shear walls in accordance with Section 8.3.5, the calculated shear stress,  $f_v$ , or diagonal tension stress resulting from in-plane seismic forces shall be increased by a factor of 2.0.

**7.3.2.5.1.2** When designing special reinforced masonry shear walls to resist in-plane forces in accordance with Section 9.3, the design shear strength,  $\phi V_n$ , shall exceed the shear corresponding to the development of 1.25 times the nominal flexural strength,  $M_n$ , of the element, except that the nominal design shear strength,  $\phi V_n$ , need not exceed 2.0 times required shear strength,  $V_u$ .

**Code Commentary:**

7.3.2.5.1.1 The 2.0 load factor for special reinforced masonry shear walls that are part of the seismic-force-resisting system designed by allowable stress design procedures is applied only to in-plane shear forces. It is not intended to be used for the design of in-plane overturning moments or out-of-plane overturning moments or shear. Increasing the design seismic load is intended to make the flexure mode of failure more dominant, resulting in more ductile performance. The 2.0 multiplier should not be applied to V when calculating the M/Vdv ratio, ~~or~~ for shear-friction design, or for determining compliance with 7.3.2.5 (i).

7.3.2.5.1.2 The effect of axial load on increasing flexural strength,  $M_n$ , and thus, shear demand, as well as the effect of axial load on influencing shear capacity,  $V_n$ , should be considered.

The provisions of this Section only apply to the nominal shear strength,  $V_n$ , and do not apply to the nominal shear friction strength,  $V_{nf}$ , nor do they apply when determining compliance with 7.3.2.5 (i).

**Specification:**

None.

**Specification Commentary:**

None.

**Mandatory Requirements Checklist:**

None.

**Optional Requirements Checklist:**

None.

<b>Subcommittee Vote:</b>									
0	<i>Affirmative</i>	0	<i>Affirmative w/ comment</i>	0	<i>Negative</i>	0	<i>Abstain</i>	0	<i>Did not vote</i>

**Subcommittee Comments:**

This ballot item submitted by Chair in accordance with Technical Committee Operations Manual Section 4.2.1. Technical input provided by John Hochwalt.

# 2022 TMS 402/602 Committee Proposed Change to Masonry Standard

Committee: Main Committee		Ballot #: 22	
Item #: 22-SL-004			
Technical Contact/Email:		John M. Hochwalt / <a href="mailto:john.hochwalt@kpff.com">john.hochwalt@kpff.com</a>	
Draft Document Dated:		3/29/2022	
Reballot of Main Committee Item No.:	NA	Response to TAC Comment No.:	NA
		Response to Public Comment No.:	116

Reference (Choose from Drop-Down Menu)	Section/Article
TMS 402 Code Section	7.3.2.5

**Notice to voter: If this Ballot Item receives any negative votes there is no possibility of resolution other than withdrawal of all negative votes. If there are any outstanding negative votes 5 days after close of this ballot, this Ballot Item will be withdrawn.**

**Rationale:** (Rationale is explanatory and not part of the proposed revision)

The reference to Hochwalt (2018) in the commentary that was added 21-SL-18.3 needs to be deleted for two reasons:

- TMS Responds is not a peer reviewed publication, which is preferred for commentary references.
- The technical rationale proposed in the reference is not necessarily consistent with the rationales of the voters supporting adoption of the 20-SL-18.3 code provisions.

**PROPOSED CHANGES:** (Only the suggested change(s) being balloted are proposed for consideration. Supplementary text included for clarity, but not proposed for modification, is not part of this ballot item. Additions are shown underlined and deletions are shown ~~struck through~~.) Do not use 'Track Changes'

**Code:**

**The following reflects the passage of 21-SL-18.3 and no changes are proposed in this ballot.**

**7.3.2.5** Special reinforced masonry shear walls — Design of special reinforced masonry shear walls shall comply with the requirements of Section 8.3, Section 9.3, or Appendix C. Reinforcement detailing shall also comply with the requirements of Section 7.3.2.2.1 and the following:

...

(i) When the ratio of  $V/F_{vm}$  for masonry designed in accordance with Chapter 8 or when the ratio  $V_u/\phi V_{nm}$  for masonry designed in accordance with Chapter 9, 10, or 11 exceeds 0.40, the termination of horizontal reinforcement embedded in grout shall meet one of the following:

1. Except at wall intersections, the ends of horizontal reinforcement shall be bent around the edge vertical reinforcement with a 180-degree standard hook.
2. At wall intersections, horizontal reinforcement shall be bent around the edge vertical reinforcement with a 90-degree standard hook and shall extend horizontally into the intersecting wall a minimum distance at least equal to the development length.

**Code Commentary:**

7.3.2.5 (i) Research (Seif Eldin (2017)) has shown an increase in the ductility of masonry piers where the horizontal reinforcement is hooked around the edge vertical bar. When the demand-to-resistance ratio is less

than 40%, inelastic response is generally expected, but coupled with the shear capacity check required for special reinforced shear walls, the effective R value for these systems is approximately 2-where the benefit of prescriptive hooks for shear reinforcement is marginal (Hochwalt (2018)).

Also delete the citation of Hochwalt (2018) from the list of references. (Not in Working Draft but part of Ballot Item 21-SL-018.3)

Hochwalt, J., and Bennett, R. (2018). "Hook Requirements for Special Reinforced Masonry Shear Walls," TMS Responds, Vol. 16, No. 1.

**Specification:**

None.

**Specification Commentary:**

None.

**Mandatory Requirements Checklist:**

None.

**Optional Requirements Checklist:**

None.

<b>Subcommittee Vote:</b>									
0	<i>Affirmative</i>	0	<i>Affirmative w/ comment</i>	0	<i>Negative</i>	0	<i>Abstain</i>	0	<i>Did not vote</i>

**Subcommittee Comments:**

This ballot item submitted by Chair in accordance with Technical Committee Operations Manual Section 4.2.1. Technical input provided by John Hochwalt.

## 2022 TMS 402/602 Committee Response to Public Comment

Committee: Main Committee	Ballot #: 22
Item #: 22-SL-005	
Technical Contact/Email: John M. Hochwalt / <a href="mailto:john.hochwalt@kpff.com">john.hochwalt@kpff.com</a>	
Public Comment Number: 2022 Comment # 104	
Public Comment Response Based on TMS 402/602 Draft Dated	3/29/2022
<b>This ballot item proposes the following response to the Public Comment:</b>	
<input type="checkbox"/> <i>Committee agrees with Public Comment, change is proposed</i>	
<input checked="" type="checkbox"/> <i>Committee agrees comment has merit but proposed changes are not completely consistent with Public Comment</i>	
<input type="checkbox"/> <i>Committee disagrees with Public Comment and no changes are proposed</i>	
<input type="checkbox"/> <i>Committee unable to fully develop a response to Public Comment</i>	
<input type="checkbox"/> <i>Public Comment only requires a response, no change to document</i>	

**Notice to voter: If this Ballot Item receives any negative votes there is no possibility of resolution other than withdrawal of all negative votes. If there are any outstanding negative votes 5 days after close of this ballot, this Ballot Item will be withdrawn.**

### Public Comment:

Public Comment 104 read as follows:

The following suggestions are made relative to the treatment of prestressed shear walls in Chapter 7:

- 7.3.2.10 (a) and (e) have incorrect references to the special reinforced wall provisions. 7.3.2.5 (b), (c), and (d) should be referenced in lieu of 7.3.2.5 (a) and (b).
- In the first paragraph of the commentary for both 7.3.2.10 and 7.3.2.11, the commentary should state "bonded reinforcement" instead of "mild reinforcement" since 7.3.2.10 (e) allows the use of bonded prestressed reinforcement to meet the prescriptive requirements
- In the first paragraph of the commentary for both 7.3.2.10 and 7.3.2.11, the references to detailing requirements that are not required by the code should be deleted.
- It is suggested to delete 7.3.2.11 (a) as it is redundant relative to 7.3.2.10 (e).
- 7.3.2.11 (d) references 9.3.5.6 for ductility requirements. The classification of special reinforced prestressed walls in Table 9.3.5.6.1 should be clarified.
- In the commentary for Section 7.4.4, special prestressed walls should be added to the first sentence. This sentence should be moved to 7.4.4.2.

### Response/Rationale:

This comment was addressed by ballot 20-SL-20 which passed the main committee with no negative votes.

There was a vote by Biggs that was intended to be recorded on ballot 20-SL-20 but was inadvertently recorded on 20-SL-21. Since it Biggs' vote raised an important issue relative to nomenclature in Chapter 7, this ballot is proposed to address that issue. The portion of the comment addressing nomenclature reads as follows:

. . . deleting the term "mild" reinforcement is a bigger issue. It shows up in Chapters 4, 7 and 10. The ballot does not address all instances.

In TMS 402 and 602, the definition is "Reinforcement - Nonprestressed steel reinforcement." "Bonded" reinforcement is not included.

TMS 602 has both bonded and unbonded prestressing tendons.

I suggest the subcommittee limit its proposed changes to seismic issues or work with the other subcommittees to address the "mild" reinforcement terminology issue.

This ballot only fixes the issues created in Chapter 7 by 20-SL-20 when the word "mild" was replaced in two locations in the commentary with the word "bonded." This ballot proposes to delete the "bonded" at those locations from the text. Simply stating "prescriptive reinforcement" is sufficient because as the commenter notes, there is no ambiguity in that term plus the term "reinforcement" is already defined in Chapter 2.

The potential issues with the use of the word "mild" elsewhere in the code will need to be addressed next cycle.

This ballot was reviewed by the Prestressed Subcommittee chair (Schultz) and the commenter (Biggs) prior to submission.

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**PROPOSED CHANGES:** *(Only the suggested change(s) being balloted are proposed for consideration. Supplementary text included for clarity, but not proposed for modification, is not part of this ballot item. Additions are shown underlined and deletions are shown ~~struck through~~.) Do not use 'Track Changes'*

**Code:**

**No changes are proposed to the Code. The following is provided to show the context of the proposed commentary changes.**

**7.3.2.5 Special reinforced masonry shear walls** — Design of special reinforced masonry shear walls shall comply with the requirements of Section 8.3, Section 9.3, or Appendix C. Reinforcement detailing shall also comply with the requirements of Section 7.3.2.2.1 and the following:

- (a) In-plane flexural reinforcement shall be deformed reinforcing bars.
- (b) The maximum spacing of vertical reinforcement shall be the smallest of one-third the length of the shear wall, one-third the height of the shear wall, and 48 in. (1219 mm) for masonry laid in running bond and 24 in. (610 mm) for masonry not laid in running bond.
- (c) The maximum spacing of horizontal reinforcement shall not exceed 48 in. (1219 mm) for masonry laid in running bond and 24 in. (610 mm) for masonry not laid in running bond.
- (d) The maximum spacing of horizontal reinforcement required to resist in-plane shear shall be the smaller of one-third the length of the shear wall and one-third the height of the shear wall. Horizontal reinforcement required to resist in-plane shear shall be uniformly distributed.

. . .

**7.3.2.10 Intermediate reinforced prestressed masonry shear walls** — Intermediate reinforced prestressed masonry shear walls shall comply with the requirements of Chapter 10, the reinforcement detailing requirements of Section 7.3.2.2.1, and the following:

- (a) Reinforcement shall be provided in accordance with Sections 7.3.2.5(b), 7.3.2.5 (c), and 7.3.2.5(d).
- (b) The minimum area of horizontal reinforcement shall be  $0.0007bd_v$ .
- (c) Shear walls subjected to load reversals shall be symmetrically reinforced.

- (d) The nominal moment strength at any section along the shear wall shall not be less than one-fourth the maximum moment strength.
- (e) The cross-sectional area of bonded tendons shall be considered to contribute to the minimum reinforcement in Sections 7.3.2.2.1, 7.3.2.5(b), 7.3.2.5 (c), and 7.3.2.5(d).
- (f) Tendons shall be located in cells that are grouted the full height of the wall.

**7.3.2.11 Special reinforced prestressed masonry shear walls** — Special reinforced prestressed masonry shear walls shall comply with the requirements of Chapter 10, the reinforcement detailing requirements of Sections 7.3.2.2.1 and 7.3.2.10 and the following:

- (a) The cross-sectional area of bonded tendons shall be considered to contribute to the minimum reinforcement in Sections 7.3.2.2.1 and 7.3.2.10.
- (b) Prestressing tendons shall consist of bars conforming to ASTM A722/A722M.
- (c) All cells of the masonry wall shall be grouted.
- (d) The requirements of Section 9.3.5.6 shall be met. Dead load axial forces shall include the effective prestress force,  $A_{ps}f_{se}$ .
- (e) The design shear strength,  $\phi V_n$ , shall exceed the shear corresponding to the development of 1.25 times the nominal flexural strength,  $M_n$ , of the element, except that the design shear strength,  $\phi V_n$ , need not exceed 2.0 times required shear strength,  $V_u$ .

...

**Code Commentary:**

**7.3.2.10 Intermediate reinforced prestressed masonry shear walls** — These shear walls are philosophically similar in concept to intermediate reinforced masonry shear walls. To provide the intended level of inelastic ductility, prescriptive ~~bonded~~ reinforcement is required. Intermediate reinforced prestressed masonry shear walls should include the sectional ductility (a/d) requirement in Section 10.5.3.

...

**7.3.2.11 Special reinforced prestressed masonry shear walls** — These shear walls are philosophically similar in concept to special reinforced masonry shear walls. To provide the intended level of inelastic ductility, prescriptive ~~bonded~~ reinforcement is required. Special reinforced prestressed masonry shear walls should include the sectional ductility (a/d) requirement in Section 10.5.3.

...

**Specification:**

None.

**Specification Commentary:**

None.

<b>Subcommittee Vote:</b>									
0	<i>Affirmative</i>	0	<i>Affirmative w/ comment</i>	0	<i>Negative</i>	0	<i>Abstain</i>	0	<i>Did not vote</i>

**Subcommittee Comments:**

This ballot item submitted by Chair in accordance with Technical Committee Operations Manual Section 4.2.1. Technical input provided by John Hochwalt.

## 2022 TMS 402/602 Committee Response to Public Comment

Committee: Main Committee	Ballot #: 22
Item #: 22-SM-197	
Technical Contact/Email: Philippe Ledent <a href="mailto:phil@masonryinfo.org">phil@masonryinfo.org</a>	
Public Comment Number: 2022 Comment # 197	
Public Comment Response Based on TMS 402/602 Draft Dated	6/1/2021
<p>This ballot item proposes the following response to the Public Comment:</p> <ul style="list-style-type: none"><li><input checked="" type="checkbox"/> <i>Committee agrees with Public Comment, change is proposed</i></li><li><input type="checkbox"/> <i>Committee agrees comment has merit but proposed changes are not completely consistent with Public Comment</i></li><li><input type="checkbox"/> <i>Committee disagrees with Public Comment and no changes are proposed</i></li><li><input type="checkbox"/> <i>Committee unable to fully develop a response to Public Comment</i></li><li><input type="checkbox"/> <i>Public Comment only requires a response, no change to document</i></li></ul>	

**Notice to voter: If this Ballot Item receives any negative votes there is no possibility of resolution other than withdrawal of all negative votes. If there are any outstanding negative votes 5 days after close of this ballot, this Ballot Item will be withdrawn.**

### Public Comment:

Public Comment 197 is related to TMS 402 Section 5.2.1.6, starting on page 76 at line 12 and states the following:

Delete the word "reinforced". All masonry beams must be reinforced per section 5.2.

### Response/Rationale:

The Subcommittee agrees with the commenter. Although Section 5.2 does not specifically state that all masonry beams must be reinforced, Section 5.2 requires that the design of beams meet the requirements of Section 8.3, Section 9.3, or Section 11.3. These sections all relate to reinforced masonry for allowable stress design, strength design, and design of AAC masonry, respectively. Thus, Section 5.2.1.6 stating "...deflections of reinforced masonry beams..." is redundant since all beams must inherently be reinforced per the requirements of Section 5.2.

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**PROPOSED CHANGES:** *(Only the suggested change(s) being balloted are proposed for consideration. Supplementary text included for clarity, but not proposed for modification, is not part of this ballot item. Additions are shown underlined and deletions are shown ~~struck through~~.) Do not use 'Track Changes'*

### Code:

**5.2.1.6.1** Deflections of ~~reinforced~~ masonry beams need not be checked when the span length does not exceed 8 multiplied by the effective depth to the reinforcement,  $d$ , in the masonry beam.

### Code Commentary:

**Specification:**

**Specification Commentary:**

<b>Subcommittee Vote:</b>									
7	<i>Affirmative</i>	0	<i>Affirmative w/ comment</i>	0	<i>Negative</i>	0	<i>Abstain</i>	2	<i>Did not vote</i>

**Subcommittee Comments: Meeting vote executed on 9-21-2021**



# 2022 TMS 402/602 Committee Proposed Change to Masonry Standard

<b>Committee: Main Committee</b>		<b>Ballot #: 22</b>
<b>Item #: 22-VG-014-015</b>		
<b>Technical Contact/Email:</b>	Brian E. Trimble, PE, <a href="mailto:btrimble@imiweb.org">btrimble@imiweb.org</a> , (703) 300-0109	
<b>Draft Document Dated:</b>	4/1/2022	
<b>Reballot of Main Committee Item No.:</b>	<b>Response to TAC Comment No.:</b>	<b>Response to Public Comment No.:</b>

<b>Reference</b> <i>(Choose from Drop-Down Menu)</i>	
<b>TMS 402 Code Section</b>	13.3.2.3
<b>TMS 402 Commentary Section</b>	13.3.2.3

**Notice to voter: If this Ballot Item receives any negative votes there is no possibility of resolution other than withdrawal of all negative votes. If there are any outstanding negative votes 5 days after close of this ballot, this Ballot Item will be withdrawn.**

An affirmative with comment on 21-VG-014-015 suggested the removal of one word from the commentary – “conservative”. This ballot item proposes to delete that word.

Comment from 21-VG-014-015”

“The adjective "conservative" in the proposed addition ... should be dropped. It is assumed here that "no strength adjustments" means adjustment factors equal to unity. In such case, the assumed specific gravity and the loading duration factor are conservative, but not the assumed wet service condition or extreme temperature condition factors as those are less than unity for less favorable conditions.”

**PROPOSED CHANGES:** *(Only the suggested change(s) being balloted are proposed for consideration. Supplementary text included for clarity, but not proposed for modification, is not part of this ballot item. Additions are shown underlined and deletions are shown ~~struck through~~.)*

**Code: NONE**

**Code Commentary:**

**13.3.2.5 General requirements**

.....

(e) The critical load path when attaching an adhered veneer to light frame backing is through the fasteners used to install the lath over the backing. These fasteners are subjected to axial forces resulting from out-of-plane wind and seismic loads and lateral shearing forces from gravity and seismic loads. Tables 13.3.2.5 and 13.3.2.6 provide maximum fastener spacing requirements for common fastener types. Given the wide array of fastener types available, however, each table also provides a minimum withdrawal and lateral strength that must be satisfied where a different fastener is selected. These withdrawal and lateral strengths must account for the reduced embedment depth of the fastener due to nonstructural materials such as insulation within the assembly cavity. Fasteners are assumed to be partially embedded into their substrate due to the presence of the cavity. The withdrawal and lateral strengths of partially embedded fasteners is derived from the Wood Handbook (FPL (2010)). Table 13.3.2.5 assumes a ~~conservative~~ specific gravity value of 0.40 for the wood light frame backing and no strength adjustments for loading duration, wet service conditions, or extreme temperatures.

. . . .

**Specification: NONE**

**Specification Commentary: NONE**

This ballot item submitted by Chair in accordance with Technical Committee Operations Manual Section 4.2.1. Technical input provided by the VG Subcommittee.

## 2022 TMS 402/602 Committee Proposed Change to Masonry Standard

Committee: Main Committee		Ballot #: 22
Item #: 22-VG-041, 42A, 184		
Technical Contact/Email:	Brian E. Trimble, PE, <a href="mailto:btrimble@imiweb.org">btrimble@imiweb.org</a> , (703) 300-0109	
Draft Document Dated:	4/1/2022	
Reballot of Main Committee Item No.:	Response to TAC Comment No.:	Response to Public Comment No.:

Reference <i>(Choose from Drop-Down Menu)</i>	
TMS 402 Commentary Section	13.3

**Notice to voter: If this Ballot Item receives any negative votes there is no possibility of resolution other than withdrawal of all negative votes. If there are any outstanding negative votes 5 days after close of this ballot, this Ballot Item will be withdrawn.**

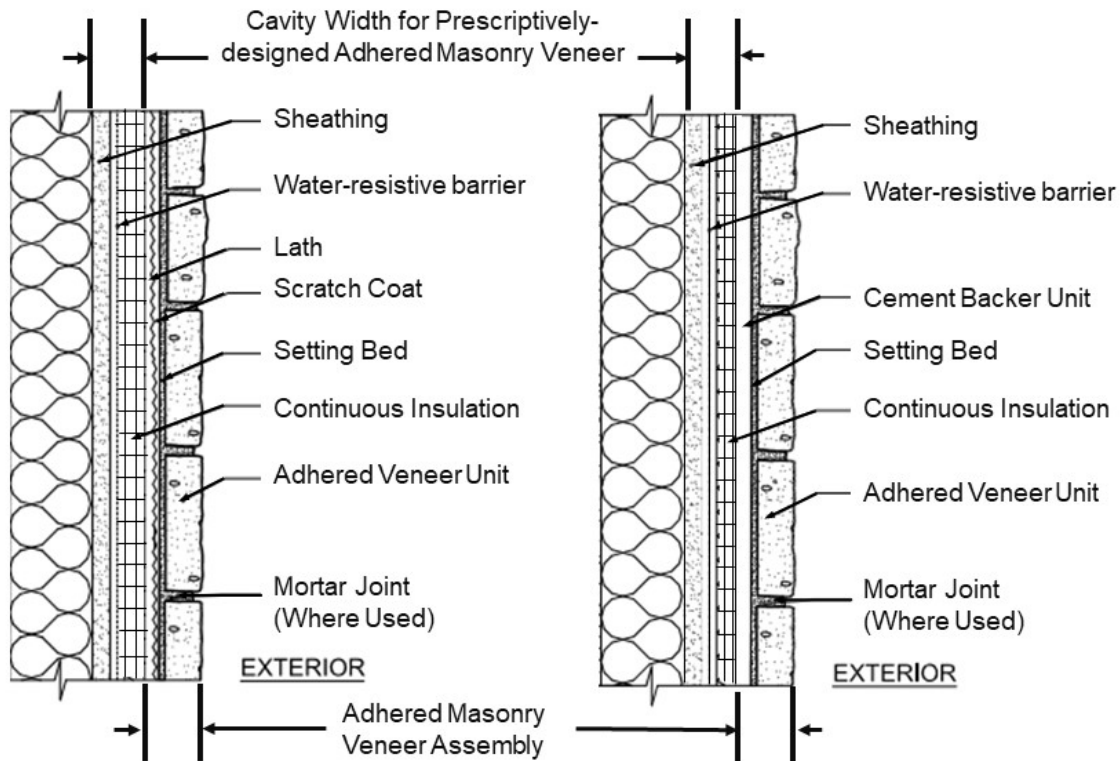
Figure CC-13.3-1 was added via Ballot Item 21-VG-041-042-184; however, some lines were not readable. In addition, there was no subheading for each of the two details. This ballot item corrects the lines and adds subtitles to the figure to identify each of the applications.

**PROPOSED CHANGES:** *(Only the suggested change(s) being balloted are proposed for consideration. Supplementary text included for clarity, but not proposed for modification, is not part of this ballot item. Additions are shown underlined and deletions are shown ~~struck through~~.)*

**Code:** NONE

**Code Commentary:**

**13.3 Adhered Veneer**



(a) with lath

(b) with cement backer unit

**Specification: NONE**

**Specification Commentary: NONE**

This ballot item submitted by Chair in accordance with Technical Committee Operations Manual Section 4.2.1. Technical input provided by VG Subcommittee.

# 2022 TMS 402/602 Committee Proposed Change to Masonry Standard

Committee: Main Committee		Ballot #: 22
Item #: 22-VG-065		
Technical Contact/Email:	Brian E. Trimble, PE, <a href="mailto:btrimble@imiweb.org">btrimble@imiweb.org</a> , (703) 300-0109	
Draft Document Dated:	4/1/2022	
Reballot of Main Committee Item No.:	Response to TAC Comment No.:	Response to Public Comment No.:

Reference <i>(Choose from Drop-Down Menu)</i>	
TMS 402 Code Section	13.2
TMS 402 Commentary Section	13.2 and 13.3

**Notice to voter: If this Ballot Item receives any negative votes there is no possibility of resolution other than withdrawal of all negative votes. If there are any outstanding negative votes 5 days after close of this ballot, this Ballot Item will be withdrawn.**

**Also note that this ballot has sub items A thru H. These are presented separately and voting negative on one item does not prevent the other items from moving forward.**

The paragraph in Table 13.2.2.3 dealing with metal studs has gone back and forth through a number of wording changes. The last ballot, 21-VG-065B confused the issue even more by using incorrect wording in the ballot item. This ballot is to rectify “metal stud” and “framing” throughout the veneer chapter.

Throughout this Code, and specifically this Chapter, the term light frame backing refers to either wood or steel stud walls. As noted in definition of backing in the commentary:

Backings typically are concrete, masonry, and light frame. In the context of this Code, the use of the term “light frame backing” refers to wood or cold-formed metal studs and other structural members, such as rim joists, used in light frame construction.

**PROPOSED CHANGES:** *(Only the suggested change(s) being balloted are proposed for consideration. Supplementary text included for clarity, but not proposed for modification, is not part of this ballot item. Additions are shown underlined and deletions are shown ~~struck through~~.)*

**Each change on this ballot is independent of the others (Parts A-H). A negative vote should indicate which specific parts the voter is voting negative on. A negative on one part does not stop the other parts from passing.**

*Portions of Tables 13.2.2.3 and 13.2.2.5 are shown from 4/1/2022 Working Draft*

**Code:**

**Portion of Table 13.2.2.3: General prescriptive anchored veneer requirements**

Backing	Veneer Tie Type
Wood Light <del>Frame</del>	Corrugated Sheet-metal
<u>Framing</u>	Sheet Metal
	Adjustable

**A):** Proposed wording left-hand column: “Wood Light ~~Frame~~ Framing”

**Portion of Table 13.2.2.3: General prescriptive anchored veneer requirements**

Backing	Veneer Tie Type
Cold-formed <del>Steel Metal</del> Light Framing	Adjustable

**B):** Proposed wording left-hand column: “Cold-formed ~~Steel Metal~~ Light Framing”

**Portion of Table 13.2.2.3: General prescriptive anchored veneer requirements**

Backing	Veneer Tie Type	Maximum Specified Cavity Width	Other requirements
Cold-formed Steel Light Framing	Adjustable	6 in. (152 mm)	Fastener: Minimum corrosion resistant No. 10 screw(s) extending through the <del>steel cold-formed metal</del> framing a minimum of three exposed threads. <del>Steel Cold-formed metal</del> framing shall be corrosion resistant and have a minimum base metal thickness of 0.043 in. (1.1 mm).

**C):** Proposed wording, right-hand column: Fastener: Minimum No. 10 screw(s) extending through the ~~steel framing cold-formed metal framing~~ a minimum of three exposed threads. ~~Cold-formed metal Steel~~-framing shall be corrosion resistant and have a minimum base metal thickness of 0.043 in. (1.1 mm).

**Portion of Table 13.2.2.5: Veneer Tie Requirements**

Tie Type	Requirements
Adjustable	1) Part of veneer tie attached to backing: <ul style="list-style-type: none"> <li>a. For concrete, masonry, wood <u>light</u> framing or cold-formed metal <u>light</u> framing:                             <ul style="list-style-type: none"> <li>(1) Barrel with minimum outside diameter of 3/16 in. (4.76 mm) and composed of solid metal.</li> </ul> </li> </ul>

**D):** Proposed wording: For concrete, masonry, wood light framing or cold-formed metal light framing:

**Code Commentary:**

**E):**

**13.2.2.3 General requirements**

....

For most structures, vertical differential movement is often accommodated by supporting the veneer at each story above 30 ft (9.1 m) with a shelf angle. See Commentary Section 13.1.2.2.2 for further information on brick veneer on wood light frame backing exceeding 30 ft (9.1 m) in height since shelf angles may not always be included in wood light frame backing structures.

....

**F):**

Figure CC-13.2-4— Cross-section of typical anchored veneer supported by light ~~frame~~ framing

**G):**

**13.3 — Adhered veneer**

Adhered veneer differs from anchored veneer in its means of attachment. Positive (compressive) out-of-plane loads are transferred directly to the masonry or concrete backing when directly bonded to the backing, or for light frame backing, through the sheathing to the light frame elements. Negative (tensile) out-of-plane loads are

transferred directly to the masonry or concrete backing when directly bonded to the backing, or for light frame backing, through the fasteners to the light frame backing elements.

...

**H):**

Figure CC-13.3-1— Cross-section of typical adhered masonry veneer supported by light frame backing

**Specification: NONE**

**Specification Commentary: NONE**

This ballot item submitted by Chair in accordance with Technical Committee Operations Manual Section 4.2.1. Technical input provided by Brian Trimble.

## 2022 TMS 402/602 Committee Proposed Change to Masonry Standard

Committee: Main Committee		Ballot #: 22
Item #: 22-VG-129		
Technical Contact/Email:	Brian E. Trimble, PE, <a href="mailto:btrimble@imiweb.org">btrimble@imiweb.org</a> , (703) 300-0109	
Draft Document Dated:	4/1/2022	
Reballot of Main Committee Item No.:	Response to TAC Comment No.:	Response to Public Comment No.:

Reference <i>(Choose from Drop-Down Menu)</i>	
TMS 402 Code Section	13.3.2.3
TMS 402 Commentary Section	13.3.2.3

**Notice to voter: If this Ballot Item receives any negative votes there is no possibility of resolution other than withdrawal of all negative votes. If there are any outstanding negative votes 5 days after close of this ballot, this Ballot Item will be withdrawn.**

While text changes were made to Sections 13.3.2.3 in both the code and commentary, there were no corresponding changes made to the titles of these sections. The proposed wording makes the titles and text consistent.

**PROPOSED CHANGES:** *(Only the suggested change(s) being balloted are proposed for consideration. Supplementary text included for clarity, but not proposed for modification, is not part of this ballot item. Additions are shown underlined and deletions are shown ~~struck through~~.)*

**Code:**

**13.3.2.3** Mortar requirements for scratch ~~Scratch~~ coat, setting bed, and ~~jointing mortar requirements~~ joints between units

**Code Commentary:**

**13.3.2.3** Mortar requirements for scratch ~~Scratch~~ coat, setting bed, and ~~jointing mortar requirements~~ joints between units

**Specification: NONE**

**Specification Commentary: NONE**

This ballot item submitted by Chair in accordance with Technical Committee Operations Manual Section 4.2.1. Technical input provided by VG Subcommittee.