



# A GUIDE FOR PLACING CONTROL JOINTS IN CMU

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# FAQS

## 1. **What are masonry control joints?**

**Answer:** Control joints (CJs) are used to accommodate volume shrinkage of concrete masonry, including cast stone. According to the National Concrete Masonry Association (NCMA), concrete masonry undergoes irreversible volume shrinkage over time. Most of the size change occurs during the first year after manufacture.

## 2. **Will a concrete masonry veneer require horizontal joint reinforcement?**

**Answer:** Yes, because the net effect is shrinkage, a combination of horizontal joint reinforcement and proper placement of control joints should be employed to reduce the potential for shrinkage cracking.

## 3. **Who is responsible in locating masonry movement joints on the drawings?**

**Answer:** According to TMS 602-16 Specification for Masonry Structures, in the Mandatory Requirements Checklist, Part 3 – Execution, Article 3.3 D.6 Movement joints, Notes to the Architects/Engineers, states; “Indicate type and location of movement joints on the project drawings”.

# CONTROL JOINT LOCATION GUIDE

Straight Wall Length	Corner Offset	Unreinforced Openings	Reinforced Openings	Tools
<b>OPTION #1: Concrete Masonry Veneer (wire 16 in. o.c.)</b>				
<b>CJ Spacing (L/H=1 1/2, max 20 ft)</b> Location <sup>1,2,3,4</sup>	4 in.	End of lintel (one or both sides of larger openings)		<a href="#">NCMA TEK 10-04</a>
<b>OPTION #2: Empirical Method, Concrete Masonry (8" high units, wire 16 in. o.c.)</b>				
<b>CJ Spacing (L/H=1 1/2, max 25 ft)</b> Location <sup>1,3,4,5</sup>	Half of the CJ spacing, max	One side of lintel (above and below openings ≤ 6 ft) <sup>6</sup> Both sides of lintel (above and below openings > 6ft) <sup>6</sup>	Away from openings	<a href="#">NCMA TEK 10-02D</a>
<b>OPTION #3: Empirical Method, Concrete Masonry (4" high units, wire 12 in. o.c.)</b>				
<b>CJ Spacing (L/H=1 1/2, max 20 ft)</b> Location <sup>1,3,4,5</sup>	Half of the CJ spacing, max	One side of lintel (above and below openings ≤ 6 ft) <sup>6</sup> Both sides of lintel (above and below openings > 6ft) <sup>6</sup>	Away from openings	<a href="#">NCMA TEK 10-02D</a>
<b>OPTION #4: Engineered Method, Concrete Masonry (wire 16 in. o.c.<sup>8</sup>)</b>				
<b>Crack Control Coefficient = 0.0010<sup>7</sup></b> <b>CJ Spacing (L/H=2 1/2, max 25 ft)<sup>1,3,4,5</sup></b>	Half of the CJ spacing, max	One side of lintel (above and below openings ≤ 6 ft) <sup>6</sup> Both sides of lintel (above and below openings > 6ft) <sup>6</sup>	Away from openings	<a href="#">NCMA TEK 10-03</a>
<b>Crack Control Coefficient = 0.0015<sup>7</sup></b> <b>CJ Spacing (L/H=2, max 20 ft)<sup>1,3,4,5</sup></b>	Half of the CJ spacing, max	One side of lintel (above and below openings ≤ 6 ft) <sup>6</sup> Both sides of lintel (above and below openings > 6ft) <sup>6</sup>	Away from openings	<a href="#">NCMA TEK 10-03</a>

<sup>1</sup> where stress concentrations occur

<sup>2</sup> reduce veneer movement by incorporating integral water repellents

<sup>3</sup> discontinue joint reinforcement at control joints

<sup>4</sup> at changes in wall height or thickness

<sup>5</sup> at movement joints in foundations and floors, and at movement joints in roofs and floors that bear on a wall

<sup>6</sup> provide slip planes

<sup>7</sup> requires more detailed knowledge of the masonry characteristics than the empirical approach

<sup>8</sup> ungrouted or partially grouted walls

# CONTROL JOINT CALCULATOR

8" High CMU Control Joint Spacing			
Wall Height:	12	ft	8 in
Method:	Empirical		
Crack Control Coefficient:	0.0015		(Engineered Method Only)
Maximum Length-to-Height Ratio:	1.5		
Maximum Control Joint Spacing:	25		
Straight Wall Length (ft):	18.667	ft	
Corner Length (ft):	9.333	ft	

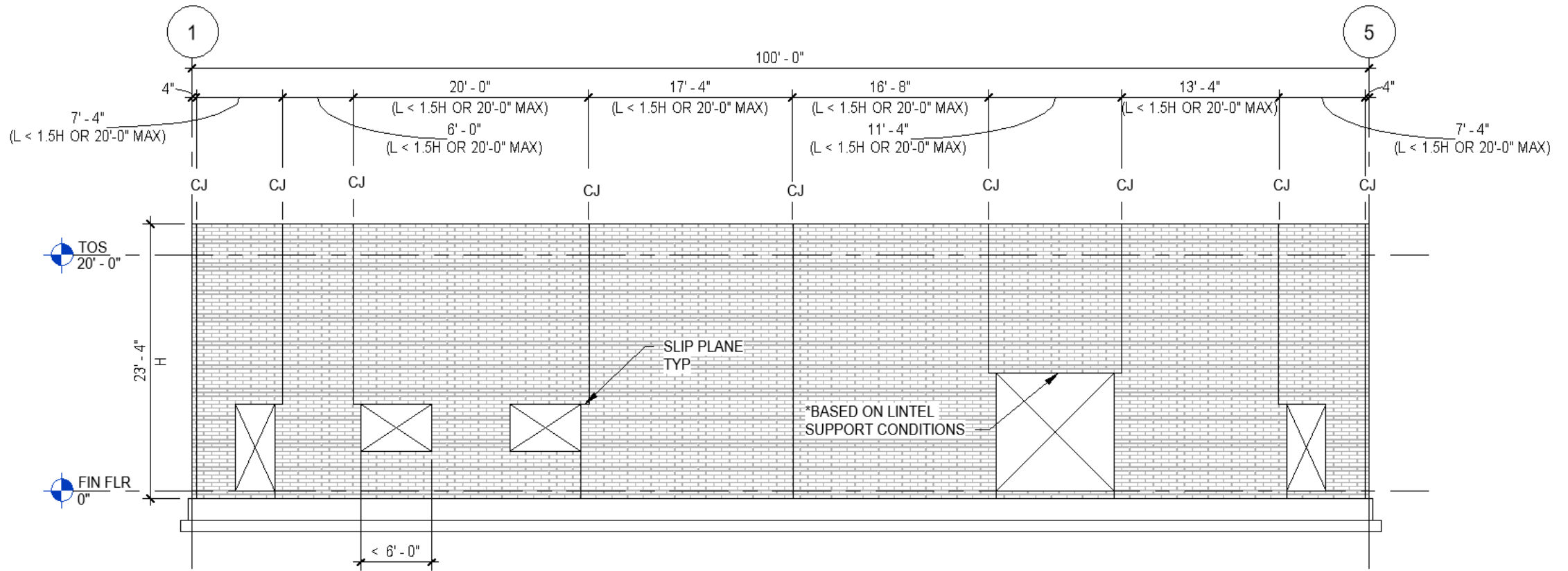
Empirical Method TEK 10-2D (2010)		
	Maximum Length-to-Height Ratio of Concrete Masonry Panel	Maximum spacing, in. (mm)
Above Grade Concrete Masonry Walls		
Nominal Unit Height: 8 in. (203 mm) <sup>2</sup>	1.5 to 1	25 ft. (7.62 m)
Nominal Unit Height: 4 in. (102 mm) <sup>2</sup>	1.5 to 1	20 ft. (6.10 m)
<sup>1</sup> Adjust spacing as needed where local experience or project conditions warrant. <sup>2</sup> Include horizontal reinforcement having an equivalent area of not less than 0.025 in. <sup>2</sup> /ft. (52.9 mm <sup>2</sup> /m) of height. See Table 2A. <sup>3</sup> Include horizontal reinforcement having an equivalent area of not less than 0.034 in. <sup>2</sup> /ft. (72.0 mm <sup>2</sup> /m) of height. See Table 2B.		

Reinforcement size	Maximum spacing, in. (mm)
W1.7 (9 gage) (MW11) <sup>1</sup>	16 (406)
W2.1 (8 gage) (MW13) <sup>1</sup>	16 (406)
W2.8 (3/16 in.) (MW18) <sup>1</sup>	24 (610)
No. 3 (M#10)	48 (129)
No. 4 (M#13)	96 (2,348)
No. 5 (M#16) or larger	144 (3,658)
<sup>1</sup> Minimum two wires per course.	

Table 2A—Maximum Spacing of Horizontal Reinforcement to Provide 0.025 Square Inches per Foot of Masonry Height (52.9 Square Millimeters per Meter)

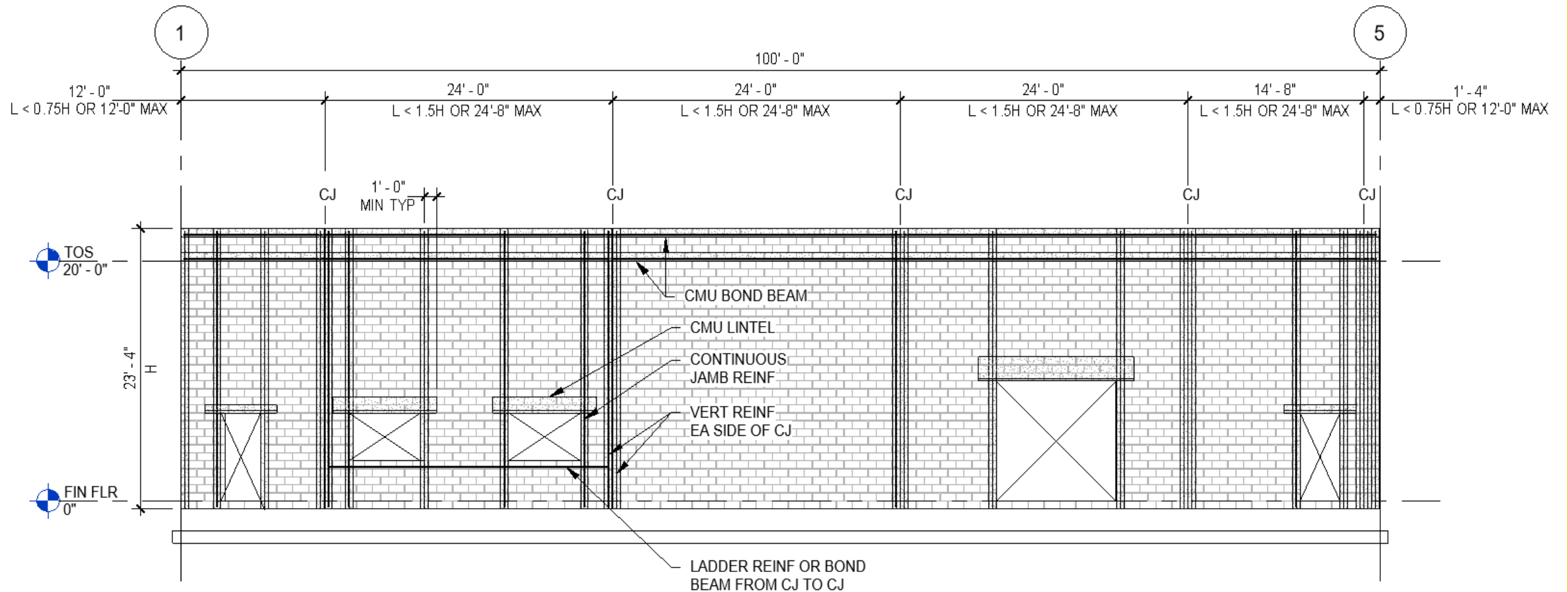
# CONCRETE MASONRY VENEER



WI.7 (9 gage) at 16" on center (0.025in<sup>2</sup>/ft)

# EMPIRICAL METHOD, CONCRETE MASONRY (8-INCH HIGH UNITS)

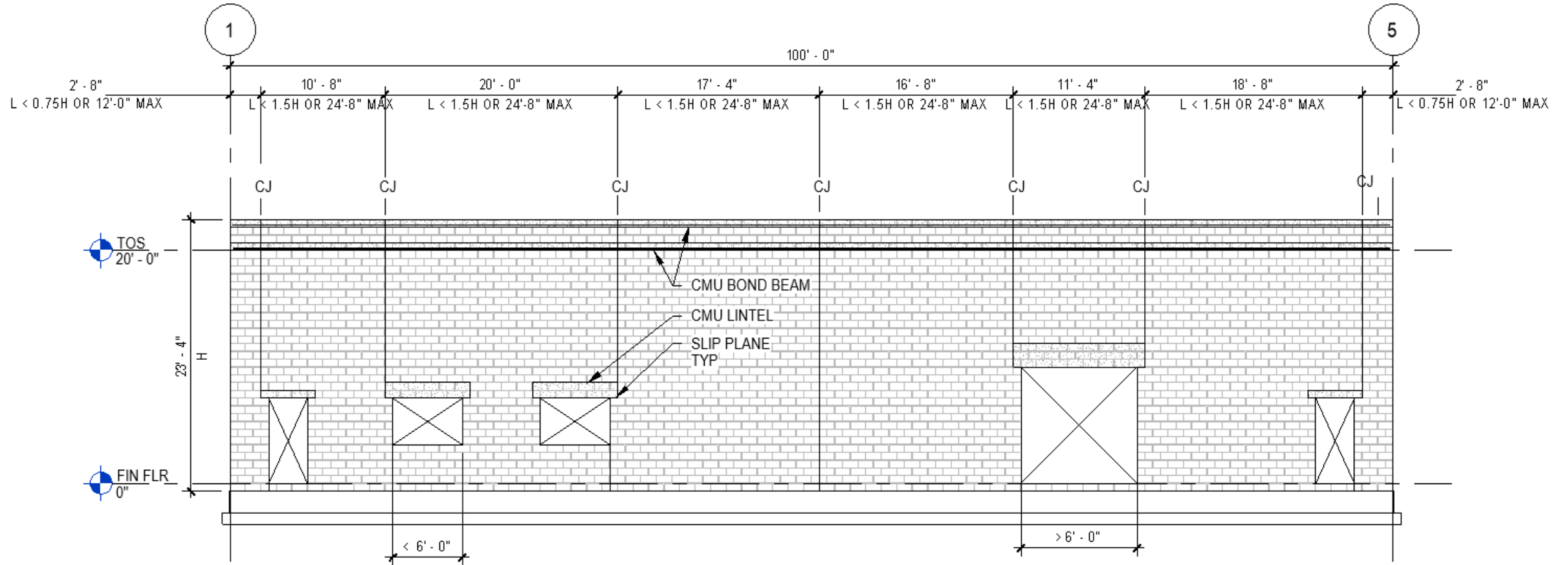
## Reinforced Opening



W1.7 (9 gage) at 16" on center (0.025in<sup>2</sup>/ft)

# EMPIRICAL METHOD, CONCRETE MASONRY (8-INCH HIGH UNITS)

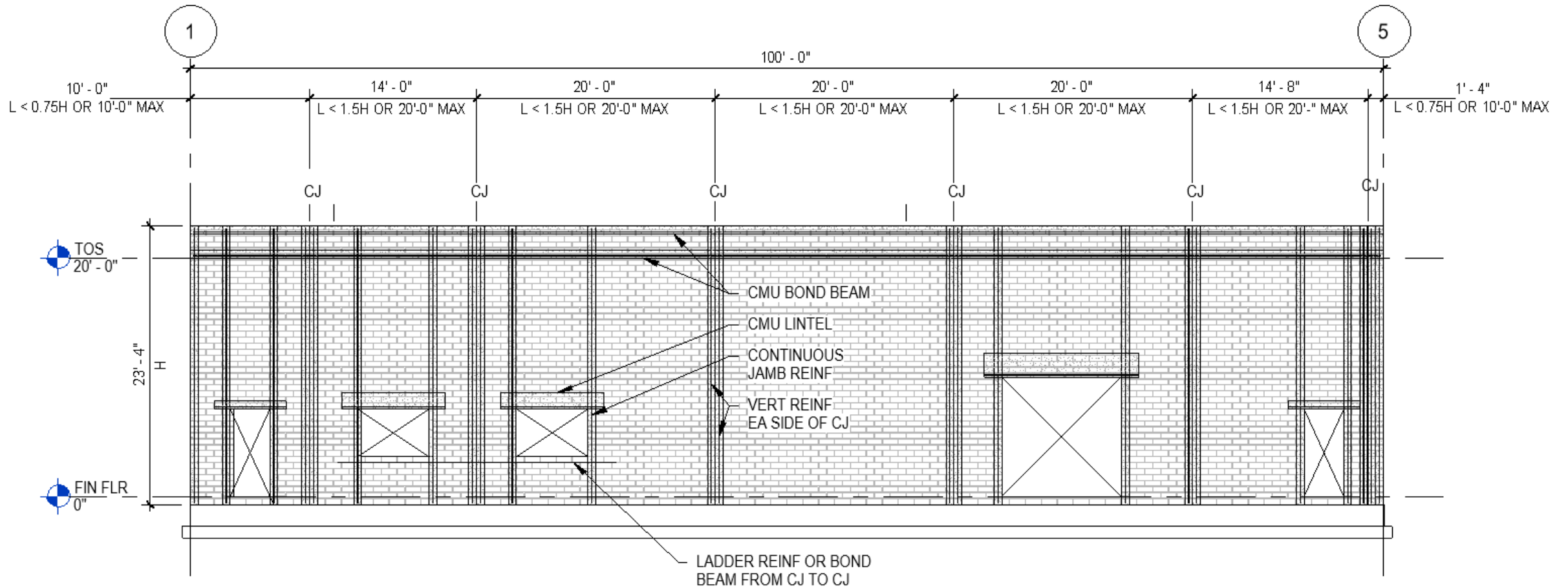
## Unreinforced Opening



WI.7 (9 gage) at 16" on center (0.025in<sup>2</sup>/ft)



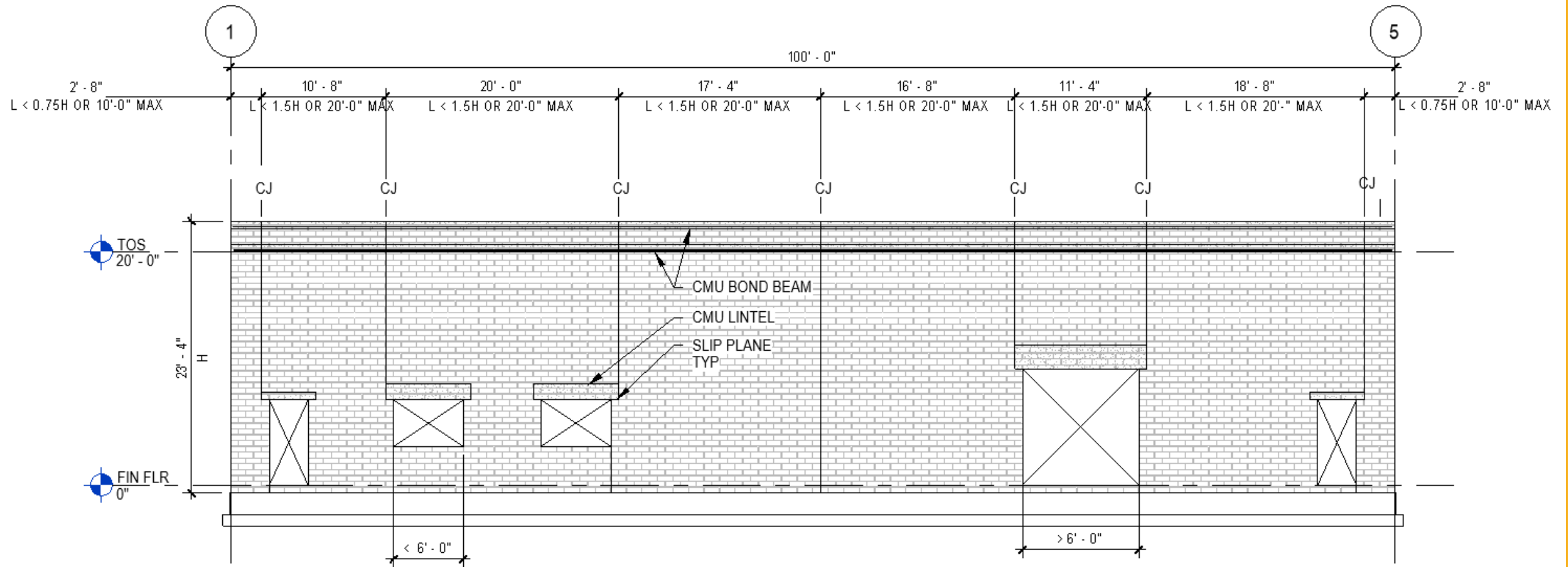
# EMPIRICAL METHOD, CONCRETE MASONRY (4-INCH HIGH UNITS)



W1.7 (9 gage) at 12" on center (0.034in<sup>2</sup>/ft)

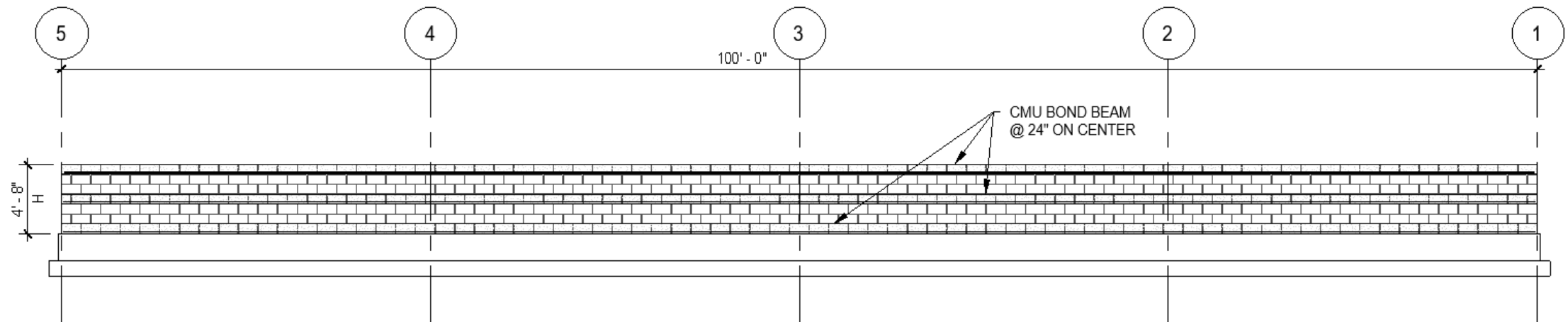
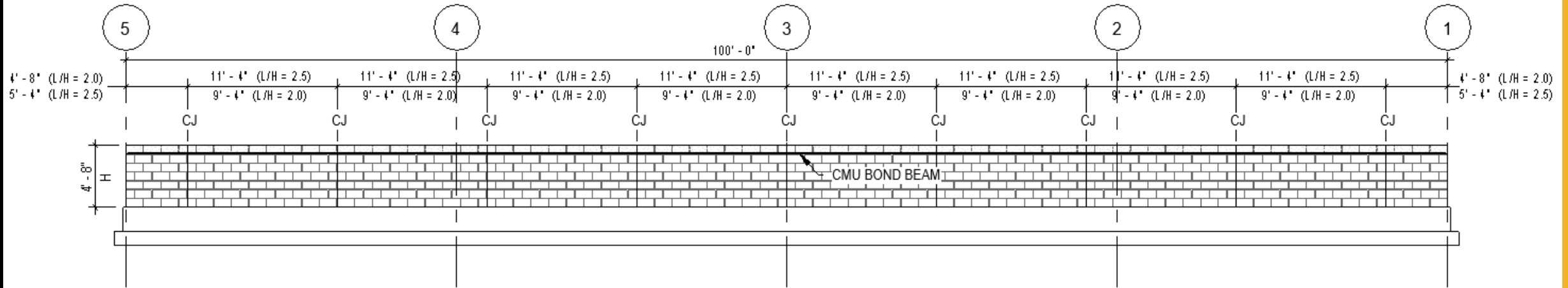
# EMPIRICAL METHOD, CONCRETE MASONRY (4-INCH HIGH UNITS)

## Unreinforced Opening



W1.7 (9 gage) at 12" on center (0.034in<sup>2</sup>/ft)

# ENGINEERED METHOD, CONCRETE MASONRY



NO CONTROL JOINTS REQUIRED ( $A_s > 0.002A_n$ )



# APPENDIX

# CONTROL JOINT SPACING

CONTROL JOINT LOCATION GUIDE			CONCRETE MASONRY <sup>1,3,4,5</sup>								
			Veneer <sup>2</sup>	EMPIRICAL METHOD				ENGINEERED METHOD			
				8" high units		4" high units		wire 16" o.c.			
			Height, H (ft-in)	wire 16" o.c.	wire 16" o.c.		wire 12" o.c.		wire 16" o.c.		
	Straight walls, L (ft-in) max. 20'-0"	Straight walls, L (ft-in) max. 24'-8"	Corners L (ft-in) max. 12'-0"	Straight walls, L (ft-in) max. 20'-0"	Corners L (ft-in) max. 10'-0"	Straight walls, L (ft-in) max. 20'-0"	CCC = 0.0015 <sup>6</sup> corners max. L (ft-in)	Straight walls, L (ft-in) max. 24'-8"	CCC = 0.0010 <sup>6</sup> corners max. L (ft-in)		
inches	feet	ft-in	L/H = 1.5	L/H = 1.5	L/H = 1.5	L/H = 1.5	L/H = 1.5	L/H = 2.0	L/H = 2.0	L/H = 2.5	L/H = 2.5
56	4.67	4'-8"	-	-	-	-	-	-	-	-	-
60	5.00	5'-0"	-	-	-	-	-	-	-	12'-0"	6'-0"
64	5.33	5'-4"	-	-	-	-	-	-	-	13'-4"	6'-8"
68	5.67	5'-8"	-	-	-	-	-	-	-	14'-0"	6'-8"
72	6.00	6'-0"	-	-	-	-	-	12'-0"	6'-0"	14'-8"	7'-4"
76	6.33	6'-4"	-	-	-	-	-	12'-8"	6'-0"	15'-4"	7'-4"
80	6.67	6'-8"	-	-	-	-	-	13'-4"	6'-8"	16'-8"	8'-0"
84	7.00	7'-0"	-	-	-	-	-	14'-0"	6'-8"	17'-4"	8'-8"
88	7.33	7'-4"	-	-	-	-	-	14'-8"	7'-4"	18'-0"	8'-8"
92	7.67	7'-8"	-	-	-	-	-	15'-4"	7'-4"	18'-8"	9'-4"
96	8.00	8'-0"	12'-0"	12'-0"	6'-0"	12'-0"	6'-0"	16'-0"	8'-0"	20'-0"	10'-0"
100	8.33	8'-4"	12'-0"	12'-0"	6'-0"	12'-0"	6'-0"	16'-8"	8'-0"	20'-8"	10'-0"
104	8.67	8'-8"	12'-8"	12'-8"	6'-0"	12'-8"	6'-0"	17'-4"	8'-8"	21'-4"	10'-8"
108	9.00	9'-0"	13'-4"	13'-4"	6'-8"	13'-4"	6'-8"	18'-0"	8'-8"	22'-0"	10'-8"
112	9.33	9'-4"	14'-0"	14'-0"	6'-8"	14'-0"	6'-8"	18'-8"	9'-4"	23'-4"	11'-4"
116	9.67	9'-8"	14'-0"	14'-0"	6'-8"	14'-0"	6'-8"	19'-4"	9'-4"	24'-0"	12'-0"
120	10.00	10'-0"	14'-8"	14'-8"	7'-4"	14'-8"	7'-4"	20'-0"	10'-0"	24'-8"	12'-0"
124	10.33	10'-4"	15'-4"	15'-4"	7'-4"	15'-4"	7'-4"	20'-0"	10'-0"	24'-8"	12'-0"
128	10.67	10'-8"	16'-0"	16'-0"	8'-0"	16'-0"	8'-0"	20'-0"	10'-0"	24'-8"	12'-0"
132	11.00	11'-0"	16'-0"	16'-0"	8'-0"	16'-0"	8'-0"	20'-0"	10'-0"	24'-8"	12'-0"
136	11.33	11'-4"	16'-8"	16'-8"	8'-0"	16'-8"	8'-0"	20'-0"	10'-0"	24'-8"	12'-0"
140	11.67	11'-8"	17'-4"	17'-4"	8'-8"	17'-4"	8'-8"	20'-0"	10'-0"	24'-8"	12'-0"
144	12.00	12'-0"	18'-0"	18'-0"	8'-8"	18'-0"	8'-8"	20'-0"	10'-0"	24'-8"	12'-0"
148	12.33	12'-4"	18'-0"	18'-0"	8'-8"	18'-0"	8'-8"	20'-0"	10'-0"	24'-8"	12'-0"
152	12.67	12'-8"	18'-8"	18'-8"	9'-4"	18'-8"	9'-4"	20'-0"	10'-0"	24'-8"	12'-0"
156	13.00	13'-0"	19'-4"	19'-4"	9'-4"	19'-4"	9'-4"	20'-0"	10'-0"	24'-8"	12'-0"
160	13.33	13'-4"	20'-0"	20'-0"	10'-0"	20'-0"	10'-0"	20'-0"	10'-0"	24'-8"	12'-0"
164	13.67	13'-8"	20'-0"	20'-0"	10'-0"	20'-0"	10'-0"	20'-0"	10'-0"	24'-8"	12'-0"
168	14.00	14'-0"	20'-0"	20'-8"	10'-0"	20'-0"	10'-0"	20'-0"	10'-0"	24'-8"	12'-0"
172	14.33	14'-4"	20'-0"	21'-4"	10'-8"	20'-0"	10'-0"	20'-0"	10'-0"	24'-8"	12'-0"
176	14.67	14'-8"	20'-0"	22'-0"	10'-8"	20'-0"	10'-0"	20'-0"	10'-0"	24'-8"	12'-0"
180	15.00	15'-0"	20'-0"	22'-0"	10'-8"	20'-0"	10'-0"	20'-0"	10'-0"	24'-8"	12'-0"
184	15.33	15'-4"	20'-0"	22'-8"	11'-4"	20'-0"	10'-0"	20'-0"	10'-0"	24'-8"	12'-0"
188	15.67	15'-8"	20'-0"	23'-4"	11'-4"	20'-0"	10'-0"	20'-0"	10'-0"	24'-8"	12'-0"
192	16.00	16'-0"	20'-0"	24'-0"	12'-0"	20'-0"	10'-0"	20'-0"	10'-0"	24'-8"	12'-0"
196	16.33	16'-4"	20'-0"	24'-0"	12'-0"	20'-0"	10'-0"	20'-0"	10'-0"	24'-8"	12'-0"
200	16.67	16'-8"	20'-0"	24'-8"	12'-0"	20'-0"	10'-0"	20'-0"	10'-0"	24'-8"	12'-0"
204	17.00	17'-0"	20'-0"	24'-8"	12'-0"	20'-0"	10'-0"	20'-0"	10'-0"	24'-8"	12'-0"
208	17.33	17'-4"	20'-0"	24'-8"	12'-0"	20'-0"	10'-0"	20'-0"	10'-0"	24'-8"	12'-0"
212	17.67	17'-8"	20'-0"	24'-8"	12'-0"	20'-0"	10'-0"	20'-0"	10'-0"	24'-8"	12'-0"
216	18.00	18'-0"	20'-0"	24'-8"	12'-0"	20'-0"	10'-0"	20'-0"	10'-0"	24'-8"	12'-0"