ABSTRACT

The purposes of this study are to examine strength and ductility of cylinder confined using wire rope, wire mesh, and a combination of wire rope and wire mesh, and to examine crack patterns, collapse model, the strength, stiffness, and ductility of columns without reinforcement and with reinforcement by using wire rope, wire mesh, and a combination of wire rope and wire mesh.

This experimental study consisted of the tests of confined cylinders and strengthened columns. Twenty two cylinders tested with standard size of 150 x 300 mm^2 were confined using three models, i.e. cylinders confined using wire rope, wire mesh, and a combination of wire rope and wire mesh. Eight cylinders were confined using wire rope with the parameter of wire rope space 20, 40, 60 and 80 mm. Six cylinders were confined using wire mesh with variation of one, two, and three layers of wire mesh restraint. Twenty three cylinders were confined using a combination of wire rope and wire mesh with variation of wire rope space 20, 40, 60, and 80 mm that were combined with one, two, and three layers of wire mesh. The confined cylinders were tested using monotonic centric axial loading. The experimental study in the columns consisted of one column without reinforcement as control and three ones with reinforcement. Control column has a square section of 180 x 180 mm^2 with height of 500 mm that was designed to fail in shear. The columns with reinforcement has a square section of 210 x 210 mm^2, consisting of one column strengthened using mortar jacket and wire rope with wire rope space of 100 mm, one column strengthened using mortar jacket and two layers of wire mesh, and one column strengthened using a combination of mortar jacket, wire rope space of 100 mm, and one layer of wire mesh. The tested column was cantilever column tested using a quasistatic pattern with a constant axial loading.

The results of tests on the confined cylinders and the strengthened columns showed that the strength and ductility of cylinders increased with the reduced space of wire rope. The strength of cylinders confined by using wire rope ranged from 29,289 to 64,425 MPa or approximately 1,137 to 2,505 times of peak strength of control cylinder. The addition of wire rope with space of 20 mm could increase the strength of cylinders, while that of wire mesh could not increase it. Strength confined cylinder one, two and three layers of wire mesh ranges; 1,004 to 1,42 times or 0,937 % - 41,98 % strength peak cylinder without confinemnet. Ductility confined cylinder one, two and three-layer of wire mesh ranges from 2,174 to 3,83, or 82,186 % -208,163 % ductility cylinder without confinement. The strength and ductility of cylinders could also be increased with the addition of wire rope combined with one, two, and three layers of wire mesh. The strength ratio of cylinders confined by using a combination of wire rope and one, two, and three layers of wire mesh compared to cylinder without being confined ranged from 1,206 to 2,634; 1,328 to 2,634; and 1,512 to 2,244, respectively. The axial ductility ratio of cylinders confined by using a combination of wire rope and one, two, and three layers of wire mesh compared to that without being confined ranged from 3,275 to 10,919; 3,187 to 9,692; and 2,488 to 9,075, respectively. Results of tests on the columns strengthened using wire rope (C-WR) and a

combination of wire rope and one layer of wire mesh (C-WR-M1) were cracked and failed in shear. Column strength strengthened with wire rope (C-WR), wire mesh (C-WM) and a combination of one layer of wire mesh (C-WR-M1) was 1,073; 1,206 and 1,069 times the power of the control column to push load, and 1,074; 1,183 and 1,110 times the tensile load control column. Stiffness of the columns strengthened with a combination of wire rope and a layer of wire mesh (C-WR-M1) on the control column (C-KTR) of 1,438 to 1,286 for the push load and tensile load. Stiffness of the columns strengthened with two layers of wire mesh (C-WM) to the control column (C-KTR) of 1,152 to 1,22 for the push load and tensile load. Stiffness of the columns strengthened with a combination of wire rope (C-WR) on the control column (C-KTR) of 1,181 to 1,163 for the push load and tensile load. Displacement ductility of the columns strengthened with wire rope (C-WR), two layers of wire mesh (C-WM) and a combination of wire rope and wire mesh (C-WR-M1) was 2,103; 2,399; and 2,774 times the ductility of the control column (C-KTR) on the push load.

Keywords: cylinder, column, restraint, reinforcement, wire mesh, wire rope, strength, ductility, shear