

## COMPOSITE MASONRY CODE REFERENCES

- **CBC:** 2016 CBC – Chapter 21  
2016 CBC – Chapter 21A (Modified for DSA, OSHPD 1 & 4)
- **TMS 402:** TMS 402/ACI 530/ASCE 5 – 2013 Building Code Requirements for Masonry Structures
- **TMS 602:** TMS 602/ACI 530./ASCE 6 – 2013 Specification for Masonry Structures

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### DEFINITIONS

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<b>CBC:</b> 202	<b>COLLAR JOINT.</b> Vertical longitudinal space between wythes of masonry...permitted to be filled with...grout. <b>TIE, WALL.</b> Metal connector that connects wythes of masonry walls together. <b>WALL (for Chapter 21).</b> A vertical element with a horizontal length-to-thickness ratio greater than three, used to enclose space.
<b>TMS 402:</b> 2.2	<b>COMPOSITE ACTION.</b> Transfer of stress between components of a member designed so that in resisting loads, the combined components act together as a single member. <b>COMPOSITE MASONRY.</b> Multiwythe masonry members acting with composite action.
<b>CBC:</b> 2104A.1.3.1.1.1	<b>Grouted masonry. Reinforced grouted masonry.</b> Reinforced grouted masonry is that form of construction made with solid concrete building brick [ASTM C55] in which interior joints of masonry are filled by pouring grout around reinforcing therein as the work progresses.

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### MASONRY CONSTRUCTION MATERIALS

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<b>TMS 602:</b> 2.3 A	<b>Masonry unit materials.</b> CMU shall conform to: ASTM C55 for concrete brick (DSA-SS, OSHPD 1 & 4 only; 2104A.1.2.1.1) ASTM C90 for load-bearing cmu ASTM C744 for prefaced cmu (such as glazed cmu)
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### DESIGN

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<b>TMS 402:</b> 4.3.1.2	<b>Section properties.</b> In members designed for composite action, stresses computed using section properties based on minimum transformed net cross-sectional area; transformed area concept for elastic analysis shall apply.
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**DESIGN (cont.)**

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<b>TMS 402:</b>	5.1.4	<b>Multiwythe masonry elements.</b>  Multiwythe walls designed for composite action shall have collar joints filled with grout and connected by wall ties.  Wythes not bonded by headers shall be bonded by wall ties as follows:  <u>Wire size</u> <u>Minimum number of wall ties required</u>  W1.7 (MW11)    one per 2 2/3 ft <sup>2</sup> (0.25 m <sup>2</sup> ) of wall W2.8 (MW18)    one per 4 1/2 ft <sup>2</sup> (0.42 m <sup>2</sup> ) of wall  The maximum spacing between ties shall be 36 in. (914 mm) horizontally and 24 in. (610 mm) vertically.  The use of rectangular wall ties to tie walls made with any type of masonry units is permitted. The use of Z wall ties to tie walls made with other than hollow masonry units is permitted. Cross wires of joint reinforcement are permitted to be used instead of wall ties.
	5.1.4.2.1(b)	
	5.1.4.2.3	
<b>TMS 402:</b>	8.1.4.2 (b)	Shear stresses developed in the planes of interfaces between wythes and collar joints shall not exceed 13 psi (89.6 kPa) for grouted collar joints.

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**QUALITY ASSURANCE**

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<b>TMS 402:</b>	3.1.6.1	<b>Acceptance relative to strength requirements. Compliance with <math>f'_m</math>.</b> Compressive strength of masonry shall be considered satisfactory if the compressive strength of each masonry wythe and grouted collar joint equals or exceeds the value of $f'_m$ .
<b>TMS 602:</b>	1.4 A.	

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**CONSTRUCTION**

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<b>CBC:</b>	2104.1	<b>Masonry construction.</b> Masonry construction must comply with Sections 21041.1 and 2104.1.2, and TMS 602.  [DSA-SS, OSHPD 1 & 4] Masonry construction must comply with Sections 2104A1.1 through 2104A.1.3, and with TMS 602
	2104A.1	
	2104A.1.3	<b>Grouted masonry.</b>
	2104A.1.3.1.1	<b>Reinforced grouted masonry.</b>
	2104A.1.3.1.1.1.2	<b>High-lift grouted construction.</b>
	2104A.1.3.1.1.1.2.1	All units in both wythes are placed in fully mortared bed and head joints.
	2104A.1.3.1.1.1.2.2	Tie placement not to exceed 24 in. o.c. horizontally and 16 in. o.c. vertically for running bond, or 12 in. o.c. vertically for stack bond.
	2104A.1.3.1.1.1.2.3	Cleanouts provided by omitting every other unit in bottom of pour.
	2104A.1.3.1.1.1.2.4	Minimum grout space of 3 1/2 in.
	2104A.1.3.1.1.1.2.5	Grout barriers max spacing of 30 ft.
	2104A.1.3.1.1.1.2.6	Approved admix for water loss reduction and grout expansion.
	2104A.1.3.1.1.1.2.7	Continuous pour in lifts of 4 ft or less. Grouting of any section between barriers must be completed in one day, with no interruptions greater than 1 hour.