DESIGNER CHECKLIST FOR CONCRETE MASONRY PARTITIONS BASED ON TMS 402/602-22

Concrete masonry partition walls are interior walls without structural function commonly used for space separation, fire resistance, and sound insulation. While partitions do not carry vertical loads other than their own weight, they are subject to lateral loading due to HVAC pressurization, occupants, seismic loads, and internal pressures from external wind entering into the structure through openings or small leakage paths. This checklist is applicable to concrete masonry partitions based on TMS 402/602-22.

TMS 402 contains design modeling options for both allowable stress design (ASD) and strength design (SD). Where design checks differ between these two modeling approaches, they are addressed separately in this Checklist.

CHECK	REQUIREMENT	REFERENCE	DESIGNER NOTES
SECTION 1: MATERIAL REQUIREMENTS			
1	Concrete Masonry Units: CMU must comply with the requirements of ASTM C90.	TMS 602 Art. 2.3 A.	Standard stretcher units are typically used for partitions. If there is horizontal reinforcement, use bond beam units configured to accept horizontal reinforcement and grout.
2	Grout: Must conform to ASTM C476.	TMS 602 Art. 2.2	ASTM C476 has options for coarse grout, fine grout, and self-consolidating grout. Coarse grout is most commonly used in concrete masonry construction unless the spaces to be grouted are congested. The primary difference between coarse grout and fine grout is the size of the aggregate in the mix, with the smaller aggregate size required of fine grout necessary to facilitate the placement and consolidation of the grout in tight spaces. As such, a fine grout can be substituted for coarse grout with no detrimental impact to the construction or performance of the masonry. However, if a fine grout is specified because of reinforcement congestion or small clearances, a fine grout complying with ASTM C476 should be used as a coarse grout may result in consolidation issues and voids within the final construction.
3	Mild Reinforcement: Must meet ASTM A615/A615M or ASTM A706/A706M.	TMS 602 Art. 2.4A	ASTM A615/A615M (carbon steel) Grade 60 is most commonly used in concrete masonry construction. ASTM A706/A706M (low alloy steel) is typically used when reinforcement is to be welded. Other specialty reinforcement (e.g., epoxy coated) is permitted by TMS 602 where warranted.
4	Joint Reinforcement: Conforms to ASTM A951.	TMS 602 Art. 2.4D	Horizontal joint reinforcement is used both for crack control as well as to resist out-of-plane flexural loading.
5	Mortar: Complying with ASTM C270 or	TMS 602 Art. 2.1A	Type N or S mortar recommended for masonry partitions. Mortar may be portland cement-lime, mortar cement, or masonry cement mortar. There is functionally no difference

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	ASTM C1714/C1714M.		between mortar complying with ASTM C270 versus mortar complying with ASTM C1714/C1714M as each must meet the same constituent material requirements and proportion/property requirements. Mortars complying with ASTM C1714/C1714M are preblended and delivered to jobsites in bags where water is added. ASTM C270 mortars may be batch onsite from constituent materials.
SECTION 2: GENERAL REQUIREMENTS			
6	Select bond pattern.	TMS 402 Sec. 4.7	Running bond and stack bond are the two most frequently used bond patters used for the construction of partitions. When using stack bond construction, TMS 402 requires a minimum area of horizontal reinforcement to maintain continuity across the mortared head joints. This reinforcement may also be used for crack control or resisting out-of-plane loads.
7	Select specified compressive strength of masonry (f'_m).	TMS 602 Art. 1.4 B	Given the relatively low design loads typically associated with interior partition walls and because their design is often tension-controlled due to the nature of the out-of-plane loading, using the minimum f'_m is often warranted. For CMU laid in Type N mortar, the resulting f'_m is 1,750 psi. For CMU laid in Type S mortar, the resulting f'_m is 2,000 psi.
8	Consider nonstructural design aspects.	General	Interior partitions may also be specified to have a minimum fire resistance rating or a minimum sound transmission class to achieve nonstructural performance objectives. These additional considerations may have implications on the structural design of the partition.
SECTION 3: STRUCTURAL DESIGN – GENERAL			
9	Determine design loading.	ASCE/SEI 7 Section 4.3.4, 13.3.1 and 26.13.	In addition to self-weight, design loading may include: Live Loads – per ASCE/SEI 7 Section 4.3.4 Seismic Loads – ASCE/SEI 7 Section 13.3.1 Wind Loads – per ASCE/SEI 7 Section 26.13 Note that ASCE/SEI 7 exempts nonstructural partitions from seismic loads when assigned to SDC A or B.
10	Determine design loading. Determine the design span and direction.	General	Partition walls may be designed to span vertically, horizontally, or simultaneously in both directions. The span direction that offers the most economical design will vary based on factors such as the relative height and length of the wall, presence of returns or intersecting walls providing support, spacing of control joints, and locations of openings.
11	Select design method.	TMS 402 Chapter 8, 9, or 15	Masonry partitions may be reinforced or unreinforced. The design may be analytical in accordance with Chapter 8 (allowable stress design) or Chapter 9 (strength design) or prescriptive in accordance with Chapter 15 of TMS 402.
SECTION 4: STRUCTURAL DESIGN – UNREINFORCED			
12	Design of unreinforced masonry partitions (ASD).	TMS 402 Sec. 8.1 and 8.2	Unreinforced masonry partitions are almost always controlled by the allowable flexural tensile stresses (TMS 402 Table 8.2.4.2) developed in the masonry as a result of out-of-plane loading. The allowable flexural tensile stresses vary with mortar type, direction of span, and presence of grout in the assembly. While

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			rarely a controlling limit, out-of-plane shear stresses should be checked as well per TMS 402 Section 8.2.6
13	Design of unreinforced masonry partitions (SD).	TMS 402 Sec. 9.1 and 9.2	Unreinforced masonry partitions are almost always controlled by the modulus of rupture stresses (TMS 402 Table 9.1.9.1) developed in the masonry as a result of out-of-plane loading. The modulus of rupture stresses vary with mortar type, direction of span, and presence of grout in the assembly. While rarely a controlling limit, out-of-plane shear loads should be checked as well per TMS 402 Section 9.2.6.
14	Prescriptive design of unreinforced masonry partitions.	TMS 402 Chapter 15	TMS 402 Chapter 15 contains prescriptive height/thickness or length/thickness ratios for masonry partitions for a range of loading conditions, mortar types, and presence of grout in the assembly.
SECTION 5: STRUCTURAL DESIGN – REINFORCED			
15	When required, detail intersecting wall providing lateral support to partitions.	TMS 402 Sec. 5.2.3.5	The connection of intersecting walls is most commonly accomplished through interlocking alternating courses of units from each wall. Alternative, anchors or horizontal reinforcing steel may be used.
16	Design of reinforced masonry partitions (ASD).	TMS 402 Sec. 8.1 and 8.3	Although many masonry partitions can be safety designed as unreinforced, nearly all concrete masonry partitions will have some reinforcing steel present in the form of joint reinforcement for crack control or trim reinforcement around openings. As such, a more economical design can be achieved by taking advantage of this reinforcement being present. Design checks include out-of-plane flexure, out-of-plane shear, deflection, and potential second-order analysis. A design example is provided at the end of this checklist to illustrate each design check; however, shear, deflection, and second-order checks rarely control for most interior partitions given the relatively low loads they are designed to resist.
17	Design of reinforced masonry partitions (SD).	TMS 402 Sec. 9.1 and 9.3	Although many masonry partitions can be safety designed as unreinforced, nearly all concrete masonry partitions will have some reinforcing steel present in the form of joint reinforcement for crack control or trim reinforcement around openings. As such, a more economical design can be achieved by taking advantage of this reinforcement being present. Design checks include out-of-plane flexure, out-of-plane shear, deflection, and potential second-order analysis. A design example is provided at the end of this checklist to illustrate each design check; however, shear, deflection, and second-order checks rarely control for most interior partitions given the relatively low loads they are designed to resist.
18	Verify effective compression width.	TMS 402 Sec. 5.1.2	For running bond construction, the effective width of the compression area for each reinforcing bar is limited to: a) The center-to-center spacing of the reinforcement; b) Six times the nominal wall thickness; and c) 72 in. maximum.
SECTION 6: DETAILING			

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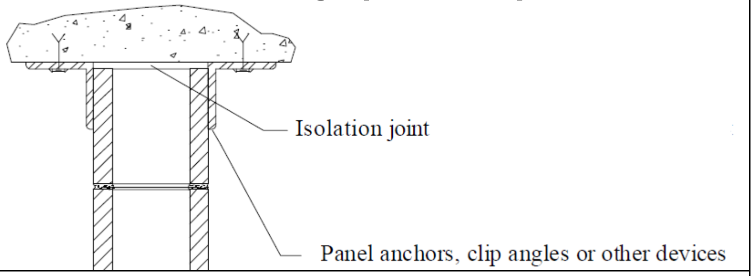
19	Verify minimum lap splice length.	TMS 402 Sec. 6.1.7 TMS 602 Art. 3.4 B.11.b	Minimum lap lengths for reinforcing bars vary with the clear cover to the nearest masonry surface or adjacent reinforcement, diameter of the reinforcement, yield strength of the reinforcement, and strength of the masonry (f'm). The minimum lap length for joint reinforcement is 8 in.
20	Verify reinforcement size limits, placement tolerances, and corrosion protection.	TMS 402 Sec 6.1.3-6.1.5	Verify reinforcement size limits (6.1.3) to mitigate congestion, provide sufficient space for reinforcement and grout consolidation (6.1.4), and maintain required reinforcement cover/protection (6.1.5) for corrosion protection.
21	Verify connection top-of-wall detailing.	TMS 402 Sec. 2.2	Per TMS 402, nonloadbearing partitions are defined as interior walls that carry less than 200 lb/ft in addition to their own weight. When lateral support is provided at the top of the partition, verify that loads from the lateral load-resisting system is not being imparted to the partition. Also verify that the anticipated deflection of the roof/floor above the partition will not result in axial loads being imparted to the partition. 
22	Provide general detailing and information.	TMS 402 Sec. 1.2.1	Either through the project drawings or specifications convey information such as location and spacing of control joints, specified compressive strength of masonry, mortar type, design loads, and additional items as may be needed for the project.
SECTION 7: SEISMIC DETAILING			
23	Verify drift limits.	TMS 402 Sec. 7.2.4	Buildings subject to seismic loads will experience some level of drift, the relative lateral displacement of one story to an adjacent story. So that partitions are not inadvertently loaded or damaged, TMS 402 and ASCE/SEI 7 limit story drift of masonry structures.
24	Verify partition wall isolation.	TMS 402 Sec. 7.3.1	Masonry partition walls are classified as nonparticipating elements in that they are not part of the seismic force-resisting system. Such elements are required to be seismically isolated so that they do not have unintended seismic loads transferred to them or affect the performance of the seismic force-resisting system by altering the strength or stiffness of the structure.
25	Considerations for SDC A and B structures.	TMS 402 Sec. 7.4.1	Masonry partitions are permitted to be designed as reinforced or unreinforced assemblies. No prescriptive seismic reinforcing steel is required.
26	Considerations for SDC C structures.	TMS 402 Sec. 7.4.3.1	Masonry partitions are permitted to be designed as reinforced or unreinforced assemblies. Minimum prescriptive seismic reinforcing steel is required in the direction of the span, which is required to consist of at least 9 gauge joint reinforcement at 16 in. on center in the horizontal direction or No. 4 reinforcing bars at 120 in. on center in the vertical direction.

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27	Considerations for SDC D, E, and F structures.	TMS 402 Sec. 7.4.4.1 and 7.4.5.1	The same requirements for SDC C apply to SDC D+ structures except that the maximum spacing of the No. 4 vertical reinforcement is reduced to 48 in. on center. Partitions constructed using stack bond and assigned to SDC E or F have additional prescriptive reinforcing requirements to provide an area of horizontal reinforcement at least 0.0015 times the gross cross-sectional area of the partition.
SECTION 8: INDUSTRY BEST PRACTICES			
28	Provide crack control measures.	CMHA TEC-009-25	Provide horizontal reinforcement and control joints to mitigate cracking potential.

STANDARD	REFERENCE
ASTM	ASTM A615/A615M, ASTM A706/A706M, ASTM C90, ASTM C270, ASTM C476, and ASTM C1714/C1714M.
TMS 402 – General	Sections 1.2.1, 2.2, 4.7, 5.1.2, 5.2.3.5, 6.1.3, 6.1.4, 6.1.5, 6.1.7, 7.2.4, 7.3.1, 7.4.1, 7.4.3.1, 7.4.4.1, 7.4.4.2.2, and 7.4.5.1. Chapter 15.
TMS 402 – Allowable Stress Design	Sections 8.1, 8.2, and 8.3.
TMS 402 – Strength Design	Section 9.1, 9.2, and 9.3.
TMS 602	Article 1.4 B, 1.5 B.6, 2.1A, 2.2, 2.3, 2.4A, and 3.4 B.11.b.
ASCE/SEI 7	Sections 4.3.4, 13.3.1, and 26.13.

DESIGN EXAMPLE

This example illustrated the design and detailing of a concrete masonry partition wall subject to the following conditions:

Material Properties	
Specified Compressive Strength of Masonry, f'_m	1,750 lb/in.^{2}
Specified Yield Strength of Reinforcing Bars, f_y	60,000 lb/in.^{2}
Specified Yield Strength of Reinforcing Wire, f_y	70,000 lb/in.^{2}
Mortar: Type N Portland Cement-Lime Modulus of Rupture, f_r (Ungrouted hollow units, normal to bed joints)	64 lb/in.^{2}
Assembly Properties	
Diameter of Reinforcing Bars (No. 4), in.	0.5
Diameter of Reinforcing Wire (9 Guage), in.	0.148
Nominal Wall Thickness, in.	6
Ungrouted Assembly Weight, lb/ft^2	24
Vertical Wall Height, ft	10
Running Bond Construction	

Design Loads	
Out-of-Plane Live Load, lb/ft^2	5
Out-of-Plane Internal Wind Pressure	4.7
Seismic Design Category	B

The factored out-of-plane load combination is determined from Chapter 2 of ASCE/SEI 7. For partitions subjected to out-of-plane loading with negligible axial load, the two load combinations that typically control are:

$$(1.6)(L) \quad \text{or} \quad (1.0)(L) + (1.0)(W \text{ or } E)$$

The live load for partitions is given in Section 4.3.4 of ASCE/SEI 7 as a minimum of 5 lb/ft^2. The internal wind pressure on the partitions is based on the external MWFRS wind pressure adjusted based on the enclosure classification of the building. For a 120 mph wind speed, Exposure B conditions, the external wind pressure is 26.2 lb/ft^2. Considering this structure as an enclosed building, the internal pressure coefficient per Section 26.13 of ASCE/SEI 7 is 0.18. Therefore, the internal wind pressure on the partition considered in this example is (0.18)(26.2 lb/ft^2) = 4.7 lb/ft^2. Finally, because this structure is assigned to SDC B, ASCE/SEI 7 does not require out-of-plane seismic loading to be considered per Section 13.3.1. The critical out-of-plane design load for this example is then:

$$1.0L + 1.0W = (1.0)\left(5\ {}^{\text{lb}}/_{\text{ft}^2}\right) + (1.0)\left(4.7\ {}^{\text{lb}}/_{\text{ft}^2}\right) = 9.7\ {}^{\text{lb}}/_{\text{ft}^2}$$

Considering the wall as a simple span assembly, the resulting factored, out-of-plane moment is then:

$$M_u = \frac{\left(9.7\,{}^{\text{lb}}/_{\text{ft}^2}\right)(10\text{ ft})^2}{8}\left(12\ \frac{\text{in.}}{\text{ft}}\right) = 1{,}455\ \frac{\text{in.-lb}}{\text{ft}}$$

Assume the No. 4 vertical reinforcement is placed within the center of the assembly (e.g., the effective depth, d = 2.81 in. for a nominal 6 in. CMU). Initially try spacing the vertical reinforcement at the maximum spacing permitted by TMS 402 of 120 in. on center. The normalized area of vertical reinforcement provided is then calculated as:

$$A_s = \frac{0.2\text{ in.}^2}{10\text{ ft}} = 0.02\ \frac{\text{in.}^2}{\text{ft}}$$

Per Section 5.1.2 of TMS 402, the effective compression width is limited to the lesser of the center-to-center spacing of the reinforcement, six times the nominal wall thickness (here, 36 in. for a 6 in. nominal unit thickness), or 72 in. Because the spacing of the vertical reinforcement in this case exceeds these limits, the conventional approach of modeling the assembly on a unit strip (per foot) basis cannot be used. Instead, an equivalent section width, *b*, is determined by dividing the controlling effective compression width (36 in.) by the spacing of the reinforcement (10 ft) as follows:

$$b = \frac{36\text{ in.}}{10\text{ ft}} = 3.6\ \frac{\text{in.}}{\text{ft}}$$

Considering the self-weight of the wall taken equal to 24 lb/ft^2, which conservatively corresponds to an ungrouted, lightweight assembly, the mid-height axial with a 0.9 dead load load factor is:

$$P_u = (0.9)\left(\frac{10\text{ ft}}{2}\right)\left(24\ {}^{\text{lb}}\!/_{\text{ft}^2}\right) = 108\ {}^{\text{lb}}\!/_{\text{ft}}$$

Although not significant, the presence of the axial compression due to the self-weight of the assembly will slightly increase the out-of-plane flexural strength. Increasing the factored axial load by tension-controlled strength reduction factor (0.9), the depth of the compression block is then calculated per TMS 402 Section 9.3.4 as:

$$a = \frac{(A_s)(f_y) + {}^{P_u}\!/_{\phi}}{(0.80)(f'_m)(b)} = \frac{\left(0.02\ \frac{\text{in.}^2}{\text{ft}}\right)\left(60{,}000\ {}^{\text{lb}}\!/_{\text{in.}^2}\right) + {}^{108\ {}^{\text{lb}}\!/_{\text{ft}}}\!/_{0.9}}{(0.80)\left(1{,}750\ {}^{\text{lb}}\!/_{\text{in.}^2}\right)\left(3.6\ {}^{\text{in.}}\!/_{\text{ft}}\right)} = 0.26\text{ in.}$$

Which is well within the face shell of the CMU. Therefore, the resulting nominal flexural strength of this assembly is determined as:

$$M_n = \left\{(A_s)(f_y) + {}^{P_u}\!/_{\phi}\right\}\left\{d - {}^{a}\!/_{2}\right\} =$$

$$\left\{\left(0.02\ \frac{\text{in.}^2}{\text{ft}}\right)\left(60{,}000\ {}^{\text{lb}}\!/_{\text{in.}^2}\right) + {}^{108\ {}^{\text{lb}}\!/_{\text{ft}}}\!/_{0.9}\right\}\left\{2.81\text{ in.} - {}^{0.26\text{ in.}}\!/_{2}\right\} = 3{,}537\,\frac{\text{in.-lb}}{\text{ft}}$$

Applying the tension-controlled strength reduction factor of 0.9, the resulting design moment strength is 3,183 in.-lb/ft, which more than satisfies the factored out-of-plane bending moment of 1,455 in.-lb/ft. Again, however, per Section 5.1.2 of TMS 402 the effective compression width is limited to the lesser of the center-to-center spacing of the reinforcement, six times the nominal wall thickness (here, 36 in.), and a maximum of 72 in., which is exceeded in this example. To address this requirement and provide a load path for out-of-plane loads applied to the field of the assembly far from the vertical reinforcement, consider the wall bending in both the vertical and horizontal directions (two way bending). Because most concrete masonry walls will have horizontal reinforcement present in the form of joint reinforcement for crack control, check whether 9 gauge joint reinforcement spaced at 16 in. on center can span horizontally between the vertically reinforced section (e.g., a design span of 10 ft corresponding to the spacing of the vertical reinforcement).

Although the horizontal spans could be considered continuous instead of simply supported, there will likely be openings and similar discontinuities in the partition assembly. As such, conservatively use the same factored out-of-plane bending moment as before:

$$M_u = 1{,}455\ \frac{\text{in.-lb}}{\text{ft}}$$

Each course of the assembly where the joint reinforcement is located will contain two wires, however, only one wire will be in the tension zone. Therefore, the normalized area of reinforcement provided by the joint reinforcement is calculated as:

$$A_s = \frac{0.017\text{ in.}^2}{{}^{16\text{ in.}}\!/_{12\ {}^{\text{in.}}\!/_{\text{ft}}}} = 0.0128\ \frac{\text{in.}^2}{\text{ft}}$$

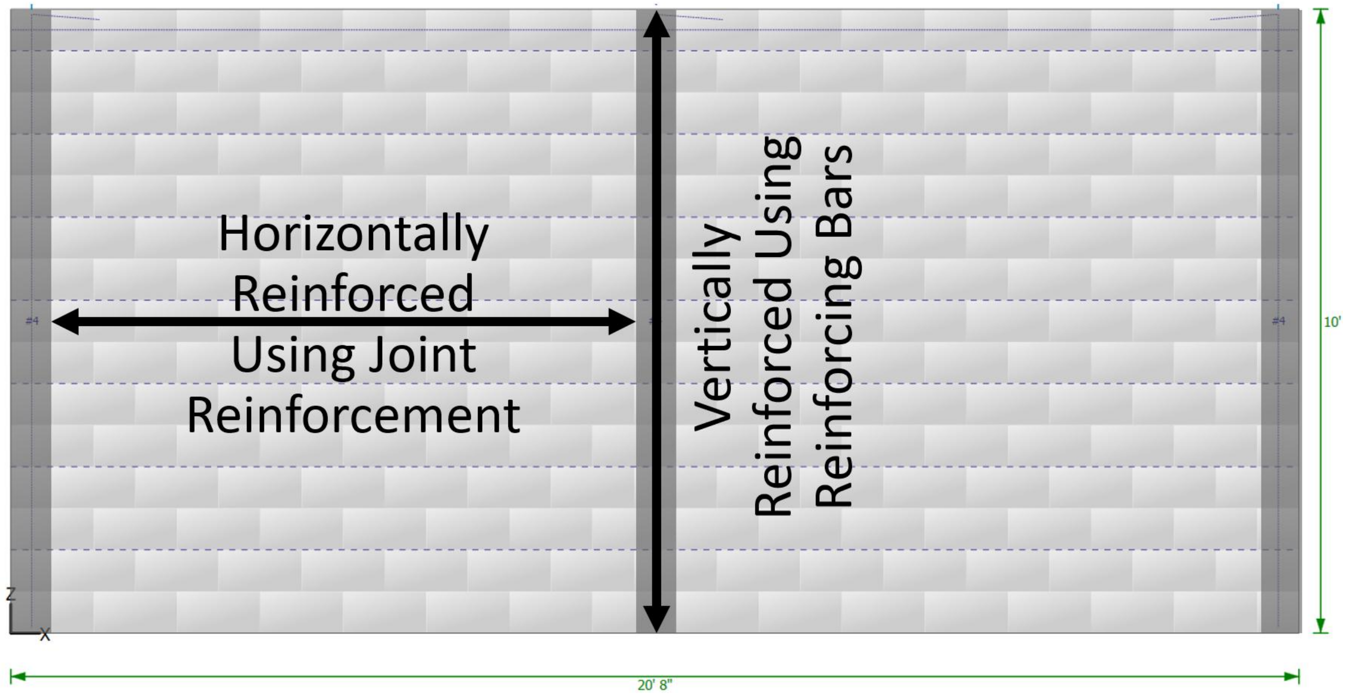
For horizontally spanning assemblies, the self-weight is not contributing to the out-of-plane flexural resistance. Therefore, here consider $P_u = 0$. Further, because the spacing of the joint reinforcement is less than six times the nominal wall thickness, the horizonal out-of-plane bending can be analyzed using a conventional unit strip basis. The resulting compression block depth is then:

$$a = \frac{(A_s)(f_y)}{(0.80)(f'_m)(b)} = \frac{\left(0.0128\ \frac{\text{in.}^2}{\text{ft}}\right)\left(70{,}000\ {}^{\text{lb}}/_{\text{in.}^2}\right)}{(0.80)\left(1{,}750\ {}^{\text{lb}}/_{\text{in.}^2}\right)\left(12\ {}^{\text{in.}}/_{\text{ft}}\right)} = 0.053\ \text{in.}$$

Given that the typical cover distance provided between the surface of the masonry and the surface of the joint reinforcement is $^5/_8$ in., the resulting effective depth of the joint reinforcement is 4.93 in. and the resulting design moment strength is:

$$\phi M_n = \phi\{(A_s)(f_y)\}\{d - {}^{a}/_{2}\} =$$
$$(0.9)\left\{\left(0.0128\ \frac{\text{in.}^2}{\text{ft}}\right)\left(70{,}000\ {}^{\text{lb}}/_{\text{in.}^2}\right)\right\}\left\{4.93\ \text{in.} - {}^{0.053\ \text{in.}}/_{2}\right\} = 3{,}954\,\frac{\text{in.-lb}}{\text{ft}}$$

Which again is considerably more than the factored out-of-plane moment of 1,455 in.-lb/ft. By considering the assembly as spanning horizontally using the joint reinforcement to the vertically reinforced sections, which in turn are supported at the base and top-of-wall, a very efficient design can be achieved while still complying with the requirements of TMS 402. Additionally, this reinforcement schedule would also meet the prescriptive seismic detailing requirements for nonparticipating elements assigned to SDC A, B, or C.



Bi-Directional Resistance Design Model

Although it rarely controls for interior partitions, the out-of-plane shear is checked per TMS 402 Section 9.3.3.1.2. Given that no shear reinforcement is provided in the out-of-plane direction, the resulting shear strength provided by the masonry is determined by:

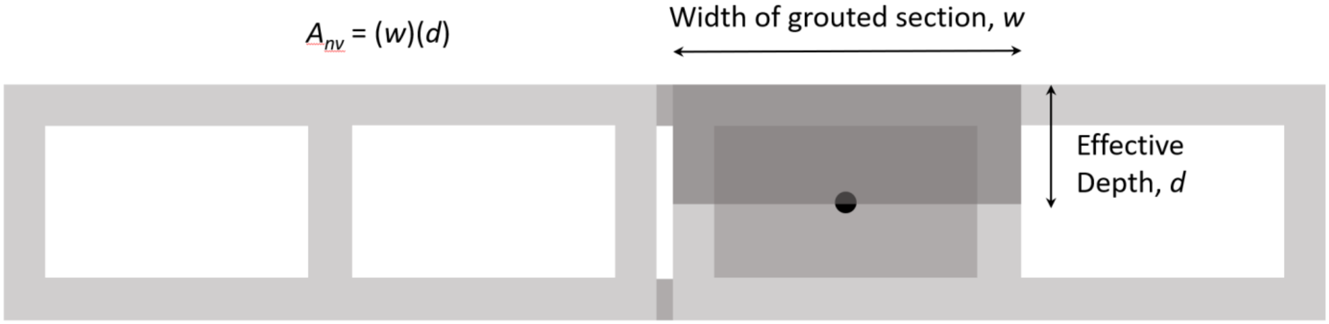
$$\phi V_{nm} = \phi \left\{ 4.0 - 1.75 \left(\frac{M_u}{V_u d_v} \right) \right\} A_{nv} \sqrt{f'_m} + 0.25 P_u$$

The critical shear plane will be at the top of the wall where the self-weight of the assembly is effectively zero ($P_u = 0$) and not contributing to the out-of-plane shear strength. Conservatively considering the ratio $M_u/V_u d_v$ is equal to 1.0 and incorporating a strength reduction factor of 0.80 for shear, the above equation reduces to:

$$\phi V_{nm} = (0.80)(2.25) A_{nv} \sqrt{f'_m} = (1.8) A_{nv} \sqrt{f'_m}$$

The net shear area determined in accordance with TMS 402 Section 4.4.5. For partially grouted construction, the area effective in resisting out-of-plane shear is the length of a grouted cell including the mortared webs on each side multiplied by the effective depth of the reinforcement. The full thickness of the wall assembly is not used as a portion of the wall is assumed to be in tension and therefore have reduced or negligible shear strength. For a CMU with a nominal length of 16 in., the length of the grouted cell plus cross-mortared webs on each side is approximately 8.3 in. Therefore, the net shear area, Anv, is calculated as:

$$A_{nv} = (8.3\text{ in.})(2.81\text{ in.}) = 23.3\text{ in.}^2$$



Net Shear Area for Partially Grouted Masonry Loaded Out-of-Plane

The design shear strength for each vertically reinforced section is then calculated as:

$$\phi V_{nm} = (1.8)(23.3\text{ in.}^2)\sqrt{1{,}750\ ^{\text{lb}}/_{\text{in.}^2}} = 1{,}754\text{ lb}$$

The factored out-of-plane shear load at each vertically reinforced section is the out-of-plane pressure multiplied by the spacing of the reinforcement considered as a uniform line load over the vertically reinforced section as follows:

$$V_u = \frac{\left(9.7\ ^{\text{lb}}/_{\text{ft}^2}\right)(10\text{ ft})(10\text{ ft})}{2} = 485\text{ lb}$$

Which is less than the design shear strength, thus satisfying this design check. In accordance with Section 9.3.4.5 of TMS 402, the out-of-plane deflection, δ_s, due to allowable stress level loads is limited to 0.7% of the wall height, h, which results in a maximum permitted mid-height deflection of:

$$\delta_s \leq 0.007(h) = (0.007)(120 \text{ in.}) = 0.84 \text{ in.}$$

Because the loads for deflection checks are allowable stress level loads, the critical load combination from ASCE/SEI 7 is often controlled by one of the following:

$$(1.0)(L) \quad \text{or} \quad (0.75)(L) + (0.75)(0.6)(W) \quad \text{or} \quad (0.75)(L) + (0.525)(E)$$

Again, because seismic loads are not required to be considered for SDC B structures, the controlling out-of-plane allowable stress level load is:

$$(0.75)\left(5 \ {}^{\text{lb}}/_{\text{ft}^2}\right) + (0.75)(0.6)\left(4.7 \ {}^{\text{lb}}/_{\text{ft}^2}\right) = 5.9 \ {}^{\text{lb}}/_{\text{ft}^2}$$

Considering the wall as a simple span assembly, the resulting allowable stress level, out-of-plane moment is then:

$$M_s = \frac{\left(5.9 \, {}^{\text{lb}}/_{\text{ft}^2}\right)(10 \text{ ft})^2}{8}\left(12 \ \frac{\text{in.}}{\text{ft}}\right) = 885 \ \frac{\text{in.-lb}}{\text{ft}}$$

The calculated out-of-plane deflection will depend on whether the assembly has exceeded the modulus of rupture (cracked), thus requiring a cracked section analysis. For a 6 in. CMU assembly containing grout at 120 in. on center, the net section modulus is 47.5 in.^{3}/ft. Per Table 9.1.9.1 of TMS 402, the modulus of rupture for a Type N portland cement-lime mortar normal to the bed joints is 64 lb/in.^{2} for an ungrouted assembly and 158 lb/in.^{2} for a fully grouted assembly. Linearly interpolating based on the percentage of grout provided in this assembly results in a modulus of rupture of 70 lb/in.^{2} and a resulting cracking moment strength of:

$$M_{cr} = \left(70 \ {}^{\text{lb}}/_{\text{in.}^2}\right)\left(47.5 \ {}^{\text{in.}^3}/_{\text{ft}}\right) = 3{,}325 \ \frac{\text{in.-lb}}{\text{ft}}$$

Which exceeds the allowable stress level out-of-plane moment. Therefore, the assembly is uncracked and the deflection is calculated based on net section properties. The net moment of inertia, In, for a 6 in. CMU assembly grouted at 120 in. is 133.6 in.^{4}/ft. The modulus of elasticity, E_m, per Section 4.2.2 of TMS 402 is 1,575,000 lb/in.^{2}. The resulting out-of-plane deflection due to allowable stress level loads calculated in accordance with Section 9.3.4.4.2 of TMS 402 is:

$$\delta_s = \frac{(5)(M_s)(h^2)}{(48)(E_m)(I_n)} = \frac{(5)\left(885 \ \frac{\text{in.-lb}}{\text{ft}}\right)(120 \text{ in.})^2}{(48)\left(1{,}575{,}000 \, {}^{\text{lb}}/_{\text{in.}^2}\right)\left(133.6 \ {}^{\text{in.}^4}/_{\text{ft}}\right)} = 0.006 \text{ in.}$$

Which is considerably less than the permitted out-of-plane deflection of 0.84 in.

The final design check is to verify that second-order effects do not impact the stability of the assembly. Given that there is no applied axial load to this partition and the wall height is relatively short, second-order effects are unlikely to control, but are checked here for completeness. For simplicity, the moment magnifier of Section 9.3.4.4.3 of TMS 402 is applied. The axial buckling strength of this assembly is calculated as follows taking the effective moment of inertia, I_{eff}, equal to 75% of the net moment of inertia, In, as stipulated by TMS 402 because the assembly is uncracked.

$$P_e = \frac{(\pi^2)(E_m)(I_{\text{eff}})}{h^2} = \frac{(3.14^2)\left(1{,}575{,}000\ {}^{\text{lb}}\!/_{\text{in.}^2}\right)(0.75)\left(133.6\ {}^{\text{in.}^4}\!/_{\text{ft}}\right)}{(120\ \text{in.})^2} = 108{,}050\ {}^{\text{lb}}\!/_{\text{ft}}$$

The resulting magnified moment is then calculated as:

$$M_{u-m} = \left(\frac{1}{1-\frac{P_u}{P_e}}\right)(M_u) = \left(\frac{1}{1-\frac{108\ {}^{\text{lb}}\!/_{\text{ft}}}{108{,}050\ {}^{\text{lb}}\!/_{\text{ft}}}}\right)\left(1{,}455\ \frac{\text{in.-lb}}{\text{ft}}\right) = 1{,}455\ \frac{\text{in.-lb}}{\text{ft}}$$