SCESCM

PROGRAM

The 2nd International Conference on Sustainable Civil Engineering Structures and Construction Materials

Toward Better Sustainable
Structures and Constructions
for Future Generation

September 23-25 2014
Yogyakarta, INDONESIA

Mechanical Properties of Perforated Retaining Wall

S. M. Dewi, Wisnumurti, A. Munawir,

Brawijaya University.,Malang Indonesia

Abstract: The perforated retaining wall purpose to carry out infiltration water inflow and reflow from the land to the channel. The aim of infiltration is saving and storage the rain water as much as possible to the land. To conform the wall with the river line the wall made of hollow concrete bricks. The bricks mounting with grouting reinforced concrete into the hollow. A small space arange between bricks shaping up the hole of the wall. The experiment set up for testing the flexural capability response of the wall i in two direction, the bricks direction, and the grouting direction. The specimen consists of six wall 90 cm x 64 cm x 6 cm. Concrete bricks have a dimensions of 12 cm x 10 cm x 6 cm. The variation of bricks spacings are 1.0 cm, 1.5 cm, and 2.0 cm. The load applied in the two points of span 90 cm. The result of testing shows that the wall in the both direction can developed a large deformation after first cracks without rupture. The average flexural capability in direction of bricks is 1700 Nm/m, and the average flexural capability in grouting direction is 3610 Nm/m.

Keywords: hollow-brick, retained-wall, perforated-wall, infiltration

1 INTRODUCTION

Usually the riverbank reinforced with the solid wall or butress. In order to drain the water from the land, the drainage pipe arrange in a few. The drainage sytem only available in one direction from land to the channel. By the way most of the drain water flow to the sea and reduce the ground water storage. The idea of perforated wall is provided water outflow and reflow from channel and land reversible.

Ordinary porous wall made from the masonry bricks. The wall has capacity to infiltrtion the water but they are a brittle and breakables. To increase the strength of the wall, some confined from reinforced concrete put between some spacing (Wisnumurti,2011). However these confined masonry wall hard to conform the river line.

The study of segmental retaining wall done through Khana (2004), Klar (2013), Kasa (2012) and Sabet, (2011). The mechanical behaviour of the wall studied by Jayalekshmi (2009), and Ali (2011).

2.THE PERFORATED RETAINING WALL

To obtain the contented strength and capability to flow the water, the perforated wall design by the reinforrced concrete hollow bricks, arrange in some distance and filled with reinforced concrete groutings.

For experimental works, the bricks shape and size in figure of eight and reinforcing with ring bars as shown in Figure-1

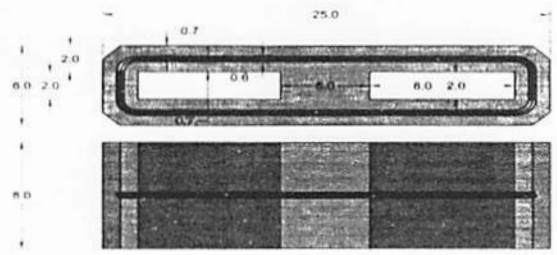

Figure-1 : Bricks shape in figure of eight

The bricks arrange in a stack interval to compose the wall. Some spacing prepared between bricks in order to become slot for drain water. The bricks hole grouting with reinforce concrete as shown in Figure-2

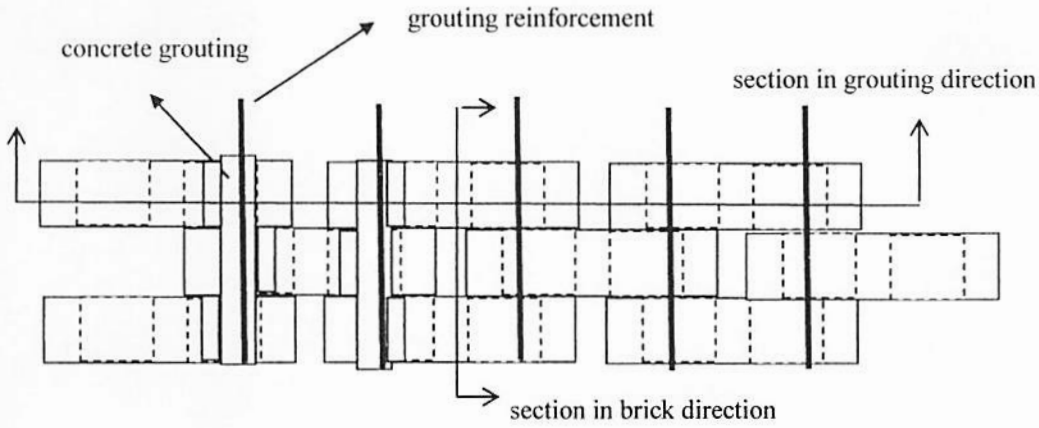

Figure-2 Arrangement of bricks

Three numbers of spacing use in laboratory research, 1 cm, 1.5 cm, and 2 cm. To appropiate the borders of wall the half bricks makes with dimension 12cm x 6 cm as shown in figure-3

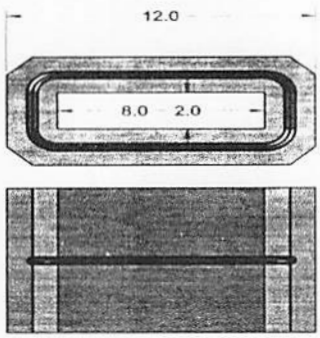

Figure-3: Bricks for the borders wall

In direction of bricks the walls size are 64 cm x 90 cm. In direction of groutings, the walls size are 64 cm x 88 cm. The arrangement respectively shown in Figure-4 and Figure-5

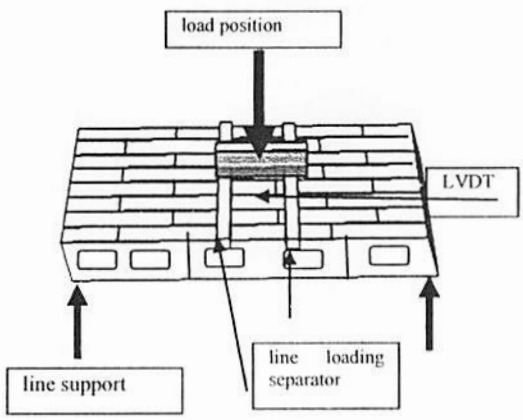

Figure-4: testing in a bricks direction

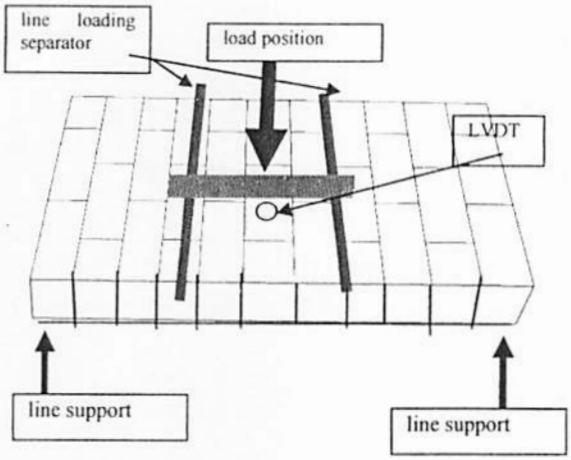

Figure-5:testing in grouting direction

3.THEORETICAL MODEL

In the brick directions, the net cross section of the wall consists of rectangular section reduce by the empty space of bricks arrangement. In grouting directions, the net cross section of the wall consists of rectangular section reduce by perforated spacing. Both of the wall cross-section shown in Figure-2. The theoretical strength analysed base on the concrete strength and effective cross section. The moment capacity of the cross section reverse to the loading capacity of the wall by static analysis. The theoretical strength in bricks direction were 620 kg, and the strength in grouting direction were 930 kg

4.RESULT OF FLEXURAL TESTING OF THE WALL

Figure-6 shows the load deflection curve of the testing result of load in bricks direction and Figure 7 shows the load deflection curve of the testing of load in grouting direction

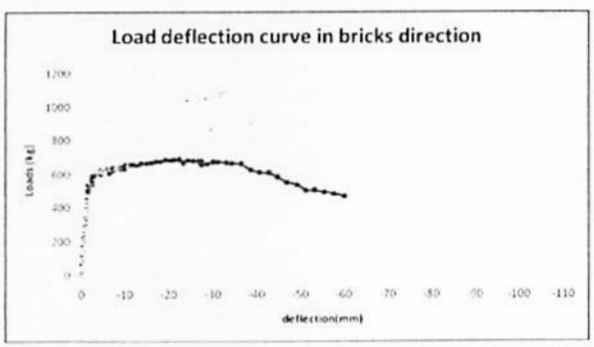

Figure-6: Load Deflection Curve in Bricks Direction

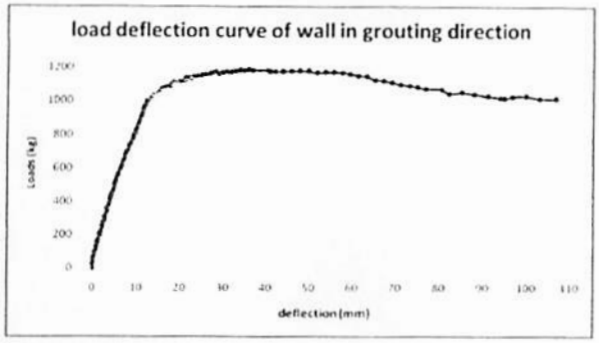

Figure-7:Load Deflection Curve in Grouting Direction

5. CONCLUSION

Load deflection curve in bricks direction and grouting direction appear the response of the wall against the out plane loadings. Agree with the theoretical hyphothese, the ultimate moment capacity in bricks direction are less than the ultimate moment capacity in grouting direction. There are a slightly difference between the theoretical and the experimental strength.

Suprisingly both of the curve, demonstrate the ductile behavior of the wall. The first crack of the wall follow with a long deformation and jumps to the second cracks with a small decrease of the moment capacity. There are no immediately failure on the wall. It run the chance to bult a ductile retaining wall and avoid the a burst failure in slope land.

The advantage of perforated wall to flow the water and restrain the soil has many prospect to solve the environmental problems ie.

a) development the vertical seepage in overpopulate city.
b) development the permeable reataining wall at river bank, mountain, and seashore.
c) development the steping contour for the river to reduce the stone roll in the river

ACKNOWLEDGMENTS

The research was carried out for the funds of The Research Council of Engineering Faculty, at Brawijaya University, Indonesia.

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