

DEPARTMENT OF ENERGY, LABOR, AND ECONOMIC GROWTH

DIRECTOR'S OFFICE

CONSTRUCTION SAFETY STANDARDS

(By authority conferred on the director of the department of energy, labor and economic growth by sections 19 and 21 of 1974 PA 154, and Executive Reorganization Order Nos. 1996-2, 2003-18, and 2008-4, MCL 408.1019, 408.1021, 445.2001, 445.2011, and 445.2025)

PART 2. MASONRY WALL BRACING

R 408.40201 Scope.

Rule 201. These rules pertain to the bracing of unsupported masonry walls exposed to wind during construction.

History: 1989 AACCS; 2010 AACCS.

R 408.40202 Availability of referenced documents.

Rule 202. (1) The following Michigan occupational safety and health standards are referenced in these rules and shall be considered part of the requirements of these rules to the extent prescribed in each reference. Up to 5 copies of these standards may be obtained at no charge from the Michigan Department of Energy, Labor and Economic Growth, MIOSHA Standards Section, 7150 Harris Drive, P.O. Box 30643, Lansing, Michigan, 48909-8143 or via the internet at website:

www.michigan.gov/mioshastandards. For quantities greater than 5, the cost, as of the time of adoption of these rules, is 4 cents per page.

(a) Construction safety standard part 1 general rules, R 408.40101 to R 408.40134.

(b) Construction safety standard part 22 signals, signs, tags, and barricades, R 408.42201 to R 408.42243.

(2) The following standards are referenced in these rules and shall be considered part of the requirements of these rules to the extent prescribed in each such reference. They are available from Mason Contractors Association of America, 33 South Roselle Road, Schaumburg, Illinois 60193, telephone number: 1-800-536-2225 or via the internet at website:

www.masoncontractors.org; at a cost as of the time of adoption of these rules, as stated in this subrule:

(a) Standard practice for bracing masonry walls under construction, chapters 5 and 6 and their commentaries, July 2001 as referenced in R 408.40211 (2) (b) as it relates to wall bracing design. Cost: \$50.00.

(b) Masonry wallbracing design handbook, March 2003. Cost: \$65.00.

(c) The standards referenced in subrule 2 (a) and (b) of this rule are also available for inspection at the Department of Energy, Labor and Economic Growth, MIOSHA Standards Section, 7150 Harris Drive, P.O. Box 30643, Lansing, Michigan, 48909-8143.

(d) Copies of the standards referenced in subrule (2) (a) and (b) of this rule may be obtained from the publisher or may also be obtained from the Department of Energy, Labor and Economic Growth, MIOSHA Standards Section, 7150 Harris Drive, P.O. Box 30643, Lansing, Michigan, 48909-8143, at the cost charged in subrule (2) (a) and (b), of this rule, plus \$20.00 for shipping and handling.

History: 1989 AACCS; 2010 AACCS.

R 408.40203 Definitions.

Rule 203. (1) "Base" means the supporting surface that the masonry wall is laid upon.

(2) "Competent person" means a person who is trained, experienced, and capable of identifying existing or potential hazards in surroundings, or under working conditions, that are hazardous or dangerous to an employee and who has the authority and knowledge to take prompt corrective measures to eliminate the hazards.

(3) "Controlling contractor" means a prime contractor, general contractor, construction manager, or any other legal entity that has the overall responsibility for the construction of the project including its planning, quality, and completion.

(4) "Initial period" means the period of time, not to exceed 24 hours, during which the masonry wall is being laid above its base or the highest line of bracing and, at the end of which, required bracing is installed.

(5) "Intermediate period" means the period of time following the initial period until the masonry wall is connected to the structural elements that provide its final lateral support.

(6) "Qualified person" means a person who, by possession of a recognized degree, certificate, professional standing, or by extensive knowledge, training, and experience, has successfully demonstrated the ability to solve or resolve problems relating to the subject matter, the work, or the project.

(7) "Reinforced masonry" means a masonry wall made up of units laid in mortar with steel reinforcement embedded in grout.

(8) "Restricted zone" means the area on each side of a masonry wall measured by a horizontal distance equal to the height of the constructed wall plus a minimum of 4 feet, measured at right angles to the wall, and continuing for the length of the wall plus a minimum of 4 feet beyond the ends of the wall.

(9) "Structural designer of record" means a registered or licensed professional who is responsible for the structural design of the project.

(10) "Unreinforced masonry" means a masonry wall made up of units laid in mortar that may contain horizontal joint reinforcement.

(11) "Unsupported masonry wall" means a masonry wall that has not obtained its final lateral support from structural elements, such as, but not limited to, roofs, floors, buttresses, crosswalls, and piers.

(12) "Wall bracing system" means a brace consisting of vertical, diagonal, and/or horizontal structural elements which provide support to the unsupported masonry wall.

(13) "Wind-measuring device" means an instrument which accurately measures wind speed to + 2 miles per hour.

(14) "Wind speed" means the velocity of a 3-second gust.

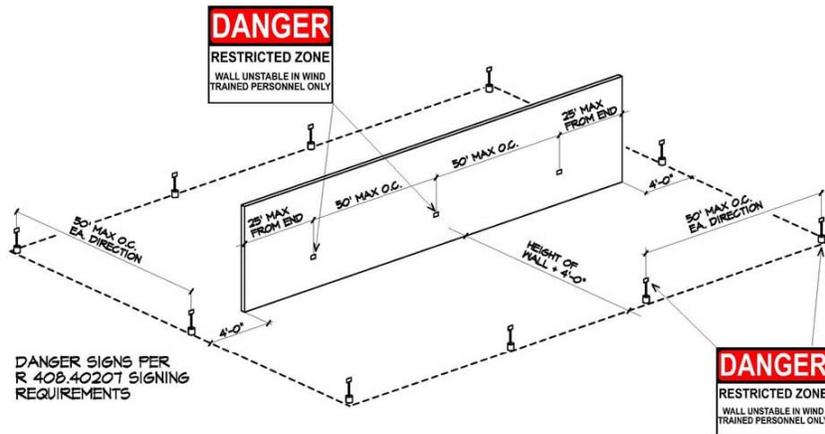
History: 1989 AACCS; 2010 AACCS.

R 408.40204 Responsibilities; restricted zone, wall bracing system, and signage.

Rule 204. (1) Prior to the start of masonry construction, the mason contractor shall notify in writing the controlling contractor where and when a restricted zone will exist. See figure 1 for a sample restricted zone plan.

(2) The mason contractor shall establish the restricted zone and the installation of the wall bracing system and danger signs. After the wall bracing system and danger signs have been installed in accordance with these rules, any person including, but not limited to, a construction manager, subcontractor, general contractor, or owner who alters or removes the wall bracing system or danger signs shall replace them in accordance with these rules.

(3) Each employer having workers in the restricted zone shall monitor the wind speed and evacuate employees when the limitations of these rules have been exceeded.



History: 1989 AACCS; 2010 AACCS.

R 408.40205 Training requirements.

Rule 205. (1) This rule supplements and clarifies construction safety standard part 1 general rules, R 408.40114 (2), as it relates to the hazards of masonry walls under construction exposed to wind.

(2) An employer shall provide training by a qualified person to each competent person or employee who is involved in installing, altering, repairing, maintaining, or inspecting the wall bracing system and restricted zone. The training shall enable an employee to recognize hazards associated with the work and shall include all of the following topics, as applicable:

- (a) The nature of hazards involving masonry walls under construction.
- (b) Instruction in the general use and maintenance of wall bracing systems, signage, and restricted zone requirements as prescribed in these rules.
- (c) Identifying unsupported masonry walls requiring bracing.
- (d) The procedures for installing, altering, repairing, inspecting, and maintaining the wall bracing system being used.
- (e) Proper installation and maintenance of a restricted zone and signage.
- (f) Procedures for monitoring wind speeds.
- (g) Procedures for vacating the restricted zone during windy conditions.
- (h) Inspecting the worksite for overhead and underground utilities and other hazards.
- (i) Inspecting the worksite for excavations in the restricted zones.
- (j) Any other pertinent requirements.

(3) An employer shall provide training by a qualified person to any employee who enters a restricted zone of a masonry wall under construction. The training shall enable an employee to recognize and understand all of the following:

- (a) The nature of hazards involving masonry walls under construction.
- (b) Instruction in the general use and maintenance of wall bracing systems, signage, and restricted zone requirements as prescribed in these rules.
- (c) Procedures for monitoring wind speeds.
- (d) Procedures for vacating the restricted zone during windy conditions.
- (e) The nature of hazards involving electrical lines within the restricted zone.
- (f) The nature of hazards involving excavating within the restricted zone.
- (g) Any other pertinent requirements.

(4) Additional training is required in each of the following situations:

- (a) When changes at the worksite present a hazard about which an employee has not been previously trained.
- (b) When changes in the types of wall bracing systems present a hazard for which an employee has not been previously trained.

(5) The employer shall verify compliance with this rule by preparing a written certification record. The written certification record shall contain the name or other identity of the employee trained, the date or dates of the training, and the signature of the person who conducted the training or the signature of the employer. If the employer relies on training conducted by another employer or completed prior to the effective date of this rule, the certification record shall indicate the date the employer determined the prior training was adequate rather than the date of actual training. The latest training certification shall be maintained and available during the workshift.

History: 1989 AACCS; 2010 AACCS.

R 408.40206 Restricted zone requirements.

Rule 206. (1) For walls greater than 8 feet in height, a restricted zone shall be established prior to the start of the construction of the wall. The restricted zone shall meet all of the following requirements (see figure 1):

(a) Be equal to the height of the constructed wall plus a minimum of 4 feet and run the entire length of the wall plus a minimum of 4 feet beyond the ends of the wall.

(b) Be established on both sides and ends of the wall.

(c) Be limited to entry by employees trained in accordance with R 408.40205.

(d) Remain in place until the wall has obtained its final lateral support.

(e) Be delineated by signing in accordance with R 408.40207.

(2) When a restricted zone extends onto or across roadways or other adjacent areas, protection shall be provided as prescribed in construction safety standard part 22 signals, signs, tags, and barricades, R 408.42223 traffic control, or by other methods.

(3) If restricted zones cannot be installed or maintained as prescribed by these rules, alternative protective methods shall be provided.

Drawings/plans or calculations shall be prepared by a qualified person and available at the jobsite.

(4) For multi-story structures the restricted zone shall be determined by a qualified person.

History: 1989 AACCS; 2010 AACCS.

R 408.40207 Signing requirements.

Rule 207. (1) Each unsupported masonry wall that is more than 8 feet in height shall be posted with a danger sign on each end and each side at intervals of not more than 50 feet as shown in figure 1.

(2) The restricted zone shall be delineated by signs at each corner and spaced at intervals of not more than 50 feet along the perimeter.

(3) The danger signs shall be maintained in readily visible, unobstructed locations and in a legible condition until the masonry wall has obtained its final lateral support.

(4) A danger sign shall comply with construction safety standard part 22 signals, signs, tags, and barricades, R 408.42201 to R 408.42243, and state:

RESTRICTED ZONE WALL UNSTABLE IN WIND TRAINED PERSONNEL ONLY

(5) An illustration of a danger sign which complies with subrule (4) of this rule is shown in figure 2.

(6) All signs must be removed after the walls have obtained their final lateral support.



History: 1989 AACS; 2010 AACS.

R 408.40208 Wind speed; determination by competent person.

Rule 208. Wind speeds shall be determined by a competent person in the vicinity of the masonry wall exposed to wind and shall be monitored during the initial and intermediate periods. A wind-measuring device shall be used to determine wind speeds.

History: 1989 AACCS; 2010 AACCS.

R 408.40209 Initial period requirements.

Rule 209. (1) Unbraced masonry walls shall not exceed the maximum height as shown in table 1 during the initial period.

(2) No one shall be within the restricted zone of a masonry wall subjected to winds exceeding 20 miles per hour during the initial period.

(3) At the end of the initial period, the wall shall be braced on both sides if it exceeds the unbraced wall heights as shown in table 2.

History: 1989 AACCS; 2010 AACCS.

R 408.40210 Intermediate period requirements.

Rule 210. (1) When the height of an unbraced masonry wall exceeds the maximum height as shown in table 2 during the intermediate period, the masonry wall shall be braced on both sides.

(2) No one shall be within the restricted zone of a masonry wall subjected to winds exceeding 35 miles per hour during the intermediate period.

(3) When bracing cannot be installed because of work operations, no one shall be permitted within the restricted zone when the wind is more than 20 miles per hour during the intermediate period as shown in table 3.

TABLE 1

INITIAL PERIOD (LESS THAN 24 HOURS)
 Maximum Unbraced Height of Unreinforced Masonry
 Above its Base or Highest Line of Bracing for Resisting 20 mph Wind

Nominal Thickness	Unit Weight of Masonry		
	Light Weight ⁽¹⁾ (<105 pcf)	Medium Weight ⁽²⁾ (105 to <125 pcf)	Normal Weight ⁽³⁾ (≥125 pcf)
	Maximum Height	Maximum Height	Maximum Height
4"	8'-0"	8'-0"	8'-0"
6"	8'-0"	8'-0"	8'-0"
8"	9'-4"	10'-0"	12'-0"
10"	13'-4"	14'-8"	17'-4"
12"	18'-0"	20'-0"	24'-0"

TABLE 2⁽⁵⁾
 INTERMEDIATE PERIOD (GREATER THAN 24 HOURS)
 Maximum Unbraced Height of Unreinforced Masonry
 Above its Base or Highest Line of Bracing for Resisting 35 mph Wind

Nominal Thickness	Unit Weight of Masonry			Unbonded Masonry ⁽⁴⁾
	Light Weight ⁽¹⁾ (<105 pcf)	Medium Weight ⁽²⁾ (105 to <125 pcf)	Normal Weight ⁽³⁾ (≥125 pcf)	
	Maximum Height	Maximum Height	Maximum Height	
4"	8'-0"	8'-0"	8'-0"	8'-0"
6"	8'-0"	8'-0"	8'-0"	8'-0"
8"	8'-0"	8'-0"	8'-0"	8'-0"
10"	8'-0"	8'-0"	8'-8"	8'-0"
12"	9'-4"	10'-0"	10'-8"	8'-0"

TABLE 3⁽⁵⁾
 INTERMEDIATE PERIOD (GREATER THAN 24 HOURS)
 Maximum Unbraced Height of Unreinforced Masonry
 Above its Base or Highest Line of Bracing for Resisting 20 mph Wind

Nominal Thickness	Unit Weight of Masonry			Unbonded Masonry ⁽⁴⁾
	Light Weight ⁽¹⁾ (<105 pcf)	Medium Weight ⁽²⁾ (105 to <125 pcf)	Normal Weight ⁽³⁾ (≥125 pcf)	
	Maximum Height	Maximum Height	Maximum Height	
4"	8'-0"	8'-0"	8'-0"	8'-0"
6"	9'-4"	10'-0"	10'-8"	8'-0"
8"	14'-8"	15'-4"	16'-8"	9'-4"
10"	18'-8"	20'-0"	22'-0"	13'-4"
12"	23'-4"	25'-4"	28'-0"	18'-0"

- ⁽¹⁾ Light Weight Units at 95 pounds per cubic foot (pcf) unit weight.
- ⁽²⁾ Medium Weight Units at 105 pounds per cubic foot (pcf) unit weight.
- ⁽³⁾ Normal Weight Units at 125 pounds per cubic foot (pcf) unit weight.
- ⁽⁴⁾ Flashing or other
- ⁽⁵⁾ Tables 2 and 3 are based on Type N masonry cement mortar.

History: 1989 AACS; 2010 AACS.

R 408.40211 Wall bracing design.

Rule 211. (1) A wall bracing system shall be designed by a qualified person and capable of providing stability to the wall for a wind speed of 40 miles per hour.

(2) A wall bracing system shall be installed in accordance with 1 of the following:

(a) A triangle wall bracing system as prescribed in R 408.40212.

(b) A bracing plan that is designed using acceptable engineering practices and the engineering content of the mason contractors association of America, standard practice for bracing masonry walls under construction, chapters 5 and 6 and their commentaries, July 2001 Edition, adopted by reference in R 408.40202. Wall bracing erection drawings/plans or calculations and specifications shall be available at the jobsite. Bracing schemes for walls matching examples specifically outlined in the mason contractors association of America, masonry wallbracing design handbook, March 2003 Edition, adopted by reference in R 408.40202, satisfy these requirements.

History: 2010 AACCS.

R 408.40212 Triangle wall bracing system.

Rule 212. (1) A triangle wall bracing system shall consist of all of the following elements assembled as shown in figure 3:

(a) Scaffold grade lumber that is suitable for planking.

(i) A 16-foot, 2-inch by 10-inch vertical brace.

(ii) A 16-foot, 2-inch by 10-inch diagonal brace.

(iii) A 16-foot, 2-inch by 10-inch horizontal brace.

(b) Two nominal 2 x 4 wood stiffeners.

(c) Top wall anchor.

(d) Base of wall or footing anchor.

(e) Bearing block.

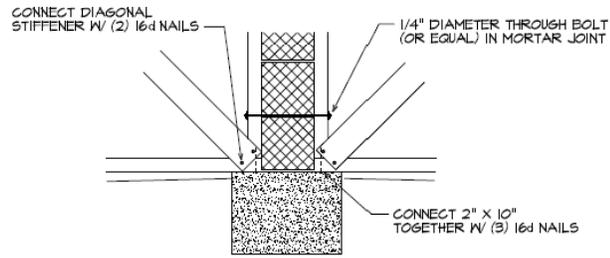
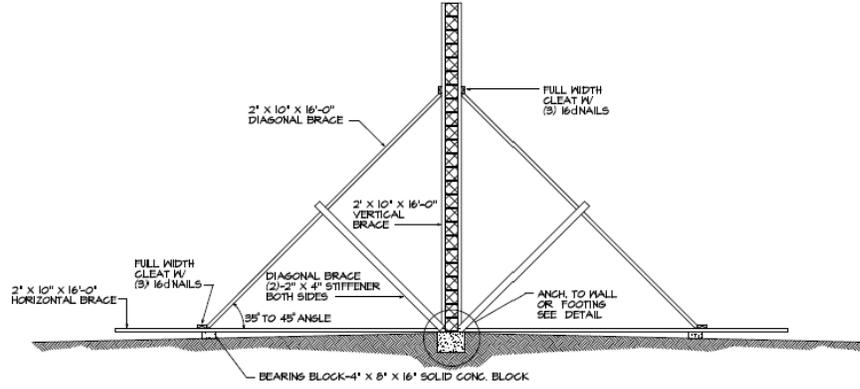
(f) Cleats.

(2) The angle of intersection of the diagonal brace and the horizontal brace shall be between 35 and 45 degrees. The diagonal brace shall not intersect the vertical brace below the midpoint height of the masonry wall.

(3) The triangle wall bracing system shall be aligned on both sides of the wall when installed.

(4) The maximum horizontal spacing for a triangle wall bracing system shall not exceed the values as shown in table 4 for the corresponding maximum wall heights and as illustrated in figure 4.

FIGURE 3
Typical Triangle Wall Bracing System



CONNECTION DETAIL

TABLE
INTERMEDIATE PERIOD (GREATER THAN 24 HOURS)
Maximum Horizontal Spacing for the Triangle Wall Bracing System for Resisting 40 mph Wind

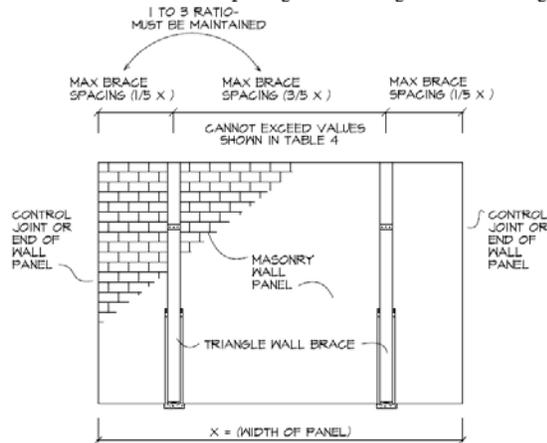
4⁽¹⁾

Nominal Thickness	Maximum Horizontal Spacing	Maximum Wall Height	Maximum Panel Width ⁽²⁾⁽³⁾
4"	9'-1"	16'	16'-0"
6"	13'-6"	16'	24'-0"
8"	17'-11"	16'	32'-0"
10"	20'-10"	16'	38'-0"

12"	23'-6"	16'	42'-8"
-----	--------	-----	--------

- (1) Table 4 is based on Type N masonry cement mortar.
- (2) Actual width of panel may not exceed design spacing of control joints or design panel widths. Consult approved permit drawings for specified control joint locations or maximum spacing.
- (3) Panels shall not include control joints within width of panel.

FIGURE 4
Maximum Horizontal Spacing for a Triangle Wall Bracing System



History: 2010 AACCS.

R 408.40213 Inspections.

Rule 213. An unsupported masonry wall, including the wall bracing system, shall be inspected for visible defects by a competent person at the beginning of each shift and

after any occurrence that could affect the structural integrity of the wall bracing system or the wall.

(a) Any bracing element that is damaged or weakened from any cause shall be immediately repaired or replaced. A competent person shall supervise the repairs.

(b) Any bracing element that is repaired shall have at least the original designed strength for the wall brace system.

(c) If any movement of the wall or physical damage to the wall occurs, the project structural designer of record shall be notified. Repairs to the wall shall be designed by a structural engineer and shall not be done without the approval of the project structural designer of record.

(d) Only those persons repairing the wall or wall bracing system may work within the restricted zone until repairs have been made.

History: 2010 AACCS.