

- A PRELIMINARY REPORT -  
RESEARCH ON WATER PERMEANCE OF MASONRY  
Sponsored by Three Members of Mason's Lime Committee,  
National Lime Association

In 1977 several Chicago area mason contractor organizations conducted a pioneering research study of water permeance of 48 composite masonry wall panels at the H.H. Holmes Testing Laboratories, Inc., Wheeling, Ill.\* The panels were built using four types of portland cement-lime mortar (M,S,N, and O) and three types of masonry cement mortar (M,S, and N), the latter involving four different brands of masonry cement. The principal conclusion of the mason contractor study was that walls constructed with portland cement-lime mortars were more resistant to water permeance than those constructed with masonry cement mortars.

This report deals with a second similar study at the Holmes laboratory, which was sponsored by three midwestern lime companies (Rockwell Lime Co., U.S. Gypsum Co., and Western Lime and Cement Co.). Four brands of masonry cement, all Type N, were included, as well as three types of portland cement-lime mortar (S, N, and O), the latter incorporating either Type S (Special) or Type SA (Special, air-entraining) hydrated lime. Following the initial testing of 30 wall panels, nine of them were cured for an additional six months outdoors and then retested for water permeance. This preliminary report will present brief highlights of the lime-sponsored study, to be followed later by a more detailed NLA technical bulletin.

Description of Test Method - The 30 test panels were constructed with a 3 in. brick wythe, a 3/8 in. mortar parging, and a 4 in. block wythe, with wire reinforcement placed at two courses (Fig. 1). They were built by experienced journeyman masons using good workmanship (full head and bed joints, tooled with a round jointer, etc.). Each wall panel was subjected to a 24 hour preconditioning period, a minimum 24 hour drying period, and a 72 hour testing period. During the preconditioning and test periods, artificially wind-driven water was applied continuously to the brick face, simulating a 5 in./hr. rainfall and 62.5 mph wind. Extent of damp wall area and volume of water passing through brick and block wythes were determined at 24, 48, and 72 hr. In addition, time of first appearance of both dampness and visible water on the backs of the wall panels were recorded.

Test Results - Figure 2 summarizes the performance of wall panels constructed with Type S, N, and O portland cement-lime mortars vs. walls laid with masonry cement mortars (all Type N), in terms of total water leakage during the 72 hr. test period. The bars represent the average for each type of mortar used in the walls.

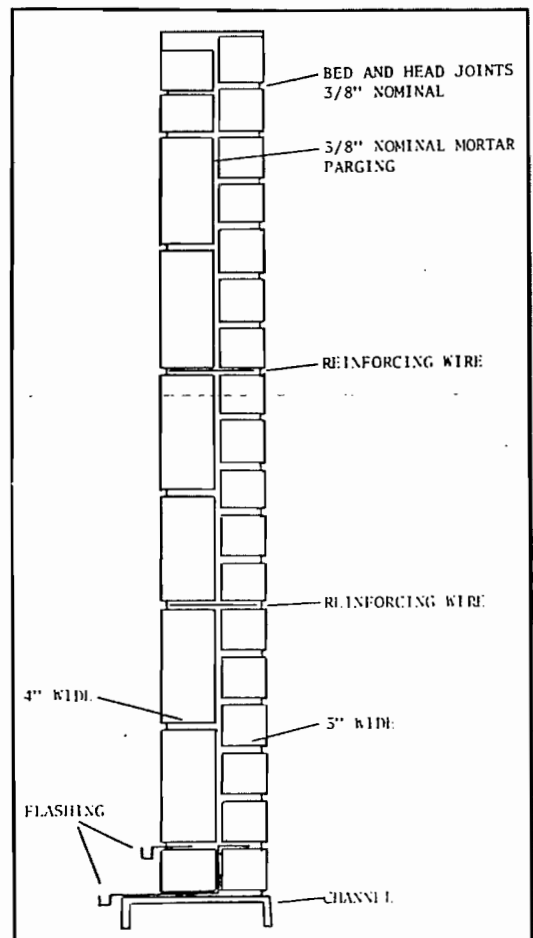
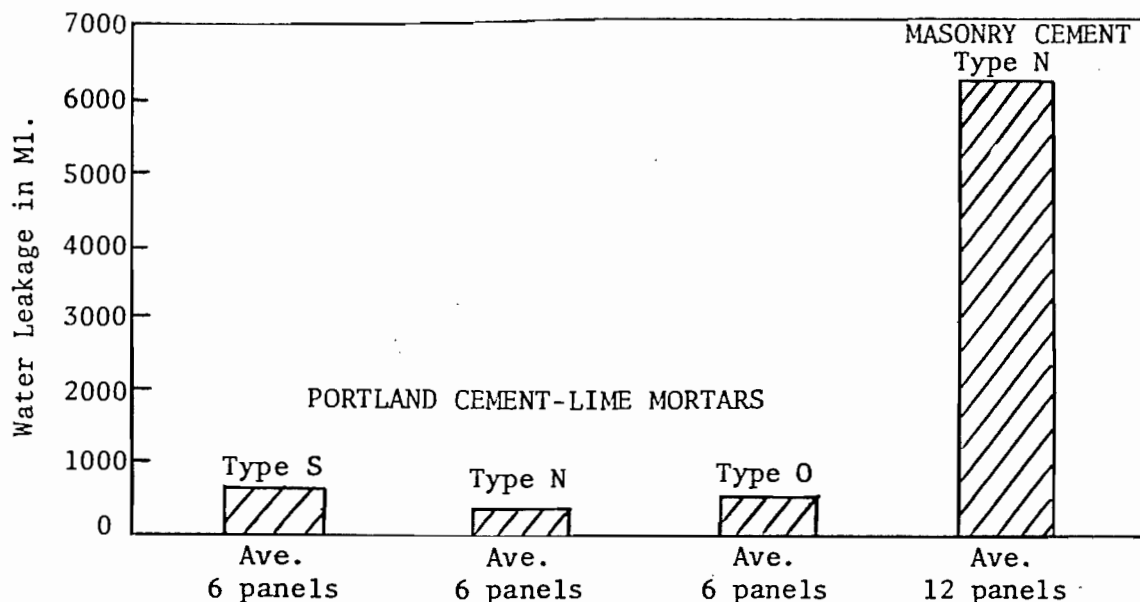


Fig. 1

\*Brown, Russell H., "Effect of Mortar on Water Permeance of Masonry," presented at the monthly meeting of the Masons Contractor Association of DuPage County, Downers Grove, Illinois, February 21, 1978.

Fig. 2 - TOTAL WATER PERMEANCE (in 72 Hr.)



Summary and Conclusions:

I. Total Water Leakage

1. Walls constructed with portland cement-lime mortars resisted water penetration to a much greater degree than those using masonry cement mortars.
2. Type N portland cement-lime mortar performed better than Types S and O mortars, although the differences in water permeance were not significantly great.

II. Rate of Water Permeance

1. Wall panels built with masonry cement mortar first exhibited dampness on back of panels in only an average of 1.2 hr., whereas the average time for dampness to appear for portland cement-lime panels was nearly double (2.3 hr.).
2. Masonry cement wall panels first showed visible moisture in 2.1 hr., whereas the average time for visible moisture for portland cement-lime panels was more the four times greater -- 8.8 hr.

III. Extent of Damp Area on Backs of Panels

1. During the 72 hr. test period the masonry cement panels generally exhibited greater percent damp area than portland cement-lime panels; and at the end of the test, the percent of dampness averaged 13.2% for portland cement-lime panels, 18.6% for masonry cement panels.

IV. Effect of Additional Curing on Wall Panels

Selected portland cement-lime wall panels were cured outdoors an additional six months and retested for water permeance. Results show a trend toward greater resistance to water penetration after the outdoor curing period. Additional research is indicated to substantiate this conclusion.