

JUST THE FAQs

questions we made up about
... MASONRY

Changing Masonry Standards

Part 2: Grouting Options

Answer provided by Diane Throop, P.E. who is Chair of Masonry Standards Joint Committee (MSJC) and Director of Engineering for the International Masonry Institute (IMI) (www.imiweb.org).



Question

Grouting criteria seems to be changing all the time. Our project has a 14-foot high CMU wall to reinforce and grout at 48 inches on center. What are the grouting options available by code? Can the contractor use self-consolidating grout and is there any special inspection or testing required?

Answer

Yes, it is great that masonry grouting provisions continue to evolve, providing new options in addition to preserving traditional procedures. The building codes still include criteria that have been in place for years as well as offering newer methods resulting from research, new product introductions, and demonstrated performance.

A brief and general timeline for recent grout placement procedures from the Masonry Standards Joint Committee (MSJC) *Building Code Requirements and Specification for Masonry Structures* (TMS 402/ACI 530/ASCE 5 and

TMS 602/ACI 530.1/ASCE 6) looks like this:

- 1999 MSJC – Grout lifts limited to 5-foot maximum height regardless of the permitted pour heights. Cleanouts required for pours above 5 feet. Conventional grout is permitted.
- 2002 MSJC – Same as 1999 MSJC with an additional demonstration panel option (see below).
- 2005 MSJC – Same as the 2002 MSJC with the addition of 12-foot 8-inch lifts with certain criteria (see below). Otherwise, lift heights are limited to 5 foot maximum.
- 2008 MSJC – Same as the 2005 MSJC with the addition of self-consolidated grout criteria.

With that overview, let's consider the options offered for the specific project mentioned. But, as always, consult your locally adopted building code and the MSJC for detailed criteria.

As mentioned above, the options permitted depend on the edition of the code that is locally adopted. Assuming that we are working under the IBC 2009 which references the MSJC 2008, there are several alternatives available. Answering the question about whether self-consolidating grout (SCG) can be used – yes, unless specifically exempted in your locally adopted code – so let's break the choices down by Conventional Grout and SCG. For this project, we have CMU. There are almost identical options for reinforced clay brick walls and autoclaved aerated concrete (AAC)

masonry, but prestressed masonry walls may have slightly different requirements.

We will assume a minimum grout space dimension of 3 x 4 inches so that the IBC and the MSJC both permit a maximum grout pour height of 24 feet for both fine and coarse grout. If the grout space is less than this, Table 7 of the MSJC Specification lists the maximum pour height. We will also assume that the space between the reinforcing bars and any protrusion, such as the face of masonry, is greater than ½ inch, so either fine or coarse grout is permitted. (Clear distance for coarse grout is ½ inch from any face of masonry unit or formed surface, ¼ inch for fine grout).

With these assumptions, all the options listed below are available and considered equal in the IBC and MSJC:

Conventional Grout Options

Option 1–Grouting without Cleanouts

Build the masonry to a maximum of 5 feet, place the vertical reinforcing steel, place the grout in lifts not to exceed 5 feet, consolidate and reconsolidate the lift. Continue this procedure two more times to reach the 14-foot wall height.

Option 2–Grouting with Cleanouts

Build the wall to the 14-foot wall height, construct cleanouts at the bottom of the wall, remove any masonry protrusions greater than ½ inch, place the reinforcement, and after inspection, close the cleanout.

- If the masonry has cured for at least 4 hours, the grout slump is maintained between 10 and 11 inches, and there are no reinforced bond beams within the pour height, then the grout may be placed in lifts up to 12 feet 8 inches, consolidated and reconsolidated. Given the wall height of 14 feet, this method requires at least 2 lifts
- If any of the criteria listed above exists – wall curing time, grout slump, bond beams in the pour height – then, the grout must be placed in lifts not exceeding 5 feet.

Self-consolidating Grout (SCG) Options

Option 1–Grouting without Cleanouts

Build the masonry to a maximum of 5 feet, place the vertical reinforcing steel, place the SCG in lifts not to exceed 5 feet. Continue this procedure two more times to reach the 14-foot wall height. Unlike conventional grout, SCG does not require consolidation or reconsolidation.



Option 2—Grouting with Cleanouts

Build the wall to 14 feet, construct a cleanout at the bottom of the wall, remove any masonry protrusions greater than ½ inch, place the vertical reinforcing steel, and after inspection, close the cleanout.

- If the masonry has cured for at least 4 hours, the SCG may be placed to the pour height – in this case, 14 feet. No consolidation or reconsolidation is required.
- If the wall has not cured for at least 4 hours, then the SCG lift height is restricted to 5 feet.

Demonstration Panel Option


To be thorough, there is one more option for either conventional grout or SCG – demonstration panels. Grout pours and lifts exceeding those specifically listed in the MSJC and/or clear spaces smaller than those listed may be used if the results of a grout demonstration panel show that the grout spaces are filled and adequately consolidated. The procedures used for the construction of the demonstration panel are then used as the minimum acceptable standard for the grout placement.

The final part of the question is whether special inspection or testing is required. Given that this wall is reinforced at 48 inches on center, it is safe to assume it was not designed using the empirical provisions of the MSJC Chapter 5. Therefore, both the MSJC and IBC call for some level of inspection and testing based on whether the facility is identified as non-essential or essential (per MSJC), or identified by Occupancy Categories I, II or III grouped together, versus Occupancy Category IV (per IBC) However, check the locally adopted building code, as some overwrite the MSJC and IBC requirements. The inspection and testing are detailed in Section 1.18 of the MSJC 2008 and in Chapter 17 of the IBC 2009.




One last note – deciding which option to select may at first seem difficult but the best option may be to involve the mason contractor in the decision making process. The contractor has experience with pricing, field and site conditions, construction sequencing, and wall bracing requirements that can be dramatically impacted by the choice of grouting method. Input from the person who will actually do the work should only improve the end result. If there is engineering or design criteria that limit the grout placement options, those

should be included in the project documents; but if not, then consider trusting the contractor in the selection of the grout placement method and trust the QA provisions to assure that the wall is constructed properly.

This article is part of a series on Masonry Standards provided by the Masonry Society (TMS). Part 1 (Special Inspections) ran in the May 2011 issue of STRUCTURE magazine.




**TUBULAR SECTIONS
CUSTOM BUILT
TO THE HIGHEST STANDARDS.
YOURS.**

SuperStruct tubular sections hold up to the strictest design standards without holding them back.

- Manufactured in a variety of shapes and sizes to your specifications
- Large sizes from 12" up to 48" squares and rectangles
- Lengths up to 55'
- Wall thickness 5/16" to 1"
- Excellent column strength and torsional properties
- Aesthetically appealing



800-825-6668 • www.valmont.com • Valley, Nebraska

Contact Kyle DeBuse at Valmont Tubing toll-free at **1-800-825-6668** ext. 3558 or **kld2@valmont.com** to learn more on the design possibilities of HSS SuperStruct.

ADVERTISEMENT - For Advertiser Information, visit www.STRUCTUREmag.org