

# Coordinating a high-lift grouting job

When conditions allow it, high-lift grouting can streamline construction and improve the wall

*By Kenneth A. Hooker*

**M**any factors influence the method a contractor chooses to place grout in a reinforced masonry wall. The volume of grout involved, the number and location of door and window openings, and the type and size of masonry units all must be considered. But many contractors agree that grouting a wall a full story at a time is the most efficient method, and say they prefer it whenever conditions make it feasible. Architects and engineers recommend it as a way to eliminate cold joints in the grout that can weaken the wall.

## High-lift grouting method

In high-lift grouting, the wall is laid up a full story (to about 24 feet maximum) and all reinforcing steel is installed before any grout is placed. Openings in the bottom course of masonry allow cores that contain vertical steel to be cleaned out before grouting begins. These cleanouts are created by knocking out the appropriate face shells of concrete block, or by leaving out brick in the first course of brick masonry. After the cores have been cleaned and inspected, the cleanouts are plugged or sealed off with forms.

Grout generally is delivered to the site in ready-mix trucks or produced onsite in silo mixers. Water and approved admixtures may be added at the site to make the grout fluid enough for pumping. Grout is transferred from the



High-lift grouting requires cleanout openings to allow removal of debris from the bottom of each reinforced vertical core. Before grouting, the openings are covered with plywood forms.

truck to a grout pump, which pumps it through a hose to the top of the wall. Grout is placed in lifts of 6 feet or less. It must be consolidated with a mechanical vibrator after each lift.

The grouting crew usually consists of four or five workers. One handles the pump hose, directing the grout into position; another one or two help to move the hose and keep it from snagging. Another crew member operates a vibrator to consolidate the grout.

Different contractors handle grout pump operation in different ways. Often, one worker is assigned to operate the pump,

direct ready-mix truck traffic, and maintain a consistent flow of grout through the hose. Dave Smith of Harv & Higam Masonry Inc., Salt Lake City, has one of the hose handlers operate the pump by remote control. Doug Williams of R.E. Williams & Sons Inc., Torrance, Calif., says they've recently switched from running their own pumps to hiring a service to supply and operate the grout pumps.

## Installing reinforcement

Methods used to install reinforcing steel vary. In some areas, codes require the steel to be in place before masonry units are

laid. In reinforced block construction, using open-ended A- or H-shaped block keeps the mason from having to thread units over the top of the reinforcing bars and is the only practical way to comply with this requirement. Given the choice, most contractors prefer a different method.

One way is to install rebar positioners as the wall goes up, then lower full-length bars of vertical steel into the cores from the top of the wall. The positioners hold the rebar in the proper alignment and tie it to horizontal reinforcement installed along with the masonry units. The advantage of this method is that the masons can work without vertical bars getting in their way. On the other hand, the correct placement of positioners is crucial to the success of this method, and feeding the bar through the positioners can be difficult.

Some contractors prefer to install rebar in shorter lengths as the wall is built, lap-splicing and tying each length to the section below. Each new section extends only a few feet above the last course of block, limiting the height that block needs to be threaded over the reinforcement. This method is somewhat more laborious, but it lessens the chance that the reinforcement will be misaligned or inadequately tied together.

### Keep grout space clean

Successful high-lift grouting depends on keeping the grout space and reinforcement clean and unobstructed as the wall is built. Mortar that protrudes from bed joints or collects on the reinforcement and inside block cores can prevent grout from flowing freely through the grout space and forming a strong bond with the units and the steel.

Sometimes simply scraping off excess mortar with a jointing tool as you go is sufficient. Some contractors allow mortar to dry before knocking off the excess with a length of reinforcing steel.

## Minimum grout spaces for various pour heights

Grout Type	Maximum Grout Pour Height (foot)	Minimum Width of Grout Space Between Wythes (inch)	Minimum Grout Space Dimensions for Grouting Cells of Hollow Units (inch x inch)	Cleanouts Required
Fine	1	¾	1½ x 2	No
Fine	5	2	2 x 3	No
Fine	12	2½	2½ x 3	Yes
Fine	24	3	3 x 3	Yes
Coarse	1	1½	1½ x 3	No
Coarse	5	2	2½ x 3	No
Coarse	12	2½	3 x 3	Yes
Coarse	24	3	3 x 4	Yes

*Note: The diameters of horizontal reinforcing bars in the grout space must first be subtracted from the grout space dimension.*

Source: Adapted from *Specifications for Masonry Structures*, ACI 530.1/ASCE 6, American Concrete Institute, P.O. Box 19150, Detroit, MI 48219. Slightly different requirements are given in Table 24-G of the Uniform Building Code (UBC), published by the International Conference of Building Officials, 5260 S. Workman Mill Rd., Whittier, CA 90601.

Usually, though, it's best to clean the grout space with high-pressure air or water a couple of times a day to remove mortar build-up before it has a chance to harden.

The cleanout openings at the base of the wall allow the

removal of any debris before grouting.

### Coordinating the job

To derive the greatest benefit from high-lift grouting, you need to coordinate the job carefully among several players—not only

## When to use the high-lift method

High-lift grouting can improve productivity, but it takes planning and careful consideration to determine whether or not it's feasible on a particular project. Following are some things to consider:

**Specifications.** Project specifications usually leave construction methods up to the contractor, but an architect or engineer *can* specify a particular grouting method. Sometimes low-lift grouting is required; in other cases, the specs spell out acceptable procedures for high-lift grouting. Make sure the method you plan to use conforms.

On multistory projects that you plan to grout one floor at a time, and even on one-story jobs, make sure the method you use to close the cleanouts is aesthetically acceptable.

**Grout space.** The Standard Specifications for Masonry Structures (ACI 530.1-88/ASCE 6-88) and UBC Table 24-G set minimum grout space dimensions for fine and coarse

grout at different pour heights (see table). Make sure the grout space is sufficient before planning to use the high-lift method.

Even if the nominal grout space dimensions are adequate, make sure the space to be grouted is unobstructed. Reinforcing steel and other objects packed too tightly in the grout space can prevent grout from flowing freely.

**Building design.** Lintels and sills for window and door openings prevent grout pumped into the top of the wall from reaching the foundation. Take openings into account when you consider high-lift grouting.

**Equipment.** Make sure you have a grout pump with sufficient capacity and make sure it's in good repair. In fact, keeping a spare pump on hand is a good idea. If the job is delayed because of a clogged or broken pump, you can easily lose any time you'd otherwise have saved.



Grout is pumped through a hose into the reinforced cells at each floor level. A second worker follows with a vibrator to consolidate the grout, making sure the vibrator head extends into the top 12 to 18 inches of the previous lift.

to fill the cores of about 1,000 block, or about 5,300 square feet of wall, reinforced 4 feet on center vertically and horizontally. Williams of R.E. Williams tries to schedule a full day of grouting at a time.

But grouting shouldn't be done too soon or too late. Mortar must set and cure enough to re-

the masonry crew, but also the inspector and the ready-mix supplier.

It's best to organize the work so that large areas can be grouted in one operation. Harv & Higam's Smith says he wants to be able to place at least one truckload of grout (8 cubic yards) at a time. That's enough

sist grout pressure and not blow out, which takes about 24 hours for concrete masonry or 3 days for brick. Waiting too long, on the other hand, can lead to shrinkage cracking in vertical joints.

You need to know when the wall will be ready for inspection and allow some time to arrange for the inspector to come. A spe-

cial inspector retained by the owner or general contractor is likely to be available on short notice, but a government inspector may need a few days of lead time. The construction must be inspected and approved before grouting begins.

The ready-mix supplier must be prepared to deliver the type and quantity of grout you need when you're ready to go. You don't want the grouting crew waiting around for material to be delivered. By the same token, be ready to move quickly when the ready-mix truck arrives. Once water is added, the grout must be placed within 1½ hours or discarded.

Using a silo mixer onsite to mix grout sometimes can make coordination easier. The silo is filled with dry grout ingredients and connected to a continuous mixer. Set the controls to deliver the specified proportions of dry ingredients, approved admixtures, and water and have the mixer discharge grout directly into the grout pump. Masonry Builders Inc., Los Angeles, has used this method successfully on some jobs. John Chrysler of Masonry Builders says a major advantage is that the grout is always fresh because it is mixed only as it is needed. ■